IV YEAR

I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ESTIMATION AND COSTING

Course Code:GR20A4001 **L/T/P/C: 2/1/0/3**

IV **Year I Semester**

Pre-Requisite: Building Materials and Construction planning.

Course Objectives:

1. Analyze the process of quantity survey.
2. Estimating the quantities of materials for buildings and roads.
3. Calculate rate per unit of any item.
4. Provide knowledge on Contracts and tendering process.
5. Assessing the value of a property

Course Outcomes:

1. Estimate the quantities of materials and different types of materials required for different types of Buildings, Roads and Structures.
2. Produce the tendering process for executing any civil engineering work.
3. Recognize the process and importanceof cost estimation, cost budgeting and cost control.
4. Estimate the rate per unit of any item of work.
5. Assess the value of any propertyand interpret the process and importance of valuation of buildings and other structures.

UNIT I

General items of work in building: Standard Units, Principles of working out quantities for detailed and abstract estimates, approximate methods of Estimating. Detailed Estimates of Buildings – centerline method, longwall short wall method.

UNIT II

Earthwork for roads, hill roads (two level sections only) and canals. Quantities of materials for different types of roads.

UNIT III

Rate Analysis: Working out data for various items of work over head and contingent charges. Reinforcement bar bending and bar requirement schedules.

UNIT IV

Contracts: Types of contracts – contract Documents – Conditions of contract, contract procedures, Tendering process, Rights and responsibilities of parties to contracts

UNIT V

Valuation of buildings: Purpose and principles of valuation, Depreciation, methods of calculating depreciation, methods of valuation, Rental method, development method, profit based method

TEXTBOOKS:

1. Estimating & Costing by B.N.Dutta, UBS publishers, 28th edition, Dec 2020.
2. Estimating & Costing by G.S.Birdie, 6th edition, 2014.
3. Valuation of real properties by S.C. Rangawala, Charotar publishing house, 10th edition, 2015.

REFERENCES:

1. Estimating, Costing & Specifications by M.Chakraborthi, Laxmi publications, 29th edition,2006.
2. Standard schedule of rates and standard Data Book by Public works department, 2019
3. SP:27, Handbook of method of measurement of building works, Bureau of Indian Standards,1987.
4. IS:1200-1992, Methods of measurements
5. National Building code, 2016.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

TRANSPORTATION ENGINEERING

Course Code:GR20A4002 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Surveying and Geomatics

Course Objectives:

1. Analyse the principles of highwayengineering and traffic analysis
2. Develop and interpret design standards for horizontal and vertical geometry.
3. Describe analytical and practical knowledge of Planning, Designing and solving transportation problems
4. Illustrate the type of conflicts that occur at intersection and design the intersection accordingly
5. Discuss the knowledge in Railway Engineering and Airport Engineering.

Course Outcomes:

1. Demonstrate the significance of highwayalignment and road development
2. Compute the geometric features of road pertaining to horizontal and vertical alignment
3. Illustrate the basic traffic streamparameters and perform basic traffic signal phasing and timing plan.
4. Demonstrate the role of intersections and their significance
5. Analyze and compare the characteristics of Railway and Airport Engineering.

UNIT I

Highway Development and Planning: Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT II

Highway Geometric Design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements -Sight Distances-Stopping sight Distance, Overtaking Sight Distance, Intermediate Sight Distance and Head light sight distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical Alignment-Gradients- Vertical curves-Summit Curves and Valley Curves.

UNIT III

Traffic Engineering: Traffic flow parameters-Volume, Speed, Density and headway- Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies, Parking types and Parking characteristics- Road Accidents- Causes and Preventive measures -Presentation of Accident Data–Condition Diagram and Collision Diagrams.

Traffic Regulation and Management: Road Traffic Signs–Types and Specifications–Road Markings-Need for Road Markings-Types of Road Markings- Design of Traffic Signals – Webster Method –IRC Method.

UNIT IV

Intersections: Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections- Channelization: Objectives –Traffic Islands and Design Criteria-Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria-Advantages and Disadvantages of Rotary Intersection.

UNIT V

Introduction to Railway Engineering and Airport Engineering: Permanent Way and functions of Rail, Sleeper and Ballast-Gradients-Grade Compensation-Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – Crossings and Turnouts.

Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway– Wind Rose Diagram – Runway Lighting system.

TEXT BOOKS:

1. Highway Engineering – S.K.Khanna &C.E.G. Justo, Nemchand & Bros., 10th edition 2017.
2. Highway Engineering Design – L.R.Kadiyali and Lal- Khanna Publications, 10th edition, 2017.
3. Airport Planning and Design- S.K.Khanna and Arora, Nemchand Bros,6th edition 1999.
4. Railway engineering- A Textbook of Railway Engineering-Subhash C.Saxena, Satyapal Arora – Dhanpat Rai & Sons –2015

REFERENCES:

1. Highway Engineering – S. P. Bindra, Dhanpat Rai & Sons. – 5th Edition (2008)
2. Traffic Engineering & Transportation Planning –Dr.L.R.Kadyali, Khanna Publications– 8th Edition –2011.
3. Railway Engineering – A text book of Transportation Engineering –S.P.Chandola, first edition 2016.
4. Air Transportation Planning & design – Virendhra Kumar & Statish Chandhra–Gal Gotia Publishers (1999).
5. Railway Engineering by Satish Chandra, M M Agarwal, Oxford University Press,2nd edition,2013.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BRIDGE ENGINEERING
(PROFESSIONAL ELECTIVE III)

Course Code:GR20A4003 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Design of Reinforced Concrete Structures, Structural Analysis II

Course Objectives:

1. Explain different types of Bridges and IRC standards.
2. Classify concepts and design of Slab Bridges
3. Understand concepts and design of T BeamBridges
4. Demonstrate the concepts of design of Plate Girder Bridges
5. Prepare concepts of design of substructure, piers and abutments

Course Outcomes:

1. Explain different types of Bridges with diagrams and Loading standards
2. Relate analysis and design of Slab bridges and suggest structuraldetailing
3. Distinguish analysis and design of T Beam bridges and suggest structuraldetailing
4. Differentiate analysis and design of Plate girder bridges
5. Explain analysis and design of substructure, piers and abutments

UNIT-I

Introduction– Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, prestressed concrete bridges, Truss Bridges, Culverts, – Nomenclature- Selection of Bridge Site- Economical span-Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading.

UNIT-II

Slab bridges-Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Guyon's – Massonet Method –Hendry- Jaegar Methods- Courbon's theory- Pigeaud's method.

UNIT-III

T-Beam bridges– Analysis and design of various elements of bridge –Design of deck slab, Longitudinal girders, Secondarybeams- Reinforcement detailing.

UNIT-IV

Plate Girder Bridges: Elements of plate girder and their design-web- flange- intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing.

UNIT-V

Design of piers - pier caps and Abutments, different types of bearings.

TEXT BOOKS:

1. 'Design of Concrete Bridges' by Aswini, Vazirani, Ratwani, 2nd edition 1995.
2. 'Essentials of Bridge Engineering' by Johnson Victor D, sixth edition 2019.
3. 'Design of Bridge Structures' by T. R. Jagadeesh, M.A. Jayaram, PHI, third edition, 2020.
4. 'Design of RC Structures' by B. C. Punmia, Jain & Jain, Lakshmi Publications, 10th edition 2015.

REFERENCES:

1. 'Design of Steel Structures' by B. C. Punmia, Jain & Jain, Lakshmi Publications, 2nd edition 2015.
2. 'Design of Bridges' by Krishna Raju fifth edition 2019.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GROUND IMPROVEMENT TECHNIQUES
(PROFESSIONAL ELECTIVE III)

Course Code:GR20A4004 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre- Requisites: Geotechnical Engineering, Foundation Engineering

Course Objectives:

1. Recognize various types ofground improvement techniques.
2. Select various ground improvement techniques like dewatering, grouting, in-situ densification methods, geo-synthetics, reinforced earth, soil stabilization, etc.
3. Educate solid foundation in terms of in-situ ground improvement methods required for different projects that come across in difficult foundation conditions.
4. Identifythe aptness of best ground improvement technique.
5. Improve on in most contemporary ground modification methods to be successful in real-time projects.

Course Outcomes:

1. Identify dewatering technique for the field related problem
2. Assess the field problems related to problematic soils by adopting various ground improvement techniques.
3. Differentiate reinforced earth retaining structures.
4. Recognize the suitability and practicability required for various ground improvement methods.
5. Assess the importance of extensive research in various ground improvement techniques.

UNIT I

Introduction: Need for ground improvement, objectives, classification of ground improvement techniques.

Dewatering: Methods of dewatering - sumps, single and multistage well points, vacuum well points, electro-osmosis method, horizontal wells and drains.

UNIT II

In-situ densification methods in granular soils: Vibration at the ground surface, impact at the ground surface, vibration at depth, impact at depth.

In-situ densification methods in cohesive soils: Preloading, verticaldrains, sand drains, stone and lime columns, thermal methods.

UNIT III

Grouting: Characteristics of grouts, grouting methods, grouting technology, ascending, descending and stage grouting.

Stabilization: Methods of stabilization, mechanism of cement and lime stabilization, factors effecting stabilization.

UNIT IV

Reinforced Earth: Mechanism, components of reinforced earth, types of reinforcing elements, applications, factors governing design of reinforced earth walls, design principles of reinforced earth walls, soil nailing.

UNIT V

Geosynthetics: Types of geo synthetics, functions and applications of geo synthetic materials-geotextiles, geogrids and geomembranes.

Expansive soils: Problems of expansive soils, tests for identification, swelling pressure tests, improvement ofexpansive soils, foundation techniques in expansive soils, under-reamed piles.

TEXT BOOKS

1. Hausmann M.R. Engineering Principles of Ground Modification, McGraw-Hill International Edition (1990).
2. Dr. P. Purushotham Raj, Ground Improvement Techniques, Laxmi Publications, NewDelhi, 2nd edition 2016.

REFERENCES

1. Moseley M.P. and K. Kirsch, Ground Improvement, Blackie Academic and Professional, Florida,2nd edition (2007).
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A, Ground Control and Improvement, JohnWiley and Sons, New York, USA (1994).
3. Robert M. Koerner, Designing with Geosynthetics, Xlibris Corporation, 6th edition (2012).
4. F.H.Chen, Foundations on Expansive soils, Elsevier Science, 2nd edition (1988).

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SURFACE HYDROLOGY

(PROFESSIONAL ELECTIVE III)

Course Code:GR20A4005 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Hydrology and Water Resource Engineering

Course Objectives:

1. Define surface water hydrology
2. Solve problems on infiltration and evaporation
3. Calculate and Visualization of stream flow and run off
4. Calculate and recognize the type of hydrographs
5. Compute the flood estimation

Course Outcomes:

1. Express the different types of hydrology definitions
2. Evaluate the consumptive use, infiltration and evaporation
3. Compute the discharge in the streams
4. Applythe hydrographs for the computing rain fall and run off
5. Apply the knowledge of computing flood estimation by various methods

UNIT I

Introduction: Hydrology- definition, Surface and ground water hydrology, Hydrologic cycle- Precipitation, Evaporation, Infiltration, Rain-gauges, Mass rainfall curve, characteristics, Mean rainfall on a basin-Arithmetic, Theissen and Isohytol Methods, Intensity-duration analysis, Intensity-frequency-duration analysis, depth-area- duration curves, estimation of missing rainfall data, consistency of rainfall records- double mass curves, rain-gauge network analysis.

UNIT II

Evaporation & Infiltration: Evaporation process, Factors affecting, estimation, measurement of Evaporation, Evaporation pans, Transpiration, Evapotranspiration, PET, Consumptive use Lysimeter, formulae for estimating PET. Infiltration process, factors affecting, measurement of infiltration, infiltrometers, infiltration capacity curve, Horton's Relation, Infiltration Indices.

UNIT III

Stream flow and Runoff: Measurement of stage, measurement of velocities-surface floats, velocity rods and current meter, measurement of discharge in a river, stage- discharge relation, extension of stage- discharge curves, selection of site for stream- discharge gauging. Components of Runoff - factors affecting and estimation of runoff - basin yield - flow duration

UNIT IV

Hydrographs: Hydrograph-components, separation of hydrograph into base flow, and DRO methods, Unit Hydrograph-principles, derivation of UH of Isolated unit storms, UH for various durations, S-curve technique. Estimation of runoff from UH, limitations of UH theory, Synthetic UH, IUH.

UNIT V

Design Flood: Maximum flood and design flood, estimation of flood- different methods, flood frequency analysis- probability table, different plotting positions, Gumble's extreme value theory, Log Pearson type-III analysis, selection of design flood. Flood routing: Flood Routing through reservoirs- Puls method and modification puls method. Channel routing-Muskinghum method, derivation of routing equations, Goodrich method. Flood Control: Flood control measures, flood control through reservoirs, channel improvements, Bank protection measures, Flood fighting, flood proofing, flood forecasting and flood warning.

TEXT BOOKS:

1. "A text book of Hydrology", P. Jayaram Reddy,3rd edition,2011, Laxmi Publications, New Delhi.
2. "Engineering Hydrology", K Subramanya, 4th edition, Tata-Mc Graw Hill Publishing company limited, New Delhi,2017.
3. "Hydrology", Madan Mohan Das, Mim Mohan Das, PHI Learning Private Ltd., New Delhi,2009.

REFERENCES:

1. "Hydrology", by, Rangaraju.
2. "Engineering Hydrology", EM Wilson, The Mac million press limited.
3. "Hydrology", H MRaghunath, New Age International Pvt Ltd,3rd edition, 2015.
4. "Introduction to Hydrology", W.Viessman Jr. & G L Lewis, Harper & Row Publications,2nd edition 1977.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

TALL BUILDINGS

(PROFESSIONAL ELECTIVE III)

Course Code:GR20A4006 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Structural analysis II and Design of Reinforced Concrete structures

Course objectives:

1. Describe the types and nature of High-Rise Structures i.e., tall buildings and the concept of design for tall buildings
2. Design aspects and material properties
3. Study behaviour oftall building under various types of loads
4. Study the structural behaviour tall buildings with and without shear walls
5. Prepare the students design of shear walls and Reinforcement detailing of shear walls used in tall buildings

Course outcomes:

1. Analyse the components and various types oftall buildings
2. Design concepts and material properties used in tall building constructions.
3. Analyse the behaviour oftall buildings subjected to different types of loads
4. Analyse the tall buildings with and without shear walls.
5. Analyse shear walls with and without openings

UNIT I

Introduction: Evolution of tall buildings-Classification of Buildings – Low-rise, medium-rise, high rise – Ordinary framed buildings & Shear-wall buildings –Behaviour of buildings under lateral loads like Wind loads, Earthquake loads & Blast loads – Basic structural & functional design requirements – Strength, Stiffness & Stability

UNIT II

Design Criteria and Materials-Development of High-Rise Structures – General Planning Considerations – Design philosophies – Materials used for Construction – High Strength Concrete – High Performance Concrete – Self Compacting Concrete – Glass – High Strength Steel

UNIT III

Loading -Gravity Loading – Dead Load – Live Load – Live load reduction technique – Impact Load – Construction Load – Sequential Loading. Lateral Loading – Wind load – Earthquake Load. Combination of Loads.

UNIT IV

Behaviour of Various Structural Systems-Factors affecting growth, Height and Structural form. High rise behaviour of Various structural systems – Rigid frames, braced frames, Infilled frames, shear walls, coupled shear walls, wall frames, tubular structures, cores, outrigger – braced and hybrid mega systems.

UNIT V

Methods of analysis: Shear walls with and without openings- Estimation of stiffness by simple cantilever theory& Deep Beamtheory- Equivalent frame for large frames.

TEXTBOOKS:

1. Design of Tall Buildings by Taranath M. McGraw Hill, first edition, 2010.
2. Bryan Stafford Smith, Alex coull, "Tall Building Structures, Analysis and Design", John Wiley and Sons, Inc., 1991.
3. Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, first edition,2011.

REFERENCES:

1. Lin.T.Y, Stotes Burry.D, "Structural Concepts and systems for Architects andEngineers", John Wiley, 1988.
2. Lynn S.Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors,Delhi, 1986.
3. Wolfgang Schueller "High Rise Building Structures", John Wiley and Sons, New York1977.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INDUSTRIAL STRUCTURES
(PROFESSIONAL ELECTIVE IV)

Course Code:GR20A4007 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-requisites: Design of reinforced concrete structures, Design of steel structures.

Course Objectives:

1. Discuss different industrial steel buildings
2. Differentiate the design concept of transmission and communication towers, chimney
3. Discriminate design of Silos and Bunkers
4. Analyze and design folded plates and cylindrical shell
5. Classifythe concepts on machine foundations

Course Outcomes:

1. Analysis and design of different industrial steel buildings.
2. Calculate the forces on transmission and communication towers
3. Correlate of silos and bunkers
4. Assess the design ofconcrete shell structures
5. Evaluate the design parameters of machine foundation

UNIT-I

Industrial steel building frames: Types of frames, bracing, crane girders and columns, workshop sheds

UNIT-II

Transmission and Communication towers: Types and configuration, Analysis and design; Chimneys; Loads and stresses in chimney shaft, Earthquake and wind effect, Stresses due to temperature difference, combined effect of loads and temperature, temperature. Design of chimney;

UNIT-III

Silos and Bunkers: Jassen's theory, Airy's theory, Shallow and deep bins, rectangular bunkers with slopping bottom, rectangular bunkers with high side walls;

UNIT-IV

Concrete Shell Structures: Folded plate and cylindrical shell structures; Introduction, structural behavior of long and short shells, beam and arch action, analysis and design of cylindrical shell structures.

UNIT-V

Machine foundations: introduction, machine vibration, structural design of foundation to rotary machines, impact machines, vibration characteristics, design consideration of foundation to impact machine, grillage, pile and raft foundation.

TEXT BOOKS:

1. Subramanian, N. (2018), Design ofSteelStructures-Limit State Design, Oxford University press, India.
2. Dunham, (2002), Planning of industrial structures, Tata McGraw Hill
3. Transmission Line Structures - S S Murthy, A R Shantha kumar, Tata McGraw Hill
4. Design of Reinforced Concrete Shells and Folded Plates, P.C. Verghese, PHI (2010)

REFERENCES:

1. Krammer., "Earthquake Geotechnical Engineering", first edition, 2003.
2. Bowles, J. E., "Foundation Analysis & Design", McGraw Hill, 5th Edition, 1996.
3. Ghali, A, "Circular Storage Tanks and Silos", E & F N Spon, London, 2nd edition 2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
GEOMETRIC DESIGN OF HIGHWAYS
(PROFESSIONAL ELECTIVE IV)

Course Code:GR20A4008 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Transportation Engineering

Course Objectives:

1. Explain the principles of highway engineering elements
2. Develop and interpret design standards for horizontal and vertical geometry.
3. Describe Intersection Planning and solving transportation problems
4. Analyze the type of conflicts that occur at intersection and design the intersection accordingly
5. Discuss Highway furniture for road safety and information.

Course Outcomes:

1. Analyze the factors influencing road vehicle performance, characteristics and design.
2. Compute the geometric features of road including horizontal and vertical alignment
3. Demonstrate the need of intersection planning and design and suggest solutions
4. Illustrate the importance of geometric design in highway system and suggest measures.
5. Demonstrate the need for road safety furniture and its importance in highway system

UNIT-I:

Highway Cross Section Elements: Functional Classification of Highway System; Design Controls – Topography, Driver characteristics, Vehicle Characteristics, Traffic, Capacity and Level of Service, Design Speed., Carriageway, Shoulders, Formation width, Right of way; Kerbs, foot paths, Medians, Camber, Objectives of Camber - Pavement Surface characteristics – Skid Resistance, factors affecting Skid resistance, Road Roughness.

UNIT-II:

Horizontal Alignment: Objectives; Sight Distances – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Importance of Sight Distances on Horizontal curves, Super elevation – Need for Super elevation; Method of computing super elevation; Minimum Radius of Curve; Methods of attainment of super-elevation; Extra widening on Curves; Transition Curves

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UNIT-III:

Vertical Alignment – Objectives, Design. Gradients – Types of Gradients, Design Standards; Vertical Curves – Summit Curves, Valley Curves and Design criteria for Vertical Curves; Combination of Vertical and Horizontal Curves – Grade Compensation.

UNIT-IV:

Intersections in Highways - Types of Intersections; Design Principles for Intersections; Types of At-grade Intersections – Channelization Objectives; Traffic Islands, Rotary Intersection – Concept and Design, Advantages and Disadvantages; Grade separated Interchanges – Types, warrants and Design standards

UNIT-V:

Highway Safety Furniture: Basic Road furniture- Signs boards and Road Markings: Types of Road Signs; Guidelines for the provision of Road Signs; Cautionary Signs, Regulatory Signs, Information Signs – Design standards; Road markings – Objective of Road Markings; Types of Road Markings; Role of Road markings in Road Safety and Traffic Regulation; Specification for Road Markings. Highway Appurtenances – Delineators, Traffic Impact Attenuators, Safety Barriers

TEXT BOOKS:

1. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna Publications (2017)
2. Traffic Engineering and Transportation Planning, L.R.Kadiyali, Khanna Publications, 8th edition (2011)

REFERENCES:

1. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers,10th edition, 2019.
2. IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas, Part 4, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PHYSICO-CHEMICAL PROCESSES FOR WATER AND WASTEWATER TREATMENT

(PROFESSIONAL ELECTIVE IV)

Course Code:GR20A4009 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Environmental Engineering

Course Objectives:

1. Identify opportunities in environmental engineering field.
2. Identify, formulate and solving problems on analysis of water.
3. Predict the population in a city such that design of water treatment plant and STP can be done and quantity of water required can be estimated.
4. Assess various techniques in treatment of water and wastewater.
5. Identify methods of disposal of sewage and their impact on environment

Course Outcomes:

1. Estimate water for domestic and industrial requirement.
2. Determine the quality of generated sludge by treatment of water and wastewater and various methods for disposal of sludge
3. Explain methods ofdisinfection, chlorination – chlorine dose, chlorine demand,
4. Describe process for removal of oil, grease etc & disposalof skimming
5. Operate and maintain the sedimentation plant

UNIT I

Water purification in natural systems- variation in water flow and the steps to estimate - water for domestic and industrial requirement -waste water quantity- List the standards of potable water quality, gas flow, physical processes, chemical processes and biological processes. Primary, secondary and tertiary treatment.

UNIT II

Unit operations, unit processes - Aeration and gas transfer - Sedimentation, different types of settling, sedimentation tank design. Coagulation and flocculation, coagulation processes, stability of colloids, destabilization of colloids, destabilization in water and wastewater treatment, transport of colloidal particles, design aspects.

UNIT III

Filtration: filtration processes, Hydraulics of flow through porous media, Rate control patterns and methods, Filter effluent quality parameters, mathematical model for deep granular filters, slow sand filtration, rapid sand filtration, pre-coat filtration, design aspects.

Disinfection: Types of disinfectants, Kinetics of disinfection, chlorination and its theory, Design of Chlorinators.

UNIT IV

Precipitation: Hardness removal, Iron, Mn, and heavy metal removal; Adsorption, adsorption equilibria and adsorption isotherm, rates of adsorption, Sorption kinetics in batch reactors, continuous reactors, factors affecting adsorption.

UNIT V

Ion Exchange - exchange processes, materials and reactions, methods of operation, Application, design aspects. Membrane Processes, Reverse osmosis, Ultrafiltration, Electrodialysis

TEXT BOOKS:

1. Text book of Water supply and Sanitary Engg. S K Hussain Oxford AndIBH2 Water Supply and Sanitary Engg . G S Birdi Dhanpatraj and Sons, 3rd edition (2017)
2. A text bookof Water Supply. V N Gharpure Allied Book House
3. A text book of Sanitary Engg. V N Gharpure Allied Book House

REFERENCES:

1. Water supplyand Sanitary Engg. Vazirani and Chandola Khanna Publishers, 1986.
2. Wastewater Engineering, Treatment, Disposal, Reuse Metcalf and Eddy McGraw Hill International Edition, 5th edition.
3. Water supply and Sewerage. E W Steel and Terence J McGhee McGraw Hill Book Company,6th edition 1991.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
REHABILITATION AND RETROFITTING OF STRUCTURES

(PROFESSIONAL ELECTIVE IV)

Course Code:GR20A4010 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-requisite: Solid Mechanics, Structural Analysis

Course Objectives:

1. Mechanisms for Structuraldistress and deterioration.
2. Causes and prevention of corrosion in concrete and steel structures
3. Inspection and Repair ofdistressed concrete and steel structures
4. Rehabilitation of distressed concrete and steelstructures
5. Health Monitoring and assessment of concrete and steelstructures

Course Outcomes:

1. Recognize various mechanisms for Structuraldistress and deterioration.
2. Learnthe measures to prevent corrosion in concrete and steel structures
3. Apply the Inspection and Repair methods of distressed concrete and steel structures
4. Employ the methods of Rehabilitation in distressed concrete and steel structures
5. Carry out health monitoring and conditional assessment surveys on concrete and steel Structures

UNIT I

Structural distress mechanisms- Maintenance and Repair Strategies – Inspections - Assessment procedure for evaluating a damaged structure, causes of deterioration – Cracks - causes - structural and non-structural damages- Physical deterioration due to moisture, temperature, shrinkage, freeze-thaw, abrasion, erosion, cavitation, crystallization of salts, Efflorescence, exposure to severe environment like marine exposure, Chemical deterioration due to corrosion of reinforcement (chloride induced, carbonation induced), Alkali-silica reaction, sulphate attack, Acid attack – case studies

UNIT II

Basics of corrosion phenomena- electrochemical process - Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection- Case studies

UNIT III

Inspection and Testing – Damage assessment techniques– Non-Destructive testing systems – Repairs in under-water structures- -materials for repair - Repair of structures distressed due to fire, Leakage, earthquake – Demolition Techniques – Engineered demolition methods – Effects due to climate, temperature, Sustained elevated temperature- fire damaged structures - Fire rating of structures- Case studies

UNIT IV

Simple systems of rehabilitation of structures - Guniting, Epoxy injection, Shoring, Underpinning, Use of carbon fibre wrapping, FRPs and carbon composites in repairs – strengthening methods in concrete and steelstructures – Retrofitting – Jacketing – Case studies

UNIT V

Structural health monitoring of structures- Sensors –Building instrumentation- smart sensing technology - strain rosette - Condition survey- Special Concretes - Quality assurance for concrete- Construction chemicals for repairs- design and construction errors- Case studies

TEXTBOOKS:

1. Ravishankar, Krishnamoorthy. T. S," Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
2. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK,1991.
3. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987

REFERENCES:

1. Shetty M.S., "Concrete Technology – Theory and Practice", S.Chand and Company, 8th edition 2018.
2. Dov Kominetzky. M.S., "Design and Construction Failures", Galgotia Publications Pvt.Ltd.,2001
3. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.
4. Gambhir. M.L., "Concrete Technology", McGraw Hill, 2013

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENVIRONMENTAL IMPACT ASSESSMENT AND LIFE CYCLE ANALYSIS

(OPEN ELECTIVE III)

Course Code:GR20A4011 **L/T/P/C: 3/0/0/3**

IV Year I Semester

Pre-Requisites: Environmental science

Course Objectives:

1. Learnthe purpose and role of EIA in the decision-making process.
2. Provide knowledge on the strengths of EIA regarding environmental management.
3. Introduce the technical and social/political limitations of EIA.
4. Teachthe administration and procedures that apply in the student's jurisdiction.
5. Demonstrate the format of an EIA Report (Environmental Impact Statement, or Environmental Statement)

Course Outcomes:

1. Identify Elements of Community and Environment Likely to Be Affected by The Proposed Developments.
2. Develop Framework for Environmental Impact Assessment and Understand the Risk Analysis and EIA Methods.
3. Explain The Importance of Public Participation, Fault Tree Analysis and Consequence Analysis in EIA
4. Assess the Processof Environmental Impact Modelling and Prediction as A Design Tool.
5. Explain The Environmental Monitoring Systems and Legislation. Interact With Experts of Other Fields to Assess the Impact.

UNIT I

Introduction: Concepts of EIA methodologies – Sustainable development- Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – Evolution of EIA: Screening and scoping; Rapid EIA and Comprehensive EIA

UNIT II

Introduction to EIA, Criteria for the selection of EIA Methodology, General Framework for Environmental Impact Assessment, Characterization and site assessment. Environmental Risk Analysis, Definition of Risk, Matrix Method; Checklist method.

UNIT III

Prediction and Assessment: Public participation Fault tree analysis, Consequence Analysis; Socioeconomic aspects, measures of the effectiveness of pollution control activities;

UNIT IV

Environmental Legislation: Introduction to Environmental Management Systems; Environmental Statement - procedures; Environmental Audit: Cost-Benefit Analysis;

UNIT V

Life Cycle Assessment, Resource Balance, Energy Balance & Management Review - Operational Control - Case Studies on EIA with reference to Indian Scenario.

TEXTBOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S.Publication, Sultan Bazar, Hyderabad,2nd edition - 2011
2. Environmental Science and Engineering, by Suresh K. Dhaneja– S.K.Katania &Sons Publication., New Delhi Reprint 2013 edition (1 January 2013)

REFERENCES:

1. Environmental Impact Assessment, by Larry Canter, 2nd edition, Mc Graw Hill Publishers, 2nd edition, 1995.
2. Judith Petts, "Handbook ofEnvironmental Impact Assessment Vol. I &II", Blackwell Science,1999
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke Prentice Hall Publishers- 2nd Edition 2015
4. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P)Ltd, Delhi, 2nd edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

TRANSPORTATION ENGINEERING LAB

Course Code:GR20A4012 **L/T/P/C: 0/0/4/2**

IV Year I Semester

Pre-Requisites: Transportation Engineering.

Course Objectives:

1. Provide knowledge of physical and mechanical characteristics of highway materials.
2. Demonstrate various experiments on highway materials to check their suitability in road construction.
3. Illustratedesign methods and test procedures for strength determination ofbituminous mixes
4. Facilitate knowledge of optimum material selection for pavement layers.
5. Understand the behavior of the materials under vehicle load conditions

Course Outcomes:

1. Estimate desired characteristics ofaggregates.
2. Distinguish suitable materials for road construction.
3. Categorize pavement materials by their physical and mechanical properties.
4. Demonstrate various experiments on bitumen to measure various properties.
5. Demonstrate bituminous mixes as per pavement requirement.

List of experiments:

Task 1: Tests on Aggregates

1. Crushing value
2. Impact value
3. Specific gravity and water absorption
4. Abrasion test
5. Shape test.

Task 2: Tests on Bitumen

1. Penetration test
2. Ductility test
3. Softening point test
4. Flash and fire point tests

Task 3: Tests on Bituminous Mixes

1. Specific Gravity- Demonstration
2. Marshall stabilitytest -Demonstration

REFERENCES:

1. Highway Engineering – S. K. Khanna & C. E. G. Justo. New Chand & Brothers,10th edition,2019.
2. Highway Material Testing - S. K. Khanna & C. E. G. Justo. (2013)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING LAB

Course Code:GR20A4013 **L/T/P/C: 0/0/4/2**
IV Year I Semester

Pre-Requisites: Structural Analysis – II, Design of Reinforced Concrete Structures, Design of Steel Structures, AUTOCAD

Course Objectives:

1. Analyze and Design the Reinforced Cement Concrete (RCC) beams with different supports and loads.
2. Analyze and Design the RCC multi- storeyed buildings with different load and load combinations.
3. Analyze and Design the RCC water tanks of different shapes.
4. Analyze and Design the Steel beams of different sections with various load combinations.
5. Analyze and Design the trusses of different sections with various load combinations

Course Outcomes:

1. Analyze and design the various beams for the different supports and loads.
2. Analyze and Design a Two and Three Dimensional (2D and 3D) frames of Multi-Storeyed Building with Wind and Seismic loads and Load combinations.
3. Analyze and Design a Reinforced Cement Concrete Over Head tank.
4. Analyze and design the distinct types of Steel Trusses and Industrial Steel Truss
5. Analyze and design the various types of Steel Beams for the different loads.

SYLLABUS:

1. Introduction to STAAD.Pro Software
2. Design of beams for Simply Supported, Over Hanging, Cantilever and Fixed conditions with Point Load and Uniformly Distributed Load.
3. Design of beams for Simply Supported, Over Hanging, Cantilever and Fixed conditions with Uniformly Varying Load and Moment.
4. Analysis and Design of multi-storeyed building with simple 2D frame.
5. Analysis and Designof multi-storeyed building with 3D frame with Dead Load and Live Load
6. Analysis and Design of multi-storeyed building with 3D frame considering Wind load and Load combinations.
7. Analysis and Design of multi-storeyed building with 3D frame with Seismic Load and load combinations.
8. Analysis and Design of multi-storeyed building with 3D frame with plates.
9. Analysis and Design of multi-storeyed building (3D frame) and Result analysis.
10. Analysis and Design of RCC Rectangular Over Head Tank.
11. Analysis and Design of RCC Circular Over Head Tank.
12. Analysis and Design of beams for various steel cross sections (I, C, T, L and composite sections).

13. Analysis and Design of Steel Tubular Trusses.
14. Analysis and Design of Industrial buildings with truss elements.
15. Analysis and Design of Steel Over Head Tank.

REFERENCES:

1. STAAD. Pro Reference Guide, Chetan Publication; 2010th edition (1 January2010).

2. Advanced Structural Analysis, A K Jain, Nem Chand & Bros. Third edition, 2015.

3. Advanced Structural Analysis, Devadas Menon, Alpha Science International,Ltd (Publisher),2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROJECT WORK – PHASE I

Course Code:GR20A4129 **L/T/P/C: 0/0/12/6**
IV Year I Semester

Pre-Requisites: Knowledge of all Civil Engineering subjects and Laboratories, communication skills

Course Objectives:

1. Improve the technical presentation skills of the students.
2. Train the studentsto do Survey and study ofpublished literature on the assigned topic
3. Impart practical skills and knowledge in their project.
4. Learn different tools and techniques to solve problems
5. Prepare technical reports

Course Outcomes:

1. Interpret ideas and thoughts into practice in a project and work in a team
2. Analyze the gap between theoretical and practical knowledge and evaluate theavailable literature on the chosen problem
3. Compose technical presentation in the conference and to develop organizational skillsand team work
4. Applythe principles, tools and techniques to solve the problem
5. Prepare and present project report