Advanced Design of Steel Structures

[VIIIth Semester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Civil Engineering	3-0-0, (3)	Program Elective	CV108201CV

[Pre-requisites: Design of Steel Structures]

Course Objectives

1. Able to design steel structures connections.
2. Able to analyze and design advance level steel structures.
3. Familiar with the relevant BIS codes to be used in steel design.

Course Content

Unit 1
Connections: Connection Classifications, Semi-rigid and Rigid Connections, Framed and seated connections, Moment resistant connections.

Unit 2
Industrial Buildings: Various components of an industrial building, Loads and load combinations, Roof systems, Design of purlins, Roof trusses, Industrial building frames.

Unit 3
Plate Girders: Riveted and Welded Plate Girders - Design of cross-section, curtailment of flange plates, stiffeners, splices.
Gantry Girder.

Unit 4
Cold Formed Steel: Introduction, application, Advantages of cold formed sections, Local buckling, Beam, Column, Combined bending & compression, Tension members, Empirical method.

Unit 5
Towers: Introduction, Types of Towers, Tower Configurations, Loads, Codal Provisions, Analysis and Design, Foundations of Towers.

Course Materials

Required Text: Text books

1. N. Subrhamanyan, “Design of Steel Structures”, Oxford Publication.
2. M. L. Gambhir, "Fundamentals of structural steel design", Mc Graw Hill.
3. Ram Chandra, “Design of Steel Structures (Vol. - I & II)” , Standard Book House, New Delhi

Optional Materials: Reference Books

1. S.K. Duggal, “Design of Steel Structure”, Tata Mc Graw Hill.
2. P. Dayarathnam , “Design of Steel Structures”, Wheeler.
3. C.G. Salmon and J.E. Johnson, “Steel Structures: Design and Behaviour”, Harper and Row, New York

Airport, Tunnel & Harbour Engineering

[VIIIth Semester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Civil Engineering	3-0-0, (3)	Program Elective-I	CV108202CV

[Pre-requisites: None]

Course objectives

1. To understand the fundamental principles and methods of transport planning
2. To understand the basic infrastructure elements of Airports and design the geometrics of runways and taxiways
3. To understand basic infrastructure elements of tunnels and learn construction practices of tunnels
4. To understand the basic infrastructure elements of Harbours and study shore and shore line process

Course Content

Unit 1 Introduction to Transportation Planning

Fundamental Concepts of Transport Planning, Introduction to Transport infrastructure Planning methods, Urban and Regional Planning.

Unit 2 Airport Planning Principles, Alignment and Geometric Design

Definition of terms related to airport engineering, factors affecting site selection, obstructions, surveys for site selection, zoning laws, Classification of obstructions, Helipads, Hangers.

Runways: Orientation, Basic Runway length and its corrections, Geometric design, Runway configuration, Taxiways layout standards, exit taxiways fillets separation.

Unit 3: Tunnel Engineering

Classification of tunnels, Tunnel shapes and sizes- Criteria and selection, Tunnel surveying, Tunnel Construction methods- Soft and Hard strata, Muck disposal methods, Tunnel lining, Ventilation and Lighting, Drainage in Tunnels.

Unit 4: Harbours and Ports: Introduction

Harbors and Ports: Classification of ports, requirements of a good port, classification of harbour, harbour planning, requirements of harbor, Docks and Spillways -Introduction, advantages of docks, moles, shape of docks and basins, dock entrance, entrance docks, quays, jetties and wharves, tide, wind and wave, dry dock, types of breakwaters.

Unit 5: Harbors and Ports: Navigational aids, shores and shore processes

Navigational Aids, Long term and short term changes of shores, factors influencing beach characteristics, beach wave interaction, beach profile modification, littoral drift, stability of shores, shore erosion due to sea level, on shore and off shore transport, long shore transport, interaction of shore structures,, mud banks.

Course Materials

Required Text: Text books

1. Prabir Kumar, “Transportation Planning: Principles, Practices and Policies”, Prentice Hall India Learning, New Delhi.
2. Khanna and Arora, “Airport Planning And Design”, Khanna Publishers, New Delhi
1. S.C. Saxena, “Tunnel Engineering”, Dhanpat Rai Publications
2. R. Srininvasan, “Harbour, Dock and Tunnel Engineering”, Charotar Publishers, New Delhi

Optional Materials: Reference Books

1. Horenjeff Robert, ”Planning & Design of Airports”, McGraw Hill Book Co., New Delhi,1985
2. Henry F. Cornik, “Dock and Harbour Engineering Vol.–I to IV”, Charles Griffin & Company Ltd., London.(1988)
3. Robert M.Sorensen, “Basic Coastal Engineering” , Springer, (2006)

Geo-Environmental Engineering

[VIIIth Semester, Fourth Year]

Course Description			
Offered by Department	Credits	Status	Code
Civil Engineering	3-0-0, (3)	Program Elective-I	CV108203CV

[Pre-requisites: None]

Course Objectives

1. To create a awareness in the field of Geo-Environmental Engineering.
2. To impart the knowledge on Geotechnical aspects in the disposal of waste materials and the remediation of contaminated sites.
3. To familiarize design of landfill and know the effect of change in environment on soil properties.

Course Content

Unit 1
Introduction and Soil-water-environment interaction, Geotechnical applications of waste materials.

Unit 2

Geotechnical characterization of waste and disposal and Site characterization.

Unit 3
Landfill Components its functions and design, Compacted clay liner, selection of soil, methodology of construction, Geosynthetics in landfill- types and functions, geosynthetic clay liners .

Unit 4
Leachate and Gas Management, Soil remediation, Investigation of contaminated soil, insitu/exiture mediations, bio remediation, thermal remediation, pump and treat method, phyto remediation and electro kinetic remediation.

Unit 5
Leachate disposal and Post closure of landfill, Variation in properties of soil due to change in environment.

Course Materials

Required Text: Text books

Dr. G V Rao and Dr. R S Sasidhar (2009) Solid waste Management and Engineered Landfills, Saimaster Geoenvironmental Services Pvt. Ltd. Publication

Optional Materials: Reference Books

1. Reddi L.N and Inyang HI (2000) Geoenvironmental Engineering: Principles and Applications, Marcel Dekker Inc Publication
2. R. N. Yong (2000) Geoenvironmental Engineering: Contaminated Soils, Pollutant Fate, Mitigation Lewis Publication.

Prestressed Concrete

[VIIIth Semester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Civil Engineering	3-0-0, (3)	Program Elective-II	CV108251CV

[Pre-requisites: Mechanics of Solids, Design of Reinforced Concrete Structures]

Course Objectives

1. To provide the basic concepts of prestressing.
2. To analyze and design the prestressed structure.
3. To become familiar with professional and contemporary issues in the design and fabrication of prestressed concrete members.

Course Content

Unit 1

Introduction, Basic concepts, Need for High strength steel and concrete, Terminology, Advantages and Applications of prestressed concrete, Materials for prestressed concrete, Prestressing systems and Devices.

Analysis of Members: Resultant stresses at a section, Pressure line or thrust line and internal resisting couple, Concept of load balancing, Stresses in Tendons
Flexure Strength: Types of Failure, Simplifies Code Procedures; Shear Strength

Unit 2

Losses of prestress: Total Losses in Pretensioned Members, Total Losses in Post-Tensioned Members, Methods for Estimating Prestress Losses, Elastic Shortening, Relaxation, Shrinkage, Creep, Friction, Anchorage Slip

Unit 3

Calculation of Deflections and Crack widths, Transfer of prestresses: Transmission Length, Bond Stresses, End-zone reinforcement; Anchorage Zone Stresses: Stresses distribution in end block, Anchorage zone reinforcement.

Unit 4

Limit state design: Philosophy, Criteria for Limit States, Design Loads and Strengths, Strength and Serviceability Limit States, Crack Widths in prestress Members, Dimensioning of prestressed Members.

Unit 5

Design of sections for Axial Tension, Design of sections for Flexure.

Course Materials

Required Text: Text books

1. N. Krishna Raju, Prestressed concrete, Tata McGraw Hill
2. IS:1343 (2012) - Code for Practice for Prestressed Concrete

Optional Materials: Reference Books

1. T.Y. Lin, Ned H. Burns, Design of Prestressed Concrete Structures, John Wiley & Sons.
2. P. Dayaratnam, P. Sarah, Prestressed Concrete Structurse, Medtech
3. R. Rajagopalan, Prestressed Concrete, Narosa
4. J.P. Annie & P. Easwary Dr. Y.R.M. Rao, Prestressed Concrete Analysis and Design, S.K Kataria.
5. Y. Guyon. Translated by P. Chambon and F.H. Turner, Limit-state Design of Prestressed Concrete ..

Expansive soils

Course Description

Offered by Department	Credits	Status	Code
Civil Engineering	3-0-0, (3)	Program Elective-II	CV108252CV

[Pre-requisites: Geotechnical Engineering - I]

Course Objectives

1. To understand of the behavior of expansive soils and problem related to it.
2. To be able to analyze and to determine behaviour of expansive soil for engineering applications.
3. To be able to determine the design data for the design of various structure on problematic ground condition.

Course Content

Unit 1: Introduction and Identification

Expansive Soils of India, related civil engineering problems, formation of expansive soils in field, identification of expansive solids in laboratory by X-ray diffraction method and differential thermal analysis.

Unit 2: Physical and Chemical Properties

Soil structure and clay minerology of expansive soil, atomic bond and molecular bonds, honey comb structure, base exchanges capacity, clay water relation, electrolysis processes.

Unit 3: Foundation on Black Cotton Soil

Foundations on swelling soils, swelling potential and mechanism of volume change, chemical composition of black cotton soil, construction techniques in black cotton soil, modern method of construction in under reamed coil.

Unit 4: Ground Improvement Techniques

Stabilization of expansive soils with lime, slag (silica fume and aluminium sludge), cement, fly ash, chemicals, reinforced earth technique, micro reinforced vegetation, vibro floatation, grouting and soil nailing.

Unit 5: Liquifaction Hazard Mitigation

Factors affecting the expansive soil, method of assessment for liquifaction, effect instrumentation for monitoring, consolidation of marine clay deposits, expansive soil model of Bingham fluid bounded by porous beds.

Course Materials

Required Text: Text Books

Design Aids in Soil Mechanics and Foundation Engineering – S.R. Kaniraj (Tata McGraw Hill, New Delhi)

Optional Materials: Reference Books

1. Basic and applied Soil Mechanics (Revised Edition) – Gopal Rajan and Rao A.S.R. (New Age, New Delhi.1998)
2. Gulhati S.K., Datta, M.: Getotechnical Engineering, Tata McGraw-Hill Publshing Company Limited, New Delhi.
3. Foundation Engineering (2nd Edition) – Peck,R.B., Hanson (W.E. and Thornburn. W.H. Johan Wiley, New York 1976)
4. Foundation Analysis and Designing – J.E. Bowles (McGraw Hill)
5. Soil Engineering in Theory and Practice (Vol. - II) – Alam Singh (Asia Publishing House, New Delhi, 1981).

Transportation Planning and Management

Course Description

Offered by Department	Credits	Status	Code
Civil Engineering	3-0-0, (3)	Program Elective-II	CV108253CV

[Pre-requisites: Highway and Railway Engineering]

Course Objectives

1. To understand of the basic concepts of transport planning, surveying and sampling methods.
2. To learn and apply the transportation planning methods for planning of road, rail and air transport network
3. To understand basic concepts of public transportation planning in urban and regional level
4. To understand and apply economic evaluation of various transportation projects

Course Content

Unit 1: Introduction

Urban transportation in India, need for planning, principles of transportation Planning, land use and traffic & their interrelation, transportation planning process, systems approach.

Unit 2: Transportation Surveys

Study area, zoning, inventory, classification studies, cordon surveys, screen line survey, O –D surveys, traffic impact studies, survey methods, sampling.

Unit 3 : Traffic demand forecasting

Trip generation factors, trip generation models, rates, trip distribution and models, Assignment techniques, modal split, mode choice modeling, land use transport interaction models.

Unit 4 : Public Transportation Planning

Classification of public transportation system, Rapid transit, Para-transit, City bus services, transport demand, planning & scheduling bus route network, public transportation in India issues.

Unit 5: Economic Evaluation of Transport Plans

Concepts of Economic evaluation, Need and benefits of Transport projects, Methods of economic evaluation.

Course Materials

Required Text: Text Books

1. Kadiyali L. R., “Traffic Engineering and Transportation Planning”, Khanna Publishers, Delhi. 2002.
2. Das Animesh, Chakraborty Parth, “Introduction to Transportation Engineering”, Prentice Hall Of India Pvt. Ltd., New Delhi, 2003

Optional Materials: Reference Books

1. Papacostas C. S. , “ Fundamentals of transportation engineering ”, Prentice Hall Of India Pvt. Ltd., New Delhi, 2002
2. Hutchinson B.G., “Principles of Urban Transportation Systems Planning”, Mc Graw Hill Publishers, 19745.
3. Khisty C.J., Lall B.K., “Transportation Engineering –An Introduction”, Prentice Hall, NJ, 2005

Remote Sensing, GIS, and its Applications

Course Description			
Offered by Department	Credits	Status	Code
Civil Engineering	3-0-0, (3)	Open Elective-I	CV108301CV

[Pre-requisites: None]

Course Objectives

1. Understanding RS & GIS concepts
2. Using various data model.
3. Application of the technology in solving engineering problems.

Course Content

Unit 1: Remote Sensing

Introduction and definition of Remote Sensing terminology, Physics of remote sensing, electromagnetic radiation (EMR), LANDSAT, SPOT, ERS, IKONOS and others, Indian Space Programme.

Unit 2: Maps

Introduction and types of Maps, Ellipsoid and Datum, Projection, Coordinate system, UTM, Thematic Maps.

Unit 3: GIS Data Models

Input data, Field data, Statistical data, Maps, Aerial photographs, Satellite data, Points, lines and areas features, Vector and Raster data, Advantages and Disadvantages, Digitizers and scanners, Digital data, GIS data formats and standards.

Unit 4: GIS Data Processing and Analysis

Satellite Data analysis, Visual interpretation, Digital image processing, Data Management, Data Analysis – Data layers, analysis of spatial and non-spatial data, Data overlay and modeling.

Unit 5: Applications of RS and GIS

Applications of GIS in Map Revision, Land use, Agriculture, Forestry, Archaeology, Municipal, Geology, Water Resources, Soil Erosion, Land suitability analysis, Change detection.

Course Materials

Required Text: Text Books

1. Introduction to Remote Sensing – Campbell, J.B. (The Guilford Press, London, 1986)
2. Remote Sensing and Geographic Information Systems – Legg, C.A. (Ellis Horwood, London, 1992)

Optional Materials: Reference Books

1. Curran, P.J., “Principles of Remote Sensing”, Longman, London, 1985.
2. Engman, E.T. an Gurney, R.J., “Remote Sensing in Hydrology”, (Chapman and Hall, London, 1991.
3. Principles of Geographic Information System for Land Resources Assessment – Burrough, P.A. (Monograph on Soil Resources Survey No. 12, Claredon, Press, Oxford, 1988)
4. Remote Sensing in Hydrology – Engaman, E.T. and Gurney, R.J. (Chapman and Hall, London, 1991)
5. Campbell, J.B., “Introduction to Remote Sensing”, The Guilford Press, Lond, 1986.

Hazardous Wastes Management

Course Description			
Offered by Department	Credits	Status	Code
Civil Engineering	3-0-0, (3)	Open Elective-I	CV108302CV

[Pre-requisites: None]

Course Objectives

1. To introduce students to various rules and regulations regarding planning and management of hazardous waste management.
2. To appreciate the necessity of hazardous waste management.
3. To understand the science and technology involved in hazardous waste management

Course Content

Unit 1

Relevant Regulations – Municipal solid waste (management and handling) rules; hazardous waste(management and handling) rules; biomedical waste handling rules; flyash rules; recycled plastics usage rules; batteries (management and handling) rules.

Unit 2

Hazardous Waste Management –Fundamentals

Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects

Unit 3

Radioactive Waste Management –Fundamentals

Sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants; disposal options

Environmental Risk Assessment, Defining risk and environmental risk; methods of risk assessment; case studies

Unit 4

Physicochemical Treatment Hazardous Waste –Chemical treatment processes

(combustion, stabilization and solidification of hazardous wastes); physico-chemical processes for hazardous wastes (soil vapour extraction, air stripping, chemical oxidation); ground water contamination and remediation

Biological Treatment of Hazardous Waste – Composting; bioreactors; anaerobic decomposition; principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation

Unit 5

Landfill design – Landfill design for solid and hazardous wastes; leachate collection and removal; landfill covers; Incineration

Biomedical Waste Management: Sources; Generation; Classification; Storage; Transportation; Disposal; Waste Treatment: Disinfection, Irradiation, and Incineration

Course Materials

Required Text: Text Books

1. John Pichtel Waste Management Practices CRC Press, Taylor and Francis Group 2005.
2. LaGrega, M.D. Buckingham, P.L. and Evans, J.C.Hazardous Waste Management, McGraw Hill International Editions, New York, 1994.
3. Richard J. Watts, Hazardous Wastes - Sources,Pathways, Receptors John Wiley and Sons, New York,1997

Optional Materials: Reference Books

1. Basics of Solid andHazardous Waste Mgmt.Tech. by Kanti L. Shah1999, Prentice Hall.
2. Solid AndHazardousWaste Management2007 by S.C. BhatiaAtlantic Publishers &Dist.

Important Online Material:

1. http://www.iswa.org.
2. http://enfor.nic.in
3. http://nptel.iitm.ac.in
4. http://www.britannica.com/EBchecked/topic/257926/hazardous-waste
1. 5.www.epa.gov/solidwaste/hazard/tsd/index.htm
5. www.envfor.nic.in/legis/hsm.htm
6. www.cpcb.nic.in/upload/NewItems/NewItem_149_Protocol.pdf

Slope Stability and Ground Improvement Techniques

Course Description

Offered by Department	Credits	Status	Code
Civil Engineering	3-0-0, (3)	Open Elective-II	CV108351CV

[Pre-requisites: None]

Course Objectives

1. To understand need for ground improvement and different mechanical, chemical, static and dynamic techniques of ground improvement.
2. To learn various stabilization techniques for cohesionless and cohesive soils.
3. To study and understand miscellaneous techniques of ground improvement including geotextiles and reinforced earth.

Course Content

Unit 1: Slope Stability

Slope stability analysis, deterministic and probabilistic approaches, method of slope stability analysis, factor of safety, stability charts and its applications, physical, analytical and mechanical methods in slope analysis. Landslides – causes, prediction, prevention and monitoring for stability.

Field instrumentation, monitoring and design of stable slopes, stabilization and strengthening of slope, design of waste and tailing dams, case study, histories of slope failures.

Unit 2: Ground Improvement Techniques

Need for ground improvement, different types of problematic soils, emerging, trends in ground Improvement, shallow and deep compaction requirements, Principles and methods of soil compaction.

Unit 3: Drainage and Dewatering system

Ground Improvement by drainage, dewatering methods, design of dewatering, systems, preloading, vertical drains, vacuum consolidation, dewatering, design and construction methods.

Unit 4: Soil Stabilization

Cement stabilization and cement columns, lime stabilization, stabilization using bitumen and emulsions, stabilization using industrial wastes

Unit 5: Geosynthetics and its Application

Introduction & need for geosynthetics types and functions of geosynthetics, testing of geosynthetics, different types of soil retaining structures, construction aspects of geosynthetic reinforced soil retaining walls

Course Materials

Required Text: Text Books

1. Purushothama Raj P. , Ground Improvement Techniques, Laxmi Publications, 2016.
2. Hausmann R., “Engineering principles of Ground Modification”, McGraw Hill Publishing Co, 1990.

Optional Materials: Reference Books

1. Hoek, E. and Bray, J.W. Rock Slope Engineering, Institute of Mines and Metallurgy, London, 1977.
2. 2. Abranison, W L, Lee, T. and Sarma, S. Slope Stability and Stabilization Method, John Wiley & Sons, New York, 2001.011.