**NBKR INSTITUTE OF SCIENCE & TECHNOLOGY :: VIDYANAGAR**

*(AUTONOMOUS)*

**CIVIL ENGINEERING**

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2013-2014)

**IV YEAR OF FOUR YEAR B.TECH. DEGREE COURSE – II SEMESTER**

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| S.No. | Course  Code | Course Title | Contact  Hours/  Week | | | Credits | Evaluation | | | | | | | | | |
| Sessional  Test-I | | | Sessional  Test-II | | Total Sessional Marks (Max. 40) | Semester  End Examination | | Max.  Total Marks | |
| **THEORY** | L | P | T |  | Duration  in Hours | | Max.  Marks | Duration  in Hours | Max.  Marks | 0.8(Better of two sessional tests)  +  0.2(Other) | Duration  in Hours | Max.  Marks |  | |
| 1 | 13CE4201 | Design & Drawing Of Irrigation Structures | 1 | 3 | - | 4 | 2 | | 40 | 2 | 40 | 3 | 60 | 100 | |
| 2 | 13CE4202 | Environmental Studies | 4 | - | - | 4 | 2 | | 40 | 2 | 40 | 3 | 60 | 100 | |
| 3 | 13CE42EX | Elective - III | 4 | - | - | 4 | 2 | | 40 | 2 | 40 | 3 | 60 | 100 | |
|  | | **PRACTICALS** |  |  | | | | | | | |  |  | | | |
| 1 | 13CE42P1 | CAAD Laboratory | - | 3 | - | 2 | | - | - | - | - | Day to day evaluation and a test  (100 Marks) |  | - | | 100 |
| 2 | 13CE42PR | Project Work | - | 3 | - | 6 | | - | - | - | - | Continuous Assessment and seminar  (80 Marks) |  | 120 | | 200 |
|  |  | **TOTAL** | **09** | **09** |  | **20** | | **6** | **-** | **6** | **-** | **300** | **9** | **300** | | **600** |

**Elective – III:**

13CE42E1 Remote Sensing & GIS 13CE42E2 Finite Element Analysis

13CE42E3 Advanced Highway Engineering 13CE42E4 Ground Improvement Techniques

13CE42E5 Environmental Pollution and Control

**13CE42E1 - REMOTE SENSING & GIS**

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| **Course category:** | Program core | **Credits:** | 4 |
| **Course Type:** | Theory | **Lecture - Tutorial - Practical:** | 3 - 1 - 0 |
| **Prerequisite:** | None | **Sessional Evaluation :**  **Univ.Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Outcomes** | CO1 | To know the workings of a remote sensing system along with the terms and concepts of the physical applications of such a system. |
| CO2 | To focus on different technical aspects of a remote sensing network with specific detail on India. |
| CO3 | To compare different types of data obtained from a remote sensing network with tools specifically designed for the purpose. |
| CO4 | To understand about various methods of corrections applied to data to ensure maximum credibility and accountability to the data collected. |
| CO5 | To identify concepts of GIS and its applications in various fields of planning and policy. |
| **Course Content** | **UNIT – I**  **FUNDAMENTALS :** Definition – History – Physics of Remote Sensing – Electromagnetic Radiation – Interaction of Electromagnetic Radiation with Atmosphere, Earth Surface Features – Vegetation, Soils, Water – Spectral Signature – Atmospheric Windows.  **UNIT – II**  **REMOTE SENSING SYSTEM:** Introduction - Platforms – Types – Satellites – Indian Remote Sensing Satellites.  **SENSORS :** Introduction – Types – Characteristics of Sensors – IFOV – Indian Remote Sensing Sensors – LISS-WIFS-PAN.  **UNIT – III**  **VISUAL DATA ANALYSIS:** Introduction – Types of Data Products – Image interpretation Techniques – Detection, Recognition, Analysis, Classification, Deduction, Idealization – Elements of Image Interpretation – Keys.  **UNIT – IV**  **IMAGE PROCESSING :** Introduction – Overview – Preprocessing \_ Radiometric Correction – Geometric correction – Rectification. Enhancement Techniques – Contrast Stretch – Edge enhancement – Filtering Techniques – Classification Techniques – Supervised and unsupervised classification.  **UNIT – V**  **GEOGRAPHICAL INFORMATION SYSTEM:** Basic Principles – Definition – Components – Data Structures – Raster and Vector formats – Functioning of GIS - Data Input – Data Manipulation – Data Retrieval – Data Analysis – Data Display – Data Base Management Systems. | |
| **Text Books and reference Books:** | **TEXT BOOKS:**   1. Remote sensing and GIS by Prof. Anji Reddy. 2. Principles of Remote Sensing & GIS by Dr. PH Anand & V. Raj Kumar   **REFERENCE BOOKS:**   1. F.F.Sabins Jr. Remote Sensing Principles and Interpretation. 2. P.J.Curran, Principles of Remote Sensing. 3. Little and Kiefe, Remote Sensing Principles and Image Interpretation. 4. C.P.I., Principles of Geographic Information Systems. 5. J.R. Jense, Principles of Remote Sensing. 6. Prithvish Nag, M. Kudrat, Digital Remote Sensing. | |

**13CE42E2 - FINITE ELEMENT ANALYSIS**

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| **Course category:** | Program core | **Credits:** | 4 |
| **Course Type:** | Theory | **Lecture - Tutorial - Practical:** | 3 - 1 - 0 |
| **Prerequisite:** | **Structural Analysis** | **Sessional Evaluation :**  **Univ.Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Outcomes** | CO1 | Able to apply the fundamental concepts of FEM. |
| CO2 | Able to understand and apply the concepts of one dimensional finite elements. |
| CO3 | Able to apply basic FEM concepts of truss elements. |
| CO4 | Able to apply basic concepts of FEM for beam elements. |
| CO5 | Able to apply isometric concepts in modeling of finite elements. |
| **Course Content** | **UNIT –I**  **INTRODUCTION TO FINITE ELEMENT METHOD:** Introduction, Finite Difference Method, Advantages and disadvantages, basis steps, Limitations, Finite Element Modeling and Discretization, Interpolation and shape functions, Types of elements, nodes and degrees of freedom  **UNIT – II**  **ONE DIMENSIONAL FINITE ELEMENTS:** Introduction, bar element, beam element, bar and beam elements of arbitrary orientation, assembly of elements, stiffness matrices, boundary conditions, loads, applications.  **UNIT – III**  **TRUSSES:** Plane trusses, local and global coordinate systems, direction cosines, element stiffness matrix, assembly of global stiffness matrix, stress calculation.  **UNIT – IV**  **FINITE ELEMENT FORMULATION:** Introduction beam stiffness, assembly of beam stiffness matrix, loading, boundary conditions, plane stress, plane strain analysis  **UNIT – V**  **ISOPARAMETRIC ELEMENTS AND FINITE ELEMENT MODELLING:** Mesh requirements, material properties, loads and reactions, boundary conditions, checking the model, analysis and design software (for practice purpose only) | |
| **Text Books and reference Books:** | **TEXT BOOKS:**   1. Finite Element Analysis – Govinda Rao. 2. Finite Element Analysis – S. S. BhavaKatti. 3. Introduction to Finite Elements Engineering. - Chandrupatla & Belegundu. 4. Introduction to Finite Elements.- Abel & Desai. 5. Finite Element Analysis in Engineering Design- S. Rajasekaran . 6. Finite Element Analysi, Theory and Programming. - C.S. Krishna Murthy.   **REFERENCE BOOKS:**   1. The Finite Element Method.- Zienkiewicz. 2. Concepts and Applications of Finite Element Analysis.- Robert Cook Davis Mallcus. 3. Theory and Problems of Finite Element Analysis. - George Buchanan. | |

**13CE42E3 - ADVANCED HIGHWAY ENGINEERING**

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| **Course category:** | Program core | **Credits:** | 4 |
| **Course Type:** | Theory | **Lecture - Tutorial - Practical:** | 3 - 1 – 0 |
| **Prerequisite:** | Transportation Engineering | **Sessional Evaluation :**  **Univ.Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Outcomes** | CO1 | To familiarize with design considerations of highway projects and factors that are involved in everyday work on a project. |
| CO2 | To analyze and study different methods of road maintenance along with failures normally associated with projects involving pavements and sub soils. |
| CO3 | To understand special and complex projects, their maintenance and workings along with factors which influence their efficiency. |
| CO4 | To explain concepts of planning and land use development with respect to highways in particular and the community in general. |
| CO5 | To understand the concepts of safety and economics, important in the economic growth of the community for its social and behavioral consequences. |
| **Course Content** | **UNIT – I**  Highway Lighting – Design factors, design of highway lighting systems.  Machinery and equipment – for earth work, rock excavation, transportation of materials, watering compaction, bituminous and concrete works.  **UNIT – II**  Soil treated roads, Soil stabilized roads – various methods. Maintenance of Highway causes of pavement failures – classification of maintenance works, failures in-flexible pavements, failure in cement concrete pavements, maintenance of bituminous roads and cement concrete roads.    **UNIT – III**  Ghat roads – Alignment, geometry of hill roads, drainage in ghat roads, maintenance problems.  Roads in special areas – Roads in swampy and water logged areas and in block cotton soils.  **UNIT – IV**  Road side development – environmental factors in planning and development of highways, road side development and arboriculture- planning plantation of trees, care of trees.  **UNIT – V**  Highway safety – Road accident situations in India, causes of road accidents. Road and its effects on Road accidents, Safety during construction.  Highway Economics – Introduction – Highway user benefits, highway costs | |
| **Text Books and reference Books:** | **TEXT BOOK**  1. Highway Engineering – S.K.Khanna & C.E.G.Justo.  2. Principles and Practices of Highway Engineering by – L.R.Kadiyali.  **REFERENCE BOOKS:**   1. Principles, Practice and Design of Highway Engg., by S.K. Sharma, S.Chand & Co.Ltd., New Delhi, 1985. 2. A course in Highway Engineering by S.P. Bindra, Dhanpat Rai & Sons, Delhi 1988. | |

**13CE42E4 -GROUND IMPROVEMENT TECHNIQUES**

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| **Course category:** | Program core | **Credits:** | 4 |
| **Course Type:** | Theory | **Lecture - Tutorial - Practical:** | 3 - 1 - 0 |
| **Prerequisite:** | **Soil Mechanics, Foundation Engineering** | **Sessional Evaluation :**  **Univ.Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Outcomes** | CO1 | Be able to understand dewatering methods and grouting techniques. |
| CO2 | Be able to apply in-situ densification methods for soils. |
| CO3 | Be able to understand and apply the various chemicals for stabilization of soils. |
| CO4 | Be able to understand components of reinforced earth and application of geosynthetics. |
| CO5 | Be able to understand the concept of ground improvement for expansive soils. |
| **Course Content** | **UNIT – I**  **Dewatering**: methods of de-watering- sumps and interceptor ditches- single, multi stage well points - vacuum well points. Horizontal wells-foundation drains-blanket drains- criteria for selection of fill material around drains –Electro-osmosis .  **Grouting:** Objectives of grouting- grouts and their properties- grouting methods- ascending, descending and stage groutinghydraulic, fracturing in soils and rocks- post grout test.  **UNIT – II**  **In – situ densification methods in granular Soils:–** Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth.  **In – situ densification methods in Cohesive soils:–** preloading or dewatering, Vertical drains – Sand Drains, Sand wick geodrains – Stone and lime columns – thermal methods.  **UNIT - III**  **Stabilisation**: Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride, sodium silicate and gypsum  **UNIT – IV**  **Reinforced Earth**: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.  **Geosynthetics** : Geotextiles- Types, Functions and applications – geogrids and geomembranes – functions and applications.  **UNIT – V**  **Expansive soils**: Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles. | |
| **Text Books and reference Books:** | **TEXT BOOKS:**  1. Hausmann M.R. (1990), Engineering Principles of Ground Modification, McGraw-Hill International Edition.  2. Purushotham Raj. Ground Improvement Techniques, Laxmi Publications, New Delhi  **REFERENCES:**  1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA.  2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley and Sons,  New York, USA.  3. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy, USA | |

**13CE42E5 - ENVIRONMENTAL POLLUTION AND CONTROL**

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| **Course category:** | Program core | **Credits:** | 4 |
| **Course Type:** | Theory | **Lecture - Tutorial - Practical:** | 3 - 1 - 0 |
| **Prerequisite:** | **Environmental Studies, Environmental Engineering** | **Sessional Evaluation :**  **Univ.Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Outcomes** | CO1 | Understanding the nature, significance and effects of pollution. |
| CO2 | Understand the effects of air pollution and various controlling parameters. |
| CO3 | Understanding the effects of water pollution and various controlling parameters |
| CO4 | Understand the various methods for solid and hazardous waste disposal. |
| CO5 | Understand the environmental legislation acts for industrial pollution control. |
| **Course Content** | **UNIT – I**  **THE NATURE OF POLLUTION:**  Air pollution and its effects on living and non-living. Water pollution and its effects, solid wastes and land pollution.  **UNIT – II**  **AIR POLLUTION CONTROL:**  Influence of metereological parameters, physical principles, dry systems, fabric collectors, wet scrubbers, electrostatic precipitations, fume incineration tall sacks. Physical separation systems gravity setting chambers, inertial separators, cyclones, fabric collectors, wet scrubbers, electrostatic precipitators, fume incineration.  **UNIT – III**  **WATER POLLUTION CONTROL:**  Routine methods for removal of suspended and dissolved impurities, advance methods like chemical oxidation, membrane separation process, and biological process for removal of phosphorous and nitrogen. Land treatment, eutrophication control.  **UNIT – IV**  **SOLD WASTE MANAGEMENT:**  Quantities and characterizations of municipal solid wastes, recovery of materials and energy sanitary land filling. Disposal of hazardous wastes.  **UNIT – V**  **ENVIRONMENTAL LEGISLATION AND INDUSTRIAL POLLUTION CONTROL:**  Legislation conserving water pollution air pollution and hazards wastes. Caste studies of pollution control in cement industries, paper, & pulp industries, brewing. | |
| **Text Books and reference Books:** | **TEXT BOOKS:**   1. [Environmental Pollution and Control](https://books.google.co.in/books?id=zxn3TgTOxggC&printsec=frontcover&dq=ENVIRONMENTAL+POLLUTION+AND+CONTROL&hl=en&sa=X&ved=0ahUKEwjrp9Dz8KbNAhUDrI8KHfytD2kQ6AEINTAA) [J. Jeffrey Peirce](https://www.google.co.in/search?sa=X&biw=1366&bih=639&tbm=bks&tbm=bks&q=inauthor:%22J.+Jeffrey+Peirce%22&ved=0ahUKEwjrp9Dz8KbNAhUDrI8KHfytD2kQ9AgINzAA), ‎[P Aarne Vesilind](https://www.google.co.in/search?sa=X&biw=1366&bih=639&tbm=bks&tbm=bks&q=inauthor:%22P+Aarne+Vesilind%22&ved=0ahUKEwjrp9Dz8KbNAhUDrI8KHfytD2kQ9AgIODAA), ‎[Ruth Weiner](https://www.google.co.in/search?sa=X&biw=1366&bih=639&tbm=bks&tbm=bks&q=inauthor:%22Ruth+Weiner%22&ved=0ahUKEwjrp9Dz8KbNAhUDrI8KHfytD2kQ9AgIOTAA) 2. Environmental Pollution Control Engineering by CS Rao 3. [Environmental Pollution and Control](https://books.google.co.in/books?id=NxwNtk3aw54C&printsec=frontcover&dq=ENVIRONMENTAL+POLLUTION+AND+CONTROL&hl=en&sa=X&ved=0ahUKEwjrp9Dz8KbNAhUDrI8KHfytD2kQ6AEISzAD) by [P. R. Trivedi](https://www.google.co.in/search?sa=X&biw=1366&bih=639&tbm=bks&tbm=bks&q=inauthor:%22P.+R.+Trivedi%22&ved=0ahUKEwjrp9Dz8KbNAhUDrI8KHfytD2kQ9AgITTAD)   **REFERENCE BOOKS:**  1. Environmental engineering by peavey and Rowe  2. Environmental pollution and control – P.A Vesilind, J.J. Peirce. | |