MAHATMA GANDHI INSTITUTE OF TECHNOLOGY

(Autonomous)
Gandipet, Hyderabad – 500 075

DEPARTMENT OF CIVIL ENGINEERING

List of Open Electives Offered by Civil Engineering Department to CSB, CSD and CSM branches under MR-21 Regulation

VI Semester Open Elective-I for CSB, CSM and CSD branches

S,No	Code	Name of the Course
1	CE631OE	Disaster Preparedness and Planning Management
2	CE632OE	Geo-Informatics

VII Semester Open Elective-II for CSB, CSM and CSD branches

S,No	Code	Name of the Course
1	CE731OE	Advanced Engineering Materials
2	CE732OE:	Environmental Impact Assessment

VIII Semester Open Elective-III for CSB, CSM and CSD branches

S,No	Code	Name of the Course
1	CE831OE	Finite Element Methods
2	CE832OE:	Remote Sensing and GIS

Open Elective for other Departments
VI Semester Syllabus
CE631 OE :Disaster Preparedness and Planning Management
(Open Elective-I)
(Common to CSB, CSM & CSD)

Course Objectives:

- To understand basic concepts in Disaster Management.
- To Understand definitions and terminologies used in Disaster Management.
- To Understand Types and Categories of Disasters.
- To Understand the Challenges posed by Disasters.
- To understand Impacts of Disasters Key Skills.

Course Outcomes:

- **Understand** the various definitions associated with disaster concept.
- **Analyze** relationship between development and disasters.
- **Understand** categories of disasters and their impacts.
- **Interpret** the different phases of disaster management cycle
- **Formulating** disaster risk reduction plans.

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

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.

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

L	T	P	C
2	0	0	2

Open Elective for other Departments
VI Semester Syllabus
CE632OE: Geo-Informatics
(Open Elective-I)
(Common to CSB, CSM & CSD)

Course Objectives:

- To introduce the concepts of remote sensing, satellite image characteristics and its components.
- To expose the various remote sensing platforms and sensors and to introduce the concepts of GIS, GPS and GNSS.

Course Outcomes:

- **Identify** and recognize the characteristics of aerial photographic images
- **Interpret** the principles and application of Remote sensing and remote sensing satellites
- **Examine** satellite imagery and to their patterns and classifications
- **Articulate** concepts of GIS and its data models.
- **Interpret** the principles of Global Navigation Satellite System.

UNIT – I :Aerial Photogrammetry:
Aerial Photographs- Basic terms & Definitions, scales, relief displacements, Flight Planning, Stereoscopy, Characteristics of photographic images – fiducial marks, principal point, Nadir, Isocenter, camera axis, tilt angle & overlap, Fundamentals of aerial photo interpretation, Introduction to Digital Photogrammetry.

UNIT – II :Remote Sensing:
Remote Sensing: Physics of remote sensing, Principles of Remote Sensing, Remote sensing satellites, and their data products, Sensors and orbital characteristics, Spectral reflectance curves, resolution and multi-concept, FCC

UNIT – III: Satellite Imagery:
Satellite Image - Characteristics and formats, Image histogram, Introduction to Image rectification, Image Enhancement, Land use and land cover classification system, Unsupervised and Supervised Classification, Applications of remote sensing

UNIT - IV: GIS:
Basic concepts of geographic data, GIS and its components, Data models, Topology, Process in GIS: Data capture, data sources, data encoding, geospatial analysis, GIS Applications, Differential GPS

UNIT - V: Navigation System:
History of Navigation, Global Navigation Satellite System (GNSS), Components of GNSS, GPS, GLONASS, GALILEO, GPS: Space segment, Control segment, User segment, GPS satellite signals, Datum, coordinate system and map projection, Static, Kinematic and Differential GPS, GPS Applications

Text Books:
1. Chouhan. T S, Geoinformatics – Fundamentals and application, Scientific Publishers
2. Garg. P K, Principles and Theory of Geo-informatics, Khanna Publishers
3. Elliott D. Kaplan and Christopher J. Hegarty, Understanding GPS/GNSS: Principles and Applications, Third Edition by, Artech House

Reference Books:
1. Lillesand T M et al: Remote Sensing & Image Interpretation
2. Punmia B C, Ashok K. Jain, Higher Surveying, Laxmi Publications
3. Bhatta B., Remote Sensing& GIS, Oxford University Press
4. Agarwal N K. Essentials of GPS , Spatial Networks: Hyderabad
5. Chandra A M, Higher Surveying, New Age International Publisher

L	T	P	C
2	0	0	2

Open Electives for other departments
VII Semester Syllabus
CE731OE: Advanced EngineeringMaterials
(Open Elective -II)
(Common to CSB, CSM and CSD)

Course Objectives:

- Know about different types of material used in construction works.
- Understand about the properties of composite materials.
- Design and prepare different mortars and steel fibrous concrete.

Course outcomes:

- **Understand** the properties of plastics, glass and its uses.
- **Understand** the properties of timber and its uses.
- **Understand** the properties of Fly ash, rubber, steel, heat insulating materials and sound absorbent materials.
- **Understand** the properties of fiber composites and its uses
- **Able** to prepare cement, lime, surkhi mortars and steel fibrous concrete.

UNIT- I: Plastics: Brief history, composition, polymerization, classification of plastics, resins, Moulding compounds, Fabrication, properties of plastics, uses of plastics, PVC pipes in building. Glass: General, properties, types and uses, special varieties of glass.

UNIT -II: Timber: Characteristics, identification and uses of common Indian timber –teak, deodar, shisham, chil, sal, veneers, plywood, laminated boards-their uses and properties, uses and strength of bamboo,preservation of timber against fire and weather etc.

UNIT- III: Miscellaneous Materials: Fly ash, Rubber–types, uses and properties, Heat insulating materials, Sound absorbent material. Steel: Market forms, properties of mild steel and hard steel, preventive measures for corrosion.

UNIT- IV: Composite Materials: Definition, classification – particulate composites, fibrous composites, properties of fibers and conventional materials.

Uni-directional Composites: Introduction, volume fractions, weight fractions, longitudinal strength and stiffness, factors influencing longitudinal strength and stiffness, transverse strength and stiffness.

Short Fiber Composites: Introduction, modulus and strength of short fiber composites, rubber reinforced composites, Laminated composites - and its applications, Fiber reinforced plastics (FRP) and its applications

UNIT -V: Mortars: Properties and uses of cement, lime and surkhi mortars, proportions, mixing, uses. **Steel** fibrous concrete: Introduction, types of fibers, properties of steel fibrous concrete.

Text Books:

1.Agarwal B D and Broutman, L J, “Analysis and Performance of Fiber Composites” Wiley Interscience Publication, John Wiley & sons New York,1980.
2.Rangwala S C, “Engineering Materials” Charotar Publishing House, Anand,1985.
3.Weatherhead R G, “FRP Technology” Applied Science Publishers Ltd., London,1998.

Reference Books:

1. Raina K B, “Civil Engineering Materials” Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1999.
2. Budinski K G, “Engineering Materials, Prentice Hall of India, New Delhi, 1985

L	T	P	C
2	0	0	2

Open Elective for other departments
VII Semester Syllabus
CE732OE: Environmental Impact Assessment
(Open Elective - II)
(Common to CSB, CSM and CSD)

Course Objectives:

- Learn various aspects of Environment Impact Assessment methodologies, impact of development activities.
- Analyze the impact on surface water, Air and Biological Environment.

Course Outcomes:

- **Identify** the environmental attributes to be considered for the EIA study.
- **Formulate** plan for EIA studies.
- **List** the suitable methodology and prepare EIA report.
- **Choose** the right methodology among available alternatives
- **Understand** Air Act, Water Act, Wildlife Acts.

UNIT – I: Basic Concepts & Methodologies of EIA :

Elements of EIA, Functions of EIA process, Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmentalparameters.EIA Methodologies, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT- II: EIA on Vegetation and Wildlife:

Prediction and Assessment of developmental activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT- III: EIA on Soil, Water and Air Quality:

Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures-EIA on Soil quality, water quality and air quality, Methodology for Assessment.

UNIT – IV: Environmental Audit & Environmental legislation objectives:

Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

UNIT – V: Environmental Acts:

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Anjaneyulu Y., Environmental Impact Assessment Methodologies, 2nd Edition, Taylor & Francis. publications
2. Barthwal, R. R. Environmental Impact Assessment, New Age International Publications

Reference Books:

1. Khitoliya R.K., Environmental Pollution, S. Chand,2014.
2. Glynn, J. and Gary, W. H. K., Environmental Science and Engineering, Prentice Hall Publishers
3. Suresh K. Dhaneja, Environmental Science and Engineering, S.K. Kataria& Sons Publication.

NewDelhi.
4. Bhatia, H. S., Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.
5. Wathern, P., Environmental Impact Assessment: Theory & Practice, Publishers- Rutledge, London,1992.

L	T	P	C
2	0	0	2

Open Elective for other Departments
VIII Semester syllabus

CE831OE: Finite Element Methods

(Open Elective -III)

(Common to CSB, CSM & CSD)

Course Objectives:

- Understandingeneralhowfiniteelementsobtainapproximatesolutionstodifferentialequations
- Appreciate the structure of a typical finite elementprogram
- Gain experience of finite element analysis applied to classical geotechnical problems (e.g. settlement, seepage, consolidation, slopestability)
- Gain insight into the soil properties needed for finite elementanalysis

Course Outcomes:

- **Understand** the fundamental theory of the Finite ElementMethod
- **Recall** the finite element properties
- **Develop** element stiffness and nodal load matrices
- **Understand** the assemblage of finite elements
- **Apply** the finite element theory to solve soil behavior under externalloads.

UNIT-I : Introduction to FEM:

Concepts of FEM, Steps involved in Finite Element Analysis Procedure, Merits and Demerits. Concept of an element, various element shapes, Displacement models, Principles of Elasticity, Stress equations, Strain-Displacement relationships in matrix form, Equations of equilibrium and compatibility conditions for 2-D,3-D Problems, Plane stress, Plane strain and axi-symmetric bodies of revolution with axi-symmetric loading.

UNIT-II: Finite Element Formulation:

Principle of minimum potential energy , Principles of virtual displacements, Raleigh Ritz Method, Weighted Residual Method, Galerkin's Method, , generalized coordinates, Shape functions, Convergent and Compatibility requirements, Geometric invariance, Natural coordinate system - area and volume coordinates.

UNIT-III: Formulation of Stiffness Matrix:

Bar Elements: Concept, stiffness matrix for a 2- noded bar element, axial bar subjected to point loads, surface forces and body forces-constant cross section and varying cross section bar.

Truss Elements: Transformation Matrix, stiffness matrix of truss member in local and global coordinates, analysis of trusses with kinematic indeterminacy not exceeding three.

UNIT-IV: Assemblage of Elements:

Beam Elements : Shape functions ,Beam element stiffness Matrix, element load vector and analysis of continuous beams with kinematic indeterminacy not exceeding three.

Plane Frame Elements: Element Stiffness Matrix, in local coordinates, Transformation or rotation and stiffness matrix, load vector in global coordinates.

UNIT-V: CST and Rectangular Elements:

Determination of strain –displacement matrix, shape functions, determination of element stiffness and load matrices, assembling global stiffness and load matrices

Iso-parametric Elements: Concept, Different isoparametric elements for 2D analysis, shape functions using Iso- parametric elements , Lagrangian elements, Serendipity elements, formulation of stiffness matrix for 4-noded isoparametric quadrilateral elements.

Text Books:

1.Chandrupatla. T R and Belegundu, A D "Introduction to Finite Elements in Engineering", 2009
2.Krishna Murthy, C. S. - Finite element analysis - Theory and programming, Tata McGraw- Hill,1994
3.P.Seshu " Finite Element Analysis", Prentic Hall of India Private India Limited, New Delhi, 2010

Reference books:

1. Desai, C. S. and J.F, Abel, Introduction to the Finite Element Method, Van Nostrand Reinhold Company (1972).
2. Reddy, J. N. Introduction to the Finite Element Method - McGraw-Hill Publishers,1993.
3. Krishna Murthy, C. S. - Finite element analysis - Theory and programming, Tata McGraw- Hill,1994
4. Zienkiewicz, O. C. - Finite element Methods, McGraw-Hill Publishers,1971.

L	T	P	C
2	0	0	2

Open Electives for other departments
VII Semester Syllabus
CE 832OE : Remote Sensing and GIS
(Open Elective -III)

(Common to CSB, CSM & CSD)

Course Objectives:

- The principles of Photogrammetry
- Principles and applications of Remote sensing
- Introduction to GIS, Spatial Systems, and its applications to Engineering Problems.
- The data types in GIS

Course Outcomes :

- **Identify** the characteristics and principles of photogrammetry
- **Understand** theconcepts of remote sensing and to **analyze** the energy interactions in the atmosphere and earth surface features
- **Understand** and **apply** GIS concepts and to **interpret** the images for preparation of thematic maps
- **Analyze** spatial and attribute data for solving spatial problems
- **Recognize** and **apply** the knowledge of GIS data models

UNIT – I: Introduction to Photogrammetry:
Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT – II: Remote Sensing:
Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Electro- magnetic Spectrum, wavelength regions important to remote sensing, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts, Indian Satellites and Sensors characteristics, Resolution, Map and Image, False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT – III: Geographic Information Systems:
Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input, verification, storage and output- Attribute data Management – Data display- Data Exploration- Data Analysis. Coordinate Systems: Geographic Coordinate System: Map Projections: Types of Map Projections-Map projection parameters- Commonly used Map Projections - Projected coordinate Systems

UNIT – IV: Vector Data Model:
Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features, Object Based Vector Data Model; Classes and their Relationship; The geo-base data model; Geometric representation of Spatial Feature and data structure, Topology rules

UNIT – V: Raster Data Model:
Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data. Data Input**:** Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing

Text Books:

1. Bhatta B, Remote Sensing and GIS ,Oxford Publishers 2015.
2. M. Anji Reddy, Remte sening and Geographic Information system, 2012
3. Kang-Tsung Chang,Introduction to Geographic Information System –, McGrawHill,2015
4. Kumar S, Basics of Remote Sensing, Laxmi Publications

Reference Books:

1. Young K.W. and Lo Albert C. P., Concepts & Techniques of GIS ,, Prentice Hall (India)Publications.
2. Peter A Burragh and Rachael A ,Principals of Geo physical Information Systems.
3. Lillesand and Kiefer , Remote Sensing and GIS, John Willey 2008.