



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For

B. TECH CIVIL ENGINEERING

(Applicable for batches admitted from 2019-2020)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA - 533 003, Andhra Pradesh, India



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IV YEAR: I- SEMESTER

| Sl. No. | Course Code | Course Title | L | T | P | Credits |
|---------|-------------|--|---|---|---|-----------|
| 1 | PC701 | Design & Drawing of Steel Structures | 3 | 0 | 0 | 3 |
| 2 | PC702 | Geotechnical Engineering - II | 3 | 0 | 0 | 3 |
| 3 | PC703 | Remote Sensing & GIS | 3 | 0 | 0 | 3 |
| 4 | PE701 | Program Elective – III | 3 | 0 | 0 | 3 |
| 5 | OE701 | Open Elective – III | 3 | 0 | 0 | 3 |
| 6 | PC704 | Remote Sensing & GIS Lab | 0 | 0 | 3 | 1.5 |
| 7 | PC705 | Geotechnical Engineering Lab | 0 | 0 | 3 | 1.5 |
| 8 | PR701 | Industrial Training/ Internship or Seminar | 0 | 0 | 3 | 1 |
| 9 | PR702 | Project Work Phase-I | 0 | 0 | 4 | 2 |
| | | Total Credits | | | | 21 |

IV YEAR: II- SEMESTER

| Sl. No. | Course Code | Course Title | L | T | P | Credits |
|---------|-------------|--|---|---|----|-----------|
| 1 | PC801 | Estimation Specifications and Contract | 3 | 0 | 0 | 3 |
| 2 | PE801 | Program Elective - IV | 3 | 0 | 0 | 3 |
| 3 | PE802 | Program Elective – V | 3 | 0 | 0 | 3 |
| 4 | PR801 | Project Work Phase-II | 0 | 0 | 16 | 8 |
| | | Total Credits | | | | 17 |



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| Open Electives | Professional Elective-I | Professional Elective-II | Professional Elective-III | Professional Elective-IV | Professional Elective-V |
|--------------------------------------|---|------------------------------------|---------------------------------------|--|---|
| a) Disaster Management | a) Repair & Rehabilitation of Buildings | a) Pre-stressed Concrete | a) Bridge Engineering | a) Finite Element Methods | a) Advanced Structural Analysis |
| b) Environmental Pollution & Control | b) Environmental Impact Assessment | b) Watershed Management | b) Industrial Waste Water Treatment | b) Design & Drawing of Irrigation Structures | b) Urban Hydrology |
| c) Elements of Civil Engineering | c) Reinforced Soil Structures | c) Advanced Foundation Engineering | c) Earth & Rock-fill Dams | c) Soil Dynamics and Machine Foundations | c) Ground Improvement Techniques |
| d) Green Technology | d) Traffic Engineering | d) Urban Transportation Planning | d) Intelligent Transportation Systems | d) Road Safety Engineering | d) Pavement Management Systems |
| e) Smart Cities | e) Construction Technology & Management | e) Architecture and Town Planning | e) Building Services | e) Disaster Management & Mitigation | e) Low-cost Housing |
| f) Project Management | | | | f)SWAYAM / NPTEL /MOOCS COURSES (12 weeks duration) | f) SWAYAM / NPTEL /MOOCS COURSES (12 weeks duration) |
| g) Traffic Safety | | | | | |
| h) Geo-Spatial Technologies | | | | | |
| i) Waste Water Treatment | | | | | |



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|---|----------|----------|----------|----------|
| IV Year – II Semester | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| Estimation Specifications and Contract | | | | |

Course Learning Objectives:

The objective of this course is to enable the students to:

- Understand the quantity calculations of different components of the buildings.
- Understand the rate analysis of different quantities of the buildings components.
- Learn various specifications and components of the buildings.

Course Outcomes:

Upon the successful completion of this course:

- The student should be able to determine the quantities of different components of buildings.
- The student should be in a position to find the cost of various building components.
- The student should be capable of finalizing the value of structures.

SYLLABUS:

UNIT – I General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

UNIT – II Rate Analysis – Working out data for various items of work over head and contingent charges.

UNIT-III Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.

UNIT – IV Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation of buildings Standard specifications for different items of building construction.

UNIT-V Detailed Estimation of Buildings using individual wall and center line method

FINAL EXAMINATION PATTERN:

The end examination paper should consist of SIX questions from Unit 1 to Unit 4, out of which THREE are to be answered (60% weight-age) & ONE mandatory question (40% weight-age) from Units 5 & 6 is to be answered.



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Text Books:

1. Estimating and Costing, B.N. Dutta, UBS publishers,2000.
2. Civil Engineering Contracts and Estimates, B. S. Patil, Universities Press (India) Pvt. Ltd., Hyd.
3. Construction Planning and Technology, Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. NewDelhi.
4. Estimating and Costing, G.S.Birdie.

References:

1. Standard Schedule of rates and standard data book, Public worksdepartment.
2. IS 1200 (Parts I to XXV-1974/ Method of Measurement of Building & Civil Engg Works –B.I.S.
3. Estimation, Costing and Specifications, M. Chakraborti; Laxmipublications.
4. National BuildingCode



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|--|--|----------|----------|----------|----------|
| IV Year – II Semester | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| PROGRAM ELECTIVE – IVa). Finite Element Methods | | | | | |

Course Learning Objectives:

The objective of this course is:

Equip students with fundamentals of Finite Element Analysis

- Enable students to formulate design problems into FEA.
- Enable students to solve Boundary value problems using FEM

Course Outcomes:

Upon completion of the course, the student will be able to

- Solve simple boundary value problems using Numerical technique of Finite element method
- Develop finite element formulation of one and two dimensional problems and solve.
- Assemble Stiffness matrices, apply boundary conditions and solve for displacements
- Compute Stresses and Strains and interpret the result.

SYLLABUS:

UNIT-I Introduction:

Principles of Elasticity- Equilibrium Equations- Strain Displacement relationships- Constitutive relationship for plane stress, plane strain and axis-symmetric bodies of revolution with axis-symmetric loading.

Stiffness method- Principle of Stationary potential energy- Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation.

UNIT-II: Finite Element formulation of truss element: Stiffness matrix- properties of stiffness matrix – Selection of approximate displacement functions- solution of a plane truss- transformation matrix- Galerkin's method for 1-D truss – Computation of stress in a truss element.

UNIT-III Finite element formulation of Beam elements: Beam stiffness- beam stiffness matrix- Examples on Analysis of beams Subjected to Concentrated and Distributed loading.

UNIT-IV Finite element formulation for plane stress and plane strain problems- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces



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UNIT-V Iso-parametric Formulation: Isoparametric bar element- plane bilinear isoparametric element – quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature for performing numerical integrations.

Text Books

1. Introduction to Finite Elements in Engineering, Tirupati R. Chandrupatla, Ashok D. Belgundu, PHIpublications.
2. A first course in the Finite Element Method, Dary L. Logan, ThomsonPublications.

Références:

1. Concepts and applications of Finite Element Analysis, Robert D. Cook, Michael E Plesha, John Wiley & sonsPublication
2. Introduction to Finite Element Method, Desai & Abel CBSPublications



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| IV Year – II Semester | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| PROGRAM ELECTIVE – IV b). Design & Drawing of Irrigation Structures | | | | | |

Course Learning Objectives:

To understand design principle of various irrigation structures

Course Outcomes:

At the end of the course the student will be able to To design various irrigation structures.

SYLLABUS:

Design and drawing of

1. Surplusweir
2. Tank sluice with a towerhead
3. Canal drop-Notchtype
4. Canalregulator
5. Undertunnel
6. Syphon aqueduct type III

Final Examination pattern: Any two question of the above six designs may be asked out of which the candidated has to answer one question. The duration of the examination is three hours.

Text Books:

1. Water Resources Engineering – Principles and Practice by C. Satyanarayana Murthy, New age International Publishers.

Reference:

1. Irrigation Engineering and Hydraulic Structures, S. K. Garg, Standard BookHouse.
2. Irrigation and Water Power Engineering, B. C Punmia& Lal, Lakshmi Publications Pvt. Ltd., NewDelhi.



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| IV Year – II Semester | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| PROGRAM ELECTIVE – IV c). Soil Dynamics and Machine Foundations | | | | | |

Course Learning Objectives:

The basic course in soil mechanics/geotechnical engineering generally introduces the fundamental concepts, principles and applications of soil as engineering material with properties under static loading.

This course on ‘Soil Dynamics’ discusses

1. To calculate the fundamental vibration parameters.
2. To analyse the vibrations of machine foundations.
3. To determine the dynamic properties of soils.
4. To decide the suitable type of machine foundation and its design aspects.
5. To select the suitable vibration isolation method for machine foundations and liquefaction mitigation methods.

Course Outcomes:

On successful completion of these course, the student able to

- a. Use theory of vibrations to find the behavior of soil under dynamic loading.
- b. Design machine foundations under different loads and soil conditions.
- c. Understand the liquefaction phenomena.
- d. Conduct various laboratory and filed tests to determine the dynamic soil prosperities and its interpretation.
- e. Design vibration isolators under any vibratory machines.

SYLLABUS:

UNIT-I

Introduction: Types of motion- SHM- Fundamental definitions- SDOF systems- Free and forced vibration with and without damping - Constant force and rotating mass type excitation –Types of damping-Equivalent stiffness of springs in series and parallel. – Resonance and its effect - magnification-logarithmic decrement –Transmissibility.

UNIT-II

Theories of Vibration Analysis- EHS Theory and lumped parameter model- Different modes of vibration- Natural frequency of foundation soil system – Barkan and IS methods – Pressure bulb concept – Reisner Theory – Limitations of Reisner theory – Sung’s solutions -- Pauw’s Analogy – Heigh’s Theory.



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UNIT-III

Dynamic properties of soils, Determination of E, G and Poisons ratio from field and laboratory tests, recommendations of Indian codes- Stress waves in bounded elastic medium- Use of wave theory in the determination of elastic properties, Elastic coefficients of soils and their determination- damping factor from free and forced vibration tests.– Block vibration test – Determination of Damping factor.

UNIT-IV

Types of machine foundations – general requirements design – criteria for machine foundations, permissible amplitudes and bearing pressure

Design data, design criteria, IS code provisions for the design foundations of reciprocating machines.

Design data, design criteria, IS code provisions for the design foundations of Impact type of machines.

UNIT-V

Vibration Isolation: Transmissibility, Principles of isolation- Methods of isolation- Vibration isolators- Types and their characterizes

Special Topics: Liquefaction of soils, CSR, CRR, Factor of safety against liquefaction - Dynamic bearing capacity, Earth retaining structures under dynamic loads

TEXT BOOK:

1. ‘Vibrations of Soils and Foundations’ by Richart Hall and Woods

REFERENCES:

1. ‘Vibration Analysis and Foundation Dynamics’ by NSV Kameswara Rao, Wheeler Publishing, New Delhi.
2. ‘Foundations of Machines- Analysis and Design’ by Prakash and Puri



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| IV Year – II Semester | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| PROGRAM ELECTIVE – IV d). Road Safety Engineering | | | | | |

Course Objectives:

1. This module on the fundamental of traffic engineering & some of the statistics methods to analysis the traffic safety.
2. The accident interrogations & risk involved with measures to identity the causes are dealt.
3. The role of road safety in planning the urban infrastructures design is discussed.
4. The various traffic management systems for safety & safety improvement strategies are dealt.

Course Outcomes:

The student is able to

- a) To understand fundamental of Traffic Engg.
- b) To investigate & determine the collective factors & remedies of accident involved.
- c) To design & planning various road geometrics.
- d) To massage the traffic system from road safety point of view.

SYLLABUS

UNIT I

Introduction to safety:

Road accidents, Trends, causes, Collision diagrams; Highway safety; Human factors and road user limitations; Speed and its effect on road safety; Vehicle factors; Highway safety in India. Multi-causal dynamic systems approach to safety; Crash Vs Accident; Road safety improvement strategies; Elements of a road safety plan, Safety data Needs; Safe vehicle design.

UNIT II

Statistical Interpretation and Analysis of Crash Data:

Before-after methods in crash analysis, Recording of crash data; Accident Investigation and Analysis; Statistical testing and the role of chance; Black Spot Identification and Investigations, Case Studies.

UNIT III

Road Safety Audits:

Key elements of a road safety audit, Road Safety Audits & Investigations, Work zone safety audit; Crash investigation and analysis, Methods for identifying hazardous road locations, Case Studies.

UNIT IV

Crash Reconstruction:

Describe the basic information that can be obtained from the roadway surface, Understand basic physics related to crash reconstruction, speed for various skid, friction, drag, and



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acceleration scenarios, variables involved in jump and flip crashes, variables involved in pedestrian crashes, Case Studies.

UNIT V

Mitigation Measures:

Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety; Safety in urban areas; Public transport and safety; Road safety policy making, Stakeholders involvement; Road safety law.

TEXT BOOKS:

1. Institute of Transportation Engineers (ITE), The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999.
Towards Safe Roads in Developing country, TRL – ODA, 2004.

REFERENCES:

1. Athelstan Popkess, Traffic Control and Road Accident Prevention, Chapman and Hall, 1997 (Digitized 2008)
2. Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 1997 (reprinted 2002).
3. Geetam Tiwari and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press, 2016.



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| IV Year – II Semester | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| PROGRAM ELECTIVE – IV e). Disaster Management & Mitigation | | | | | |

Course Objectives:

The objectives of the course are

1. To Understand basic concepts in Disaster Management
2. To Understand Definitions and Terminologies used in Disaster Management
3. To Understand Types and Categories of Disasters
4. To Understand the Challenges posed by Disasters
5. To understand Impacts of Disasters Key Skills

Course Outcomes:

The student will develop competencies in

- a) the application of Disaster Concepts to Management
- b) Analyzing Relationship between Development and Disasters.
- c) Ability to understand Categories of Disasters and
- d) realization of the responsibilities to society

SYLLABUS

UNIT I:

Introduction - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT II

Disasters- Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT III

Disaster Impacts- Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT IV

Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.



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UNIT V

Disasters, Environment and Development- Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text Books:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

Reference Books:

1. <http://ndma.gov.in/> (Home page of National Disaster Management Authority)
2. <http://www.ndmindia.nic.in/> (National Disaster management in India, Ministry of Home Affairs).
3. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
4. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC



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| IV Year – II Semester | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| PROGRAM ELECTIVE – Va). Advanced Structural Analysis | | | | | |

Course Learning Objectives:

The objective of this courses:

- Familiarize Students with Different types of Structures
- Equip student with concepts of Arches
- Understand Concepts of lateral Load analysis
- Familiarize Cables and Suspension Bridges
- Understand Analysis methods Moment Distribution, Kani's Method and Matrix methods

Course Outcomes:

At the end of this course; the student will be able to

- Differentiate Determinate and Indeterminate Structures
- Carryout lateral Load analysis of structures
- Analyze Cable and Suspension Bridge structures
- Analyze structures using Moment Distribution, Kani's Method and Matrix methods

SYLLABUS:

UNIT – I Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Deflections of simple beams and pin jointed plane trusses.

INDETERMINATE TRUSSES: Determination of static and kinematic indeterminacies – Analysis of trusses having single and two degrees of internal and external indeterminacies –Castigliano's second theorem.

UNIT II

Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Hinges with supports at different levels.

Two Hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, Tied arches – Fixed arches – (No analytical question).



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UNIT-III Approximate Methods of Analyses: Application to building frames. (i) Portal Method (ii) Cantilever Method (iii) Substitute frame method for approximate analysis of multi-storey frames subjected to gravity loads and lateral loads. Shear force and bending moment diagrams - Elastic curve.

UNIT – IV Cable Structures and Suspension Bridges: Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges.

UNIT – V Moment Distribution Method: Analysis of Portal frames – including Sway-Substitute frame analysis by two cycle. Slope deflection method: Analysis of Portal frames – including Sway. Analysis of inclined frames. Shear force and bending moment diagrams - Elastic curve.

Kani's Method: Analysis of continuous beams – including settlement of supports and single bay portal frames with and without side sway. Shear force and bending moment diagrams - Elastic curve.

Text Books:

1. Structural Analysis by R.C. Hibbeler, Pearson, NewDelhi.
2. Basic Structural Analysis, K U Muthu et. al., IK International Publishing house pvt. Ltd.

References:

1. Indeterminate Structural Analysis, K U Muthu et. al., IK International Publishing house pvt. Ltd.
2. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna Publishers, New Delhi.
3. Mechanics of Structures Vol – II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
4. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt. Ltd.
5. Structural Analysis: A Matrix Approach, G.S.Pandit and S.P.Gupta, Mc Graw Hill Pvt. Ltd.



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| IV Year – II Semester | | L | T | P | C |
| | | 3 | 0 | 0 | 3 |
| PROGRAM ELECTIVE – V b). Urban Hydrology | | | | | |

Course Learning Objectives:

The course is designed to:

- appreciate the impact of urbanization on catchment hydrology
- understand the importance of short duration rainfall runoff data for urban hydrology studies.
- learn the techniques for peak flow estimation for storm water drainage system design.
- understand the concepts in design of various components of urban drainage systems
- learn some of the best management practices in urban drainage.
- understand the concepts of preparation master urban drainage system

Course Outcomes

At the end of the course the student will be able to

- develop intensity duration frequency curves for urban drainage systems
- develop design storms to size the various components of drainage systems.
- apply best management practices to manage urban flooding.
- prepare master drainage plan for an urbanized area.

SYLLABUS:

UNIT I

Introduction: Urbanisation and its effect on water cycle – urban hydrologic cycle – trends in urbanisation – Effect of urbanisation on hydrology

Precipitation Analysis: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration - Frequency (IDF) curves, design storms for urban drainage systems.

UNIT II

Approaches to urban drainage: Time of concentration, peak flow estimation approaches, rational method, NRCS curve number approach, runoff quantity and quality, wastewater and stormwater reuse, major and minor systems.

UNIT III

Elements of drainage systems: Open channel, underground drains, appurtenances, pumping, source control.



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UNIT IV

Analysis and Management: Stormwater drainage structures, design of stormwater network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for stormwater management.

UNIT V

Master drainage plans: Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning , use of models in planning

Text Books:

1. Geiger W.F., Marsalek, W.J. Rawls and F. C. Zuidema, (1987 - 2 volumes), UNESCO, Manual on Drainage in Urbanised Area
2. Hall M J (1984), Elsevier Applied Science Publisher. Urban Hydrology
3. Wanielista M P and Eaglin (1997), Wiley and Sons, Hydrology – Quantity and Quality Analysis,
4. Akan A.O and R.L. Houghtalen (2006), Wiley International, Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling,

References:

1. Stormwater Detention for Drainage, Stahre P and Urbonas B (1990), Water Quality and CSO Management, Prentice Hall.
2. Urban water cycle processes and interactions, Marsalek et. al. (2006), Publication No. 78, UNESCO, Paris (<http://www.bvsde.paho.org/bvsacd/cd63/149460E.pdf>)
3. Frontiers in Urban Water Management – Deadlock or Hope, by Maksimovic C and J A Tejada-Guibert (2001), IWA Publishing



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| IV Year – II Semester | L | T | P | C |
| | 3 | 0 | 0 | 3 |
| PROGRAM ELECTIVE – V c). Ground Improvement Techniques | | | | |

Course Learning Objectives:

The objective of this course is:

1. To make the student appreciate the need for different ground improvement methods adopted for improving the properties of remoulded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
2. To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
3. To enable the students to know how geotextiles and geosynthetics can be used to improve the engineering performance of soils.
4. To make the student learn the concepts, purpose and effects of grouting.

Course Outcomes:

- a. By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations.
- b. The student should be in a position to design a reinforced earth embankment and check its stability.
- c. The student should know the various functions of Geosynthetics and their applications in Civil Engineering practice.
- d. The student should be able to understand the concepts and applications of grouting.

SYLLABUS:

UNIT- I

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT -II

Dewatering – sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells – criteria for choice of filler material around drains – electro osmosis

UNIT- III

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.
 Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – post grout tests. Introduction to Liquefaction & its effects & applications.



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UNIT- IV

Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

UNIT- V

Geosynthetics – geotextiles – types – functions , properties and applications – geogrids , geomembranes and gabions - properties and applications.

TEXT BOOKS:

1. ‘Ground Improvement Techniques’ by Purushotham Raj, Laxmi Publications, New Delhi.
2. ‘Ground Improvement Techniques’ by NiharRanjanPatro ,Vikas Publishing House (p) limited , New Delhi.
3. ‘An introduction to Soil Reinforcement and Geosynthetics’ by G.L.Siva Kumar Babu, Universities Press.

REFERENCE BOOKS:

1. ‘Ground Improvement’ by MP Moseley , Blackie Academic and Professional, USA.
2. ‘Designing with Geosynthetics’ by RM Koerner , Prentice Hall



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DEPARTMENT OF CIVIL ENGINEERING

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| PROGRAM ELECTIVE – V d). Pavement Management Systems | | | | | |

Course Learning Objectives:

1. To know various components and functions of pavement management systems
2. To know various pavement serviceability concepts and deterioration models
3. To know various functional and structural evaluation methods
4. To study design alternatives, rehabilitation and maintenance of pavements
5. To study the role of expert systems in pavement management

Course Outcomes:

At the end of the course, student will be able to

- a) Understand the features and functions of pavement management systems
- b) Asses pavement performance by observing different models
- c) Evaluate the pavement functionally and structurally
- d) Identify and select suitable design strategies and decide the maintenance and rehabilitation measures required for a given pavement
- e) Acquire knowledge of expert systems for managing pavements

SYLLABUS

UNIT-I

Introduction: Definition -Components of Pavement Management Systems, Essential features. Pavement Management Levels and functions: Ideal PMS- Network and Project levels of PMS- Influence Levels- PMS Functions- Function of Pavement evaluation.

UNIT-II

Pavement Performance: Serviceability Concepts- roughness-Roughness Components-Equipment- IRI -modeling techniques, structural condition deterioration models, mechanistic and empirical models, HDM and other models, comparison of different deterioration models.

UNIT-III

Pavement Evaluation:

Functional Evaluation: Functional and Structural deterioration models, unevenness prediction models and other models, comparison. Case studies.Equipments

Structural Evaluation: - Basics- NDT and Analysis—Condition Surveys-Distress-Destructive Structural Analysis- Application in Network andProject Levels



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UNIT-IV

Design Alternatives, Rehabilitation and Maintenance: Design objectives and constraints, basic structural response models, physical design inputs, alternate pavement design strategies and economic evaluation, life cycle costing, analysis of alternate pavement strategies based on distress and performance, case studies. Equipment's, Identification of Alternatives-Deterioration Modeling-Priority Programming Methods.

UNIT-V

Expert Systems and Pavement Management: Role of computers in pavement management, applications of expert systems for managing pavements, expert system for pavement evaluation and rehabilitation, knowledge-based expert systems, case studies.

TEXT BOOKS:

1. Ralph Haas and Ronald W. Hudson, 'Pavement Management System', McGraw Hill Book Co. 1978
2. Ralph Haas, Ronald Hudson Zanieswki. 'Modern Pavement Management, Kreiger Publications.

REFERENCES:

1. Proceedings of North American Conference on Managing Pavement.
2. Proceedings of International Conference on Structural Design of Asphalt Pavements NCHRP, TRR and TRB Special Reports



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| PROGRAM ELECTIVE – V e). Low-Cost Housing | | | | | |

SYLLABUS

UNIT – I

Housing Scenario Status of urban housing- Status of Rural Housing,
 Housing Finance: Introducing- Existing finance system in India- Government role as facilitator
 Status at Rural Housing Finance- Impedimently in housing finance and related issues

UNIT- II

Land Use and Physical Planning for Housing:

Planning of urban land- Urban land ceiling and regulation act- Effectincey of building bye laws - Residential Densities

Housing the Urban Poor: Living conditions in slums- Approaches and strategies for housing urban poor

UNIT-III

Development and Adopt on of Low-Cost Housing Technology

Adoption of innovative cost effective construction techniques- Adoption of precast elements in partial prefabrication- Adopting of total prefabrication of mass housing in India- General remarks on pre cast rooting/flooring systems- Economical wall system- Single Brick thick loading bearing wall- 19cm thick load bearing masonry walls- Half brick thick load bearing wall-Fly ash, gypsum thick for masonry- Stone Block masonry- Adoption of precast R.C. plank and join system for roof/floor in the building

Alternative Building Materials for Low Cost Housing: Substitute for scarce materials- Ferro cement- Gypsum boards- Timber substitutions- Industrial wastes- Agricultural wastes

UNIT- IV

Low Cost Infrastructure Services

Present status- Technological options- Low cost sanitation's- Domestic wall- Water supply energy

Rural Housing: Introduction- traditional practice of rural housing continuous- Mud Housing technology- Mud roofs- Characteristics of mud- Fire resistant treatment for thatched roof- Soil stabilization- Rural Housing programs

UNIT-V

Housing in Disaster Prone Areas

Earthquake- Damages to houses- Traditional Houses in disaster prone areas Type of Damages and Railways of non-engineered buildings- Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions- Requirements of structural safety of thin precast roofing units against - Earthquake forces- Status of R&D in earthquake strengthening measures- Floods- cyclone- future safety



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TEXT BOOKS:

1. Building materials for low –income houses – International council for building research studies and documentation.
2. Modern trends in housing in development countries – A.G. Madhava Rao, D.S. Ramachandra Murthy & G. Annamalai
3. Light weight concrete- Academic Kiado- Rudhai. G – Publishing home of Hungarian Academy of Sciences 1963.

REFERENCE BOOKS:

1. Building Systems for Low Income Housing, Ashok Kumar Jain; Management Publishing House, 1992
2. Hand book of low-cost housing - by A. K. Lal – Newage international publishers.
3. Low Cost Housing in Developing Countries, Guru Charan Mathur; For Centre for Science & Technology of the Non-Aligned and Other Developing Countries, Oxford & IBH Publishing Company, 1993



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| PROJECT WORK | | | | | |

The main objective of the Project work is

- To enable the student, apply engineering knowledge that has been taught all through the programme for solving practical engineering problem.
- To enable the student capable for problem solving / problem shooting.
- To instill and inculcate team spirit/ team work in to the minds of the students.
- To enable/ train the students report making/documentation.
- To provide students an opportunity to use any civil engineering software for their project work.

Outcomes of the Project work.

Up on completion of the Project work, the student will be able to

- Apply all levels of Engineering knowledge in solving the Engineering problems.
- Work together with team spirit.
- Use Civil Engineering software at least one.
- Document the projects



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ALL OPEN ELECTIVES

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| a) DISASTER MANAGEMENT | | | | | |

Course Learning Objectives:

The objective of this course is:

1. Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities.
2. Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ.
3. Understand the 'relief system' and the 'disaster victim.'
4. Describe the three planning strategies useful in mitigation.
5. Identify the regulatory controls used in hazard management.
6. Describe public awareness and economic incentive possibilities.
7. Understand the tools of post-disaster management.

Course Outcomes:

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

- a. Affirm the usefulness of integrating management principles in disaster mitigation work
- b. Distinguish between the different approaches needed to manage pre- during and post- disaster periods
- c. Explain the process of risk management
- d. Relate to risk transfer

SYLLABUS:

UNIT-I

Natural Hazards and Disaster Management: Introduction of DM – Inter disciplinary nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: Vegetal Cover floods, droughts – Earthquakes – landslides – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast.

UNIT-II

Man Made Disaster and Their Management Along With Case Study Methods Of The Following: Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrorism -threat in mega cities, rail and aircraft accidents, ground water, industries - Emerging infectious diseases and Aids and their management.

UNIT-III

Risk and Vulnerability: Building codes and land use planning – Social Vulnerability – Environmental vulnerability – Macro-economic management and sustainable development, Climate change risk rendition – Financial management of disaster – related losses.



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UNIT-IV

Role of Technology in Disaster Managements: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations- roads and bridges- mitigation programme for earth quakes – flowchart, geospatial information in agriculture drought assessment - Multimedia Technology in disaster risk management and training - Transformable Indigenous Knowledge in disaster reduction – Role of RS & GIS.

UNIT-V

Multi-sectional Issues, Education and Community Preparedness: Impact of disaster on poverty and deprivation - Climate change adaptation and human health - Exposure, health hazards and environmental risk-Forest management and disaster risk reduction -The Red cross and red crescent movement - Corporate sector and disaster risk reduction- Education in disaster risk reduction- Essentials of school disaster education - Community capacity and disaster resilience-Community based disaster recovery - Community based disaster management and social capital-Designing resilience- building community capacity for action.

TEXT BOOKS:

1. An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazards– S.Vaidyanathan: CBS Publishers & Distributors Pvt. Ltd.
2. Natural Hazards & Disaster Management, Vulnerability and Mitigation by RB Singh- Rawat Publications
3. ‘Disaster Science & Management’ by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
4. ‘Disaster Management – Future Challenges and Opportunities’ by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

REFERENCE BOOKS:

1. ‘Disaster Management’ edited by H K Gupta (2003), Universities press.
2. ‘Disaster Management – Global Challenges and Local Solutions’ by Rajib shah & R R Krishnamurthy (2009), Universities press.
3. R. Nishith , Singh AK, “ Disaster Management in India : Perspectives, Issues and strategies” New Royal Book Company.”



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| b) ENVIRONMENTAL POLLUTION & CONTROL | | | | | |

Course Learning Objectives:

The objective of this course is:

1. Impart knowledge on fundamental aspects of air pollution & control, noise pollution, and solid waste management.
2. Provide basic knowledge on sustainable development.
3. Introduces some basics of sanitation methods essential for protection of community health.
4. Provide basic knowledge on solid waste management.

Course Learning Outcomes:

By the end of successful completion of this course, the students will be able to:

- a. Identify the air pollutant control devices
- b. Have knowledge on the NAAQ standards and air emission standards
- c. Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods.
- d. Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
- e. Appreciate the methods of environmental sanitation and the management of community facilities without spread of epidemics.
- f. Appreciate the importance of sustainable development while planning a project or executing an activity.

SYLLABUS:

UNIT – I

Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards.

Noise Pollution: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000.

UNIT –II

Industrial Wastewater Management: – Strategies for pollution control - Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants - Recirculation of industrial wastes – Effluent standards.

UNIT – III

Solid Waste Management: Solid waste characteristics – basics of on-site handling and collection – separation and processing – Incineration-Composting-Solid waste disposal methods – fundamentals of Land filling.



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UNIT – IV

Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT- V

Sustainable Development: Definition- elements of sustainable developments -Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability- sustainable development.

TEXT BOOKS:

1. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003.
3. Environmental Science
- 4.
5. and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
3. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing.

REFERENCES:

1. Air Pollution and Control by M.N. Rao & H.N. Rao
2. Solid Waste Management by K. Sasi Kumar, S.A. Gopi Krishna. PHI New Delhi.
3. Environmental Engineering by Gerard Kiley, Tata McGraw Hill.
4. Industrial Water Pollution Control by Nemerow Jr., McGraw Hill Publishing.
5. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard – Cengage Learning.
6. Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.
7. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.



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| c) ELEMENTS OF CIVIL ENGINEERING | | | | | |

COURSE OBJECTIVES:

The objectives of this course are to make students to learn about

1. basics of Civil Engineering concepts
2. the surveying, elevations and mapping
3. the construction materials and elements
4. water resource development

COURSE OUTCOMES:

At the end of the course the student is familiar

- a) basics of Civil Engineering concepts
- b) the surveying the elevations and mapping
- c) the construction materials and elements
- d) water resource development and
- e) overall infrastructure development

SYLLABUS

Unit I

Scope of Civil Engineering: Introduction: Impact of Infrastructural Development on the Economy of a Country, Role of Civil Engineers, Importance of Planning, Scheduling and Construction Management.

Surveying:

Introduction: Surveying and levelling, Object and uses, Primary divisions, Fundamental principles, Classification of surveying, Plans and maps, Scales, Units of measure.

Unit II:

Compass surveying:

Types and uses of compass, Bearings, Whole Circle Bearings, and Reduced Bearings, Computation of angles; Meridians; declinations and dip of needle; Local attraction; compass surveying field work.

Elevation measurements:

Levelling, object and uses, terms used in levelling, levelling instruments, methods of levelling, recording and methods of reducing, errors in levelling, contours; characteristics and applications.

Modern Tools of Surveying and Mapping:

Introduction to Theodolite, Electronic Distance Measurement Instruments, Total Station, Global Positioning System, Remote Sensing and Geographic Information System.



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DEPARTMENT OF CIVIL ENGINEERING

Unit III:

Construction Materials

Requirement, types, uses, properties and importance of Civil Engineering materials like Stone, Bricks, Lime, Cement, Ferrous and Non Ferrous Metals, Ceramic Materials, Timber, Sand, Aggregate, Mortar and Concrete, Paints and Varnishes, Glass, Plastic, Conducting, Magnetic, and Miscellaneous Materials

Unit IV:

Elements of Building Construction

Planning:

Elementary principles and basic requirements of a building planning, layout of residential & industrial buildings.

Construction:

Classification of buildings based upon occupancy and structure, Design Loads, Common building components, their functions, and nominal dimensions. Elements of building drawing. Introduction to building byelaws.

Unit V

Water Resources Development

Elementary Hydrology, Sources of water, Watershed Development, water requirements and its conservation, Hydraulic Structures of Storage, Water Conveyance System: Canals; Water Conduits.

Books:

1. Surveying Vol. I & II, Dr. B. C. Punamia Laxmi Publication, Delhi
2. Building Construction, Dr. B. C. Punamia Laxmi Publication, Delhi
3. Engineering Material, Dr. S.C. Rangwal, Charotar Pub. House
4. Irrigation Engineering and Hydraulic Structures, Santoshkumar Garg, : Khanna Publishers Delhi
5. Civil Engineering Material, Jakson and Dhir, ELBS Publishing London
6. Civil Engg. Drawing, S. C. Rangwal, Charotar Pub. House Anand
7. Elements of Civil Engineering (IV Edition) by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition



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| d) GREEN TECHNOLOGY | | | | | |

Course Learning Objectives:

The objective of this course is:

1. To present different concepts of green technologies.
2. To acquire principles of Energy efficient technologies.
3. To impart knowledge on the methods of reducing CO₂ levels in atmosphere.
4. To gain knowledge of the importance of life cycle assessment
5. To learn the importance of green fuels and its impact on environment.

Course Learning Outcomes

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

- Enlist different concepts of green technologies in a project
- Understand the principles of Energy efficient technologies
- Estimate the carbon credits of various activities
- Identify the importance of life cycle assessment
- Recognize the benefits of green fuels with respect to sustainable development.

SYLLABUS:

UNIT- I

Introduction: Green Technology – definition- Importance – Historical evolution – advantages and disadvantages of green technologies-factors affecting green technologies- Role of Industry, Government and Institutions – Industrial Ecology – role of industrial ecology in green technology.

Cleaner Production (CP): Definition – Importance – Historical evolution - Principles of Cleaner Production–Benefits–Promotion – Barriers – Role of Industry,

UNIT- II

Cleaner Production Project Development and Implementation:

Government and Institutions – clean development mechanism, reuse, recovery, recycle, raw material substitution-Wealth from waste, case studies.

Overview of CP Assessment Steps and Skills, Process Flow Diagram, Material Balance, CP Option Generation – Technical and Environmental Feasibility analysis – Economic valuation of alternatives - Total Cost Analysis – CP Financing – Preparing a Program Plan – Measuring Progress- ISO 14000.

UNIT- III

Pollution Prevention and Cleaner Production Awareness Plan – Waste audit – Environmental Statement, carbon credit, carbon sequestration, carbon trading, Life Cycle Assessment - Elements of LCA – Life Cycle Costing – Eco Labelling.

UNIT -IV

Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Non-conventional energy sources: Solar Energy-solar energy conversion technologies and devices, their principles, working and application.



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UNIT- V

Green Fuels – Definition-benefits and challenges – comparison of green fuels with conventional fossil fuels with reference to environmental, economical and social impacts- public policies and market-driven initiatives.

Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in Indian context; tidal and geothermal energy.

TEXT BOOKS:

1. 'Pollution Prevention: Fundamentals and Practice' by Paul L Bishop (2000), McGraw Hill International.
2. 'Cleaner Production Audit' by Prasad Modak, C.Visvanathan and Mandar Parasnis (1995), Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok
3. 'Non-conventional Energy Sources' by Rai G.D.

REFERENCES:

1. 'Pollution Prevention and Abatement Handbook – Towards Cleaner Production' by World Bank Group (1998), World Bank and UNEP, Washington D.C.
2. 'Handbook of Organic Waste Conversion' by Bewik M.W.M.
3. 'Energy, The Solar Hydrogen Alternative' by Bokris J.O.
4. 'Solar Energy' by Sukhatme S.P.
5. 'Waste Energy Utilization Technology' by Kiang Y. H.



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| e) SMART CITIES | | | | | |

Course Objectives:

The course aims towards

1. developing a sensitization
2. skills to understand
3. applicability of Inclusive urban planning and
4. improving towards the sustainable development.

Course Outcome:

After learning the course

The students should be able to:

- a) Understand the importance
- b) practicing the concept of inclusive urban planning
- c) will have sensitization towards implementing contributions in sustainable development.

SYLLABUS

Unit – I Understanding Inclusive Planning:

Definition and components; urban consultations; basic principles of urban consultation, process of urban consultations; urban strategic planning, good urban governance, subsidiarity, equity, efficiency, transparency and accountability, civic engagement and citizenship, security; valuing difference and working with diversity; liveable cities;

Unit – II Stakeholders profile and needs, access to shelter, services and livelihoods:

Urban Poor, Informal Sector, Gender, Children, Elderly, Disabled, Displaced people, etc.; Slums - dimensions, causative factors, determinants, location characteristics of settlements; Informal sector - growth, characteristics, functions, economic contributions, linkages with formal sector, impact on Urban Development

Unit – III Participatory Planning Process and Policies, Programmes and Legislation:

Methods, role of stakeholders (including civil society organizations), etc.; Related Acts, Five year plans, policies and programmes at various levels.

Unit- IV Smart Cities:

Innovation economy (Innovation in industries, clusters, districts of a city; Knowledge workforce: Education and employment; Creation of knowledge-intensive companies); Urban Infrastructure (Transport, Energy/ Utilities, protection of the environment and safety); Governance (Administration services to citizens, participatory and direct democracy, services to the citizen, quality of life)



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Unit – V Planning interventions:

Inclusive zoning, development and building regulations, Slum Improvement; drafting strategic urban development plans – objectives and key actors; planning framework for actions, process of drafting the plan, key considerations; urban design and decision-making; city transport for all; water supply and sanitation, urban disaster management, management through decentralization,

Reference Books:

1. Jo Beall (1997); “A city for all: valuing differences and working with diversity”; Zed books limited, London
2. UN-Habitat; “Inclusive and sustainable urban planning: a guide for municipalities”; Volume 3: Urban Development Planning (2007); United Nations Human Settlements Programme
3. Arup Mitra; “Insights into inclusive growth, employment and wellbeing in India”; Springer (2013), New Delhi
4. William J. V. Neill (2004); “Urban Planning and cultural identity”; Routledge, London
5. John S. Pipkin, Mark E. La Gory, Judith R. Balu (Editors); “Remaking the city: Social science perspective on urban design”; State University of New York Press, Albany
6. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science
7. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development
(http://indiansmartcities.in/downloads/CONCEPT_NOTE_3.12.2014__REVISED_AND_LATEST_.pdf)

List of Open Source Software/learning website:

- Google books and publications on inclusive urban planning
(https://www.google.co.in/search?q=inclusive+urban+planning&btnG=Search+Books&tbo=bks&tbo=1&gws_rd=ssl)
- MoUD, GOI Website (<http://indiansmartcities.in/site/index.aspx>)



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| f) PROJECT MANAGEMENT | | | | | |

Course Learning Objectives:

The objective of this course is:

1. To introduce to the student, the concept of project management including network drawing and monitoring
2. to introduce the various equipment related to construction like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery
3. to introduce the importance of safety in construction projects

Course Outcomes:

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

- a) appreciate the importance of construction planning
- b) understand the functioning of various earth moving equipment
- c) know the methods of production of aggregate products and concreting
- d) apply the gained knowledge to project management and construction techniques

SYLLABUS:

UNIT- I

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method

UNIT -II

Project evaluation and review technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources introduction to softwares for construction management project management using PRIMAVERA (or) equivalent.

UNIT- III

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers

UNIT -IV

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets

Concreting equipment — concrete mixers – Batching plants, mobile using plants like “Ajax” etc. mixing and placing of concrete – consolidating and finishing



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UNIT -V

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering

BIM for Civil Engineers (Building Information Modelling)

TEXT BOOKS:

1. 'Construction Planning, Equipment and Methods' by Peurifoy and Schexnayder , Shapira, Tata Mcgrawhill
2. 'Construction Project Management Theory and Practice' by Kumar Neeraj Jha (2011), Pearson.
3. 'Construction Technology' by Subir K. Sarkar and Subhajit Saraswati, Oxford University press

REFERENCES:

1. 'Construction Project Management - An Integrated Approach' by Peter Fewings , Taylor and Francis
2. 'Construction Management Emerging Trends and Technologies' by Trefor Williams , Cengage learning



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| g) TRAFFIC SAFETY | | | | | |

Course Objectives:

- 1) This module on the fundamentals of traffic engg. & some of the statistical methods to analyse the traffic safety.
- 2) The accident interrogations and risk involved with measures to identify the causes are dealt.
- 3) The role of road safety in planning the urban infrastructures design is discussed.
- 4) Various mitigation measures to prevent the road accidents are dealt.

Course Outcomes: The student is able to

- a) To understand fundamentals of Traffic Engg.
- b) To investigate and determine the collective factors & remedies of accident involved.
- c) To design and plan various road geometrics.
- d) To manage the traffic system from road safety point of view.

UNIT I

Fundamentals of Traffic Engineering:

Basic Characteristics of Motor-Vehicle Traffic, Highway Capacity, Applications of Traffic Control Devices, Traffic Design of Parking Facilities, Traffic Engineering Studies; Statistical Methods in Traffic Safety Analysis – Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons.

UNIT II

Accident Investigations and Risk Management:

Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies, Traffic Management Measures and Their Influence on Accident Prevention, Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features, Accident Reconstruction.



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UNIT III

Road Safety in Planning and Geometric Design:

Vehicle And Human Characteristics, Road Design and Road Equipments, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Design and Protective Devices, Post Accident Care.

UNIT IV

Role of Urban infrastructure design in safety:

Geometric Design of Roads; Design of Horizontal and Vertical Elements, Junctions, At Grade and Grade Separated Intersections, Road Safety in Urban Transport, Sustainable Modes and their safety.

UNIT V

Mitigation Measures:

Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety; Safety in urban areas; Public transport and safety; Road safety policy making, Stakeholders involvement; Road safety law, Road safety audit.

TEXT BOOKS:

1. Institute of Transportation Engineers (ITE), The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999.
Towards Safe Roads in Developing country, TRL – ODA, 2004.
2. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
3. Fundamentals of Traffic Engineering, Richardo G Sigua

REFERENCES:

1. Athelstan Popkess, Traffic Control and Road Accident Prevention, Chapman and Hall, 1997 (Digitized 2008)
2. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, TrulsVaa, Michael Sorenson
3. Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 1997 (reprinted 2002).
4. Geetam Tiwari and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press, 2016
5. Fundamentals of Transportation Engineering – C.S. Papacostas, Prentice Hall India.
6. Transportation Engineering – An Introduction, C.Jotinkhisty, B. Kent Lall
7. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, Truls Vaa, Michael Sorenson



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8. Road Safety by NCHRP.

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| h) GEO-SPATIAL TECHNOLOGIES | | | | | |

Course Objectives:

1. Understand the various spatial and non-spatial data types, and data base management
 - a. techniques
2. Develop the concepts and professional skills in utility of geospatial techniques
3. Improve the working knowledge of geospatial techniques in field problems

Course Outcomes:

At the end of the course the student will be able to:

- a) Understand the geospatial technology relating to the data acquiring and processing that is associated with geographic locations
- b) Apply Geospatial techniques in the decision support systems useful for decision makers and community services.
- c) Ability to solve the problems related to the natural resource management, environment, urban planning and Infrastructure development, etc.
- d) Able to generate the thematic maps using Geospatial techniques
- e) Apply the concept of Geospatial Techniques to the Civil Engineering problems

SYLLABUS

UNIT –I

Introduction – Basic concepts, socioeconomic challenges, fundamentals of geographical information systems (GIS), history of geographical information system, components of geographical information systems.

Projections and Coordinate Systems – Map definitions, representations of point, line, polygon, common coordinate system, geographic coordinate system, map projections, transformations, map analysis.

UNIT –II

Data Acquisition:Data Types, Spatial, Non-Spatial (Attribute) Data, Data Format – Vector and Raster Data, Manual Digitizing, Scanner, Aerial Photographic Data, Remotely Sensed Data, Digital Data, Cartographic Database, Digital Elevation Data.

Data Management:Data Storage and Maintenance, Data Compression, Data Quality and Standards, Precision, Accuracy, Error – Geometric errors and corrections, Radiometric errors and corrections, types of Systematic and Non-systematic errors.



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UNIT –III

Data Modeling: Spatial Data Analysis, Data Retrieval Query, Simple Analysis, Recode Overlay, Vector Data Model, Raster Data Model, Digital Elevation Model, Cost and Path Analysis, Knowledge Based System.

GIS Analysis and Functions: Organizing data for analysis, analysis function, maintenance and analysis of spatial data, buffer analysis, overlay analysis, transformations, conflation, edge matching and editing, maintenance and analysis of spatial and non-spatial data.

UNIT –IV

Applications of GIS: Environmental and Natural Resource Management, Soil and Water Resources, Agriculture, Land Use Planning, Geology and Municipal Applications, Urban Planning and Project Management, GIS for decision making under Uncertainty, standard GIS packages, Introduction to Global Positioning Systems (GPS) and its applications.

UNIT – V

Introduction to Remote Sensing: General background of Remote Sensing Technology, Objectives and Limitations of Remote Sensing, Electro-Magnetic Radiation, Characteristics, Interaction with Atmosphere and Earth Surface, Remote Sensing Platforms and Sensors, Satellite Characteristics, Digital Image Processing, IRS Series and High Resolution Satellites, Remote Sensing Applications to Watershed Modeling, Environmental Modeling, Urban Planning and Management.

Textbook:

1. Demers, M.N, (2013). *Fundamentals of Geographic Information Systems* Wiley India Pvt. Ltd.,
2. Burrough, P. A., and McDonnell R. A. (1998). *Principles of Geographical Information Systems*. Oxford University Press, New York.
3. Kang-tsung Chang. (2006). *Introduction to Geographical Information Systems*. Tata McGraw-Hill Publishing Company Ltd., Third Edition, New Delhi.
4. George Joseph, (2013). *Fundamentals of Remote Sensing* Universities Press.

References:

1. Sabins F.F. Jr. (1978). *Remote Sensing Principles and Interpretations*. W.H. Freeman and Company, San Francisco.
2. Tor Bernhardsen. (2002). *Geographical Information System*. Wiley India (P) Ltd., Third Edition, New Delhi.
3. Hoffman-Wellenhof, B, et al. (1997). *GPS Theory and Practice*. Fourth Edition, Springer Wein, New York.
4. Lilysand T.M., and Kiefer R.W. (2002). *Remote Sensing and Image Interpretation*. John Wiley and Sons, Fourth Edition, New York.
5. Choudhury S., Chakrabarti, D., and Choudhury S. (2009). *An Introduction to Geographic Information Technology*. I.K. International Publishing House (P) Ltd, New Delhi.



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| i) WASTEWATER TREATMENT | | | | | |

Course Learning Objectives:

The course will address the following:

1. Enables the student to distinguish between the quality of domestic and industrial water requirements and wastewater quantity generation.
2. To impart knowledge on selection of treatment methods for industrial wastewater.
3. To know the common methods of treatment in different industries
4. To acquire knowledge on operational problems of effluent treatment plant.

Course Outcomes:

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

- a) Know the quality and quantity of water for various industries and Advanced water treatment methods
- b) Learn the common methods of treatment of wastewaters and Biological treatment methods
- c) Study of methods to reduce impacts of disposal of wasters into environment and CETPs.
- d) Study of methods of treatment of wastewaters from specific industries like steel plants, refineries, and power plants, that imply biological treatment methods
- e) Study of methods of treatment of wastewaters from industries like Aqua, dairy, sugar plants, and distilleries that imply biological treatment methods

SYLLABUS:

UNIT – I

Industrial water Quantity and Quality requirements: Boiler, Cooling, Domestic/Canteen and Process waters for Textiles, Food processing, Dairy, Aqua industry, Sugar mills, Brewery and distillery Industries, Fertilizer industry, Power plants. Advanced water treatment - Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Freezing, elutriation, Removal of Iron and Manganese, Removal of Colour and Odour. Use of Municipal wastewater in Industries.

UNIT – II

Basic theories of Industrial Wastewater Management: Industrial waste survey - Measurement of industrial wastewater Flow-generation rates – Industrial wastewater sampling and preservation of samples for analysis - Wastewater characterization- Toxicity of industrial effluents- Common methods of Treatment of wastewaters - Unit operations and processes- Volume and Strength reduction –Neutralization – Equalization and proportioning- recycling, reuse and resources recovery. Miscellaneous Treatment: Biological treatment of sewage- Primary, secondary and Tertiary treatment of sewage.



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UNIT – III

Industrial wastewater disposal management: Discharges into Sewers, Streams- Oxygen sag curve, Lakes-eutrophication and oceans and associated problems, Land treatment – sewage sickness, Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges- Recirculation of Industrial Wastewaters- Effluent Disposal Method.

UNIT – IV

Process and Treatment of specific Industries-1: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants. Case studies.

UNIT – V

Process and Treatment of specific Industries-2: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Tanneries, Sugar Mills, Distillers, Dairy and Food Processing industries, Aqua industry, Pharmaceutical Plants. Case studies.

Text books

1. Industrial Wastewater Treatment by KVSG Murali Krishna, Paramount Publishers, Visakhapatnam, 2019
2. Wastewater Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH, New Delhi.
3. Industrial Wastewater treatment by A.D. Patwardhan, PHI Learning, Delhi
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Shyam R Asolekar, Mc-Graw Hill, New Delhi; 3rd Edition

References

1. Industrial Water Pollution Control by W. Wesley Eckenfelder, Mc- GrawHill, Third Edition
2. Wastewater Engineering by Metcalf and Eddy Inc., Tata McGrawhill Co., New Delhi
3. Wastewater Treatment- Concepts and Design Approach by G.L. Karia & R.A. Christian, Prentice Hall of India.
4. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard, Cengage Learning.