SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

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

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

BCE041 Energy & Environmental Engineering
Course Contents

Course Outcome

CO1- Describe the various sources of energy by learning about renewable and non-renewable energy sources.
CO2- Develop a understanding of environmental biodiversity and sustainable development by learning about ecosystems and its related cycles.
CO3- Discuss the concept of environmental pollution, its classification, causes, hazards and remedies.
CO4-understand the importance of social ethics and moral values by the study of ethical situations,
CO5- understand the impact of waste on society and learn about solid waste management.

Unit-I

Introduction to Energy Science: Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment; Overview of energy systems, sources, transformations, efficiency, and storage; Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

Unit-II

Ecosystems Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit-III

Biodiversity and its conservation Introduction – Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; India as a mega-diversity nation; Hot-sports of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex- situ conservation of biodiversity.

Unit-IV

Environmental Pollution Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards; Solid waste Management: Causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides.

Unit-V

Social Issues and the Environment From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns. Case Studies Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Wasteland reclamation; Protection Act; Air (Prevention and Control of Pollution) Act; Water

(Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.

Field work

- Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

Reference Books:-

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
2. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai,
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)
6. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
7. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaia

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BCE042 Construction Technology
Course Contents

Course Objectives:

1. To develop Fundamental knowledge of properties of concrete and its ingredients.
2. To acquire an interest in concrete technology and admixture and its filled requirements.
3. Developing a good skill of various methods of concrete making, placing and special formwork.
4. Developing a professional skill of concrete mix design by IS Code Method.

Unit-I

Cement: Production, Composition Properties, Types And Cement Chemistry. Introduction to Supplementary, Cementations Materials. Aggregates: Mineralogy, Properties, Test and Standards. Quality Of Water For Use In Concrete.

Unit-II

Introduction & study of accelerators, retarders, water reducers, air entrainers , water proofers, super plasticizers. Study of supplementary cementing materials like fly ash, silica fume , ground granulated blast furnace slag, metakaoline and pozzolana; their production, properties and effect on concrete properties .

Unit-III

Principle of mix proportioning, properties related to mix design, Mix design method (IS method and ACI method). Mix design of concrete: packing density, Rheology, mix design examples. Study and uses of high strength concrete, self compacting concrete, fiber reinforced concrete, ferro cement, ready Mix Concrete, recycled aggregate concrete and status in India.

Unit-IV

Concrete production, batching, mixing and transportation of concrete. Workability: test for work ability of concrete (slump test, compacting factor test and Vee Bee test). Segregation and bleeding in concrete, curing of concrete and its methods. Determination of compressive and flexural strength as per BIS. Mechanical properties of concrete: elastic modules , poison's ratio, creep, shrinkage and durability of concrete.

Unit-V

Construction of Earthquake Resistant Building Planning of earthquake resistant building, Construction of walls – provision of corner reinforcement, construction of beams and columns, Base isolation.

Course Outcome

CO1- To Analyze property of cement and study of mineralogy.
CO2- Understand metakaoline and pozzolana and study of accelerator, retarders .
CO3- Understand Work with various mix design of concrete and its rheology.
CO4-Develop the skill workability test, slump test, shrinkage and durability of concrete .
CO5- Describe the various construction of earth quake resistant building and construction of beam and column.

Reference Books:-

1. Mohan Rai & M. P. Jai Singh, Advances in Building materials and Constructions.
2. S. P. Arora and S. P. Bindra, A text Book of Building Construction-Dhanpat Rai and Sons, New Delhi.
3. S. K. Sarkar and Saraswati, Construction Technology- Oxford University Press, New Delhi.
4. Sushil Kumar, Building Construction.
5. B. C. Punmia , Building Construction.
6. Metchell , Building Construction.
7. Chudley R.., Construction Technology.
8. Dr. K.R. Arora Soil Mechanics & Foundation Engg - Std. Publishers Delhi
9. B.C. Punmia, Soil Mechanics & Foundation Engg. - Laxmi Publications Delhi

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

Academic Session: 2024-25

BCE043 Structural Analysis-I

Course Contents

Course Objectives:

1. To learn the methods which are applied to analyse indeterminate structures.
2. To gain the expertise in analysis of indeterminate beams and rigid frames.
3. To develop professional skill in analyzing indeterminate pin jointed structures.
4. To learn to draw influence line diagrams for stress functions in indeterminate beams which may be useful for moving the maximum values of the stress functions.

Unit-I

Introduction of Statically indeterminate Structures: Concept of Static indeterminacy, Analysis of fixed and continues beams by theorem of three moments, effects of sinking of support.

Unit-II

Rolling loads on simply supports beams with concentrated and uniformly distributed loads, maximum B.M. and S.F. Influence lines for reactions, bending moments and shear forces in simply supported beam, cantilevers and beams with overhangs. Influence lines for forces in members of simple trusses and for BM and SF in panels of simple trusses.

Unit-III

Strain energy method as applied to the analysis of redundant frames and redundant truss up to two Degrees, Determination of deflection of trusses. Castiglinos theorems. Maxwells reciprocal theorem. Bettis theorem.

Unit-IV

Bucking of columns and beams. Eulers and Rankines formula. Analysis of Two-Hinged arches. Three Hinged Arch, S.F. and normal thrust, parabolic arches.

Unit-V

Slope defection method as applied to indeterminate beams & continues beams portal frames. Frame with inclined legs upto 3 degree of freedom. Approximate method: Analysis of multi-stored frame, portal, cantilever and substitute frame methods.(max. three bay three storey). Introduction to flexibility method upto two DOF, Column Analogy Method.

Course Outcome

CO1: To understand strain energy, energy theorems.

CO2: Analysis of fixed end continuous beam by theorem of three moments .

CO3: Analysis of beams and frames by slope and deflection method, column analogy method.

CO4: To understand three hinged arches of different shapes, two hinged and fixed arches.

CO5: To understand maximum shear force and bending moment curves for various type of rolling loads, influence lines for determinate structures.

References Books:-

1) Rammamurtham, Theory of Structures, Dhanpat Rai .
2) Bhavikatti S.S. Analysis of Structures (I&II) Vikas Publication
3) B C Punmia, Theory of Structures, Firewall Media.
4) A Kassimali, Structural Analysis, Cengage Learning.
5) A Ghali, A Neville, T G Brown, Structural Analysis: CRC Press.
6) Hibbler, Structure Analysis -1, Pearson Education India
7) Das MM, Structural Analysis, PHI
8) Thandavamurthy TS, Structural Analysis, Oxford
9) Muthuku, Azmi I, Basic Structural Analysis, IK International Publisher
10) C KWang, Intermediate Structural Analysis, McGraw Hill
11) J Kinney Sterling, Indeterminate structural Analysis, Addison-Wesley
12) RR Mamuther S Theoty of Structures Dhanpat Rai
13) Jain O.P.-Jain B.K. Theory& Analysis of Structures (I&II) Nem Chand.

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

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BCE044 Transportation Engineering-I (Highway Engineering)

Course Contents

Course Objectives:

1. Be familiar with principles of Highway planning & Geometric design.
2. Fundamental Concepts of Traffic Engineering.
3. Learning different highway materials & their testing.
4. Learning pavement design & its Construction.

Unit-I

Highway planning, Alignment & Geometric Design: Principles of highway planning, road planning in India and financing of roads, classification patterns. Requirements, Engg. Surveys for highway location. Cross sectional elements- width, camber, super-elevation, sight distances, extra widening at curves, horizontal and vertical curves, numerical problems.

Unit-II

Bituminous & Cement Concrete Payments: Design of flexible pavements, design of mixes and stability, WBM, WMM, BM, IBM, surface dressing, interfacial treatment- seal coat, tack coat, prime coat, wearing coats, grouted macadam, bituminous concrete specification, construction and maintenance. Advantages and disadvantages of rigid pavements, general principles of design, types, construction, maintenance and joints, dowel bars, tie bars. Brief study of recent developments in cement concrete pavement design, fatigue and reliability.

Unit-III

Low Cost Roads, Drainage of Roads, Traffic Engg. & Transportation Planning: Principles of stabilization, mechanical stabilization, requirements, advantages, disadvantages and uses, quality control, macadam roads-types, specifications, construction, maintenance and causes of failures. Surface and sub-surface drainage, highway materials: properties and testing etc. Channelized and unchannelized intersections, at grade & grade separated intersections, description, rotary-design elements, advantages and disadvantages, marking, signs and signals, street lighting. Principles of planning, inventories, trip generation, trip distribution, model split, traffic assignment, plan preparation.

Unit-IV

Airport Planning, Runway & Taxiway: Airport site selection. air craft characteristic and their effects on runway alignments, wind rose diagrams, basic runway length and corrections, classification of airports. Geometrical elements**:** taxi ways and runways, pattern of runway capacity.

Unit-V

Airport, Obstructions, Lightning & Traffic control: Zoning regulations, approach area, approach surface-imaginary, conical, horizontal. Rotating beacon, boundary lights, approach lights, runway and taxiway lighting etc. instrumental lending system, precision approach radar, VOR enroute traffic control.

Course Outcome

CO1- To identify components of roads ,their dimensions, functions and IRC recommendations of different types of Roads , super-elevation ,camber and curves.

CO2- Illustrate different road materials and explain construction procedure of different kind of roads, wearing coat, design of flexible pavement.

CO3- Illustrate maintenance and repair techniques of roads and highway drainage arrangement, low cost road drainage of road.

CO4- Analyze of airport site selection, runway alignment, discus taxiway and runways.

CO5- To identify air port planning, obstruction, lighting and various instrumental landing system.

Reference Books:-

1. Highway Engineering by Gurucharan Singh
2. Principles of Pavement Design by E.J. Yoder & M.W. Witzech
3. Highway Engineering by O'Fleherty
4. Highway Engineering by S.K. Khanna & C.E.G. Justo
5. Airport Planning & Design by S.K. Khanna & M. G. arora
6. Foresch, Charles "Airport Planning"
7. Horonjeff Robert "The Planning & Design of Airports"
8. Sharma & Sharma, Principles and Practice of Highway Engg.
9. Haung, Analysis and Design of Pavements
10. Relevant IRC & IS codes
11. Laboratory Mannual by Dr. S.K. Khanna
12. Highway Engg. By Hews & Oglesby
13. Highway Material by Walker

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BCE045 Engineering Geology & Remote Sensing

Course Contents

Course Objectives:

1. To understand fundamental concepts of engineering geology
2. To learn about the various types of rocks and their properties.
3. To study about the Earthquakes, its causes, classification etc
4. To gain knowledge about Landslides, Land subsidence and Geological Hazards
5. To learn about Geological investigations in Civil Engg.

Unit-I

Introduction and physical geology: Branches application and scope of geology, age and parts of the earth, weathering or rocks, geological action of river, ground water, sea and oceans, Concept and causes of earthquakes and volcanoes.

Unit-II

Mineralogy and crystallography: Fundamentals of mineralogy, physical properties, study of common rock forming minerals and ore minerals, importance to civil engineering, and element of crystals and introduction to crystal systems.

Unit-III

Petrology: Rock cycle, composition, classification and structures of igneous, sedimentary and metamorphic rocks of civil engineering importance, study of common rock types, brief geological history of India.

Unit-IV

Structural geology: Introduction outcrops dip and strike of beds. Problems on dip, strike, thickness and three bore hole problems. Folds: parts of fold, classification, effects on outcrops, their identification in field, Importance of folds in civil engineering projects .Joints: definition, nomenclature and classification, Importance of joints in civil engineering projects. Faults: terminology, classification, mechanics of faulting, recognition of faults in the field, Importance of faults in civil engineering projects. Unconformity: Formation of unconformity, Types of unconformity.

Unit-V

Applied geology and remote sensing: Engineering properties of rocks, selection of sites for Dam, Tunnel, Reservoirs and Canals, uses of remote sensing technique. Types, components and elements of remote sensing, EMS and MSS, Visual interpretation technique, application of .GIS in civil engineering and resource mapping (site selection, water resources, rocks and soil).

Course Outcome

CO1: Understanding of the role of geology in design and construction processes.
CO2: Apply geological concepts and approaches to rock engineering projects.
CO3: Identify and classify rocks using basic geological classifications and understand the formation and properties of each category.
CO4: Use the geological literature to establish the Geo-technical framework needed to properly design and construct heavy civil engineering projects.
CO5: Understanding the application of remote sensing and geographical information system in civil engineering projects.

Reference Books:-

1. Prabin Singh -"Engineering and General Geology"
2. P. K. Mukherjee -"A test Book of Geology"
3. S. K. Garg -"A text Book of Physical and Engineering Geology"

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BCE042P Construction Technology Lab

List of Experiments:

Test on Aggregates:

1. Determination of Soundness test on aggregate.
2. Determination of Deleterious materials in fine aggregate.
3. Determination of Grading curve of Mix aggregate & sieve analysis.

Properties of Fresh Concrete:

1. To study the effect of use of mineral admixture and chemical admixture on the workability of fresh concrete using Slump Cone test.
2. To study the effect of use of mineral admixture and chemical admixture on the workability of fresh concrete using Compaction Factor Test.
3. To study the effect of use of mineral admixture and chemical admixture on the workability of fresh concrete using Vee-bee test.
4. To study the effect of use of mineral admixture and chemical admixture on the workability of fresh concrete using Flow table test.

Mix Design:

1. Mix Design by I.S. Code method (with OPC Cement)
2. Mix Design by I.S. Code method (with Slag Cement)
3. Mix Design by I.S. Code method (with Admixtures Cement)

Reference Books:

1. Lab Manual Concrete – M.L. Gambhir (Tata McGraw Hill)
2. Concrete Technology – M.S. Shetty (S. Chand & Co.)
3. Concrete Technology – M.L. Gambhir (Tata McGraw H

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BCE043P Structural Analysis-I Lab

List of Experiment:-

1. To verify Maxwell- Bett's Law.
2. To determine the flexural rigidity of the beam verify it theoretically.
3. To determine the deflection of a pin jointed truss and to verify the results theoretically and graphically
4. To verify strain in an externally loaded beam with the help of a strain gauge indicator and to verify theoretically
5. To study behavior of different types of columns and find Euler's buckling load for each case
6. To study two hinged arch for the horizontal displacement of the roller end for a given system of loading and to compare the same with those obtained analytically
7. To study the behavior of a portal frame under different end conditions apparatus.
8. To find the value of flexural rigidity (EI) for a given beam and compare it with theoretical value.
8. To determine the deflection of a pin connected truss analytically &graphically and verify the same experimentally.

References Books:-

1. Mechanics of Materials – Dr. B. C. Punmia, Jain & Jain (Laxmi Publications)
2. Theory of Structures - Dr. B. C. Punmia, Jain & Jain (Laxmi Publications)
3. Structural Analysis – Negi L.S. & Jangid R.S. (Tata McGraw Hill)
4. Basic Structural Analysis (Vol. I & II) – Bhavikatti S.S. (Vikas Publishing)
5. Theory of Structures – Ramamurtham S. & Narayan R. (DhanpatRai Publications)

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BCE044P Transportation Engineering-I (Highway Engineering) Lab

List of Experiments:

1. Aggregate Crushing Value Test
2. Determination of aggregate impact value
3. Determination of Los Angeles Abrasion value
4. Determination of California Bearing Ratio values
5. Determination of penetration value of Bitumen
6. Determination of Viscosity of Bituminous Material
7. Determination of softening point of bituminous material
8. Determination of ductility of the bitumen
9. Determination of flash point and fire point of bituminous material
10. Determination of Bitumen content by centrifuge extractor
11. Determination of stripping value of road aggregate
12. Determination of Marshall stability value for Bituminous mix
13. Determination of shape tests on aggregate

Reference Books:-

1. Highway Engineering – Justo & Khanna (Khanna Publishers)
2. Highway Engineering Manual – Justo & Khanna (Khanna Publishers)

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BCE045P Engineering Geology & Remote Sensing Lab

List of Experiment's (Expandable)

1. Identification of simple rock forming minerals and important ores.
2. Identification of rocks.
3. Simple map Exercises.
4. Field Visit/Geological Excursion

Reference Books:-

1. Geology and Engineering – Leggot, R.F. (Mc-Graw Hill, New York)
2. Engineering and General Geology – Prabin Singh (Katson Publication House)

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BCE046P Software Lab (Python Programming)

Course Contents

List of Experiments:

1. To write a python program that takes in command line arguments as input and print the number of arguments.
2. To write a python program to perform Matrix Multiplication.
3. To write a python program to compute the GCD of two numbers.
4. To write a python program to find the most frequent words in a text file.
5. To write a python program find the square root of a number (Newton's method).
6. To write a python program exponentiation (power of a number).
7. To write a python program find the maximum of a list of numbers.
8. To write a python program linear search.
9. To write a python program Binary search.
10. To write a python program selection sort.
11. To write a python program Insertion sort.
12. To write a python program merge sort.
13. To write a python program first n prime numbers.
14. To write a python program simulate bouncing ball in Pygame.

Reference Books:-

1. Python Data Analytics– Fabio Nelli, APress.
2. Python for Data Analysis, Wes McKinney, O'Reilly.