GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(An UGC Autonomous Institution - Affiliated to JNTUH)
Ibrahimpatnam, Ranga Reddy District, Hyderabad - 501 506.

Department of Civil Engineering

GNITC - Regulation - R18

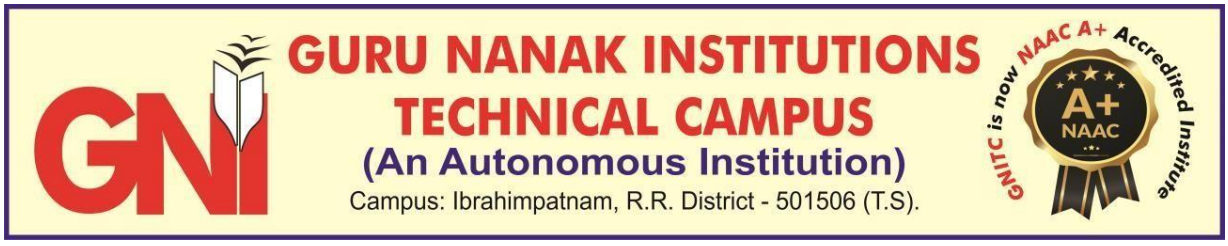
COURSE STRUCTURE AND DETAILED SYLLABUS

for

III YEAR B. TECH

CIVIL ENGINEERING

(Applicable for the batches admitted from 2018-19)



GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

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Ibrahimpatnam, Ranga Reddy District, Hyderabad - 501 506.

Department of Civil Engineering

COURSE STRUCTURE

(Applicable from the batch admitted during 2018-19 and onwards)

III YEAR B.TECH CE - I SEMESTER

S. No.	Group	Course Code	Course Title	Hours per Week			Credits
				L	T	P	
1	PC	18PC0CE14	Structural Analysis-II	3	0	0	3
2	PC	18PC0CE15	Geotechnical Engineering	3	0	0	3
3	PC	18PC0CE16	Structural Engineering	3	0	0	3
4	PC	18PC0CE17	Transportation Engineering - I	3	0	0	3
5	PE	18PE0CE1X	Professional Elective-I	3	0	0	3
6	OE	18OE0XXX	Open Elective – I	3	0	0	3
7	PC	18PC0CE18	Highway Engineering and Concrete Technology Lab	0	0	3	1.5
8	PC	18PC0CE19	Geotechnical Engineering Lab	0	0	3	1.5
9	HS	18HS0EN03	Advanced Communication skills Lab	0	0	2	1
10	MC	18MC0EN01	Constitution of India	3	0	0	0
11	MC	18MC0CS01	Fundamentals of Artificial Intelligence	3	0	0	0
Total Credits							**22**

Professional Elective-I			
1	PE	18PE0CE1A	Concrete Technology
2	PE	18PE0CE1B	Earthquake Engineering
3	PE	18PE0CE1C	Introduction To Offshore Structures

III YEAR B.TECH CE - II SEMESTER

S. No.	Group	Course Code	Course Title	Hours per Week			Credits
				L	T	P	
1	PC	18PC0CE20	Hydrology & Water Resources Engineering	3	0	0	3
2	PC	18PC0CE21	Environmental Engineering - I	3	0	0	3
3	PC	18PC0CE22	Foundation Engineering	3	0	0	3
4	PC	18PC0CE23	Design of Steel Structures	3	1	0	4
5	PE	18PE0CE2X	Professional Elective – II	3	0	0	3
6	OE	18OE0XXX	Open Elective – II	3	0	0	3
7	PC	18PC0CE24	Environmental Engineering Lab	0	0	2	1
8	PC	18PC0CE25	Computer Aided Design Lab	0	0	2	1
9	MC	18MC0EN02	Gender Sensitization lab	0	0	2	0
10	MC	18MC0CS02	Fundamentals of Cyber Security	3	0	0	0
Total Credits							**21**

Professional Elective-II			
1	PE	18PE0CE2A	Prestressed Concrete
2	PE	18PE0CE2B	Optimization techniques in structural engineering
3	PE	18PE0CE2C	Introduction to Composite Materials

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L	T	P	C
3	0	0	3

STRUCTURAL ANALYSIS – II (18PC0CE14)

Course Objectives:

The objective of the course is to make the students

- Identify the various actions in arches.
- Understand classical methods of analysis for statically indeterminate structures.
- Differentiate the approximate and numerical methods of analysis for indeterminate structures.
- Find the degree of static and kinematic indeterminacies of the structures.
- Plot the variation of S.F and B.M when a moving load passes on indeterminate structure

UNIT – I

TWO HINGED ARCHES: Introduction – Classification of Two hinged Arches – Analysis of two hinged parabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shortening of rib.

CABLES and SUSPENSION BRIDGES:

Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of a cable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of three hinged stiffening girder suspension bridges.

UNIT – II

KANI'S METHOD: Analysis of continuous beams including settlement of supports - Analysis of single bay single storey and single bay two storey frames including side Sway using Kani's method - Shear force and bending moment diagrams - Elastic curve.

MOMENT DISTRIBUTION METHOD - Analysis of continuous beams with and without settlement of supports using - Analysis of Single Bay Single Storey Portal Frames including side Sway - Analysis of inclined frames - Shear force and Bending moment diagrams, Elastic curve.

UNIT – III

APPROXIMATE METHODS OF ANALYSIS: Introduction – Analysis of multi-storey frames for lateral loads: Portal Method, Cantilever method and Factor method - Analysis of multi-storey frames for gravity loads - Substitute frame method.

UNIT – IV

MATRIX METHODS OF ANALYSIS: Introduction to flexibility and stiffness matrix methods of analyses using 'system approach' upto three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods -Analysis of pin-jointed determinate plane frames using flexibility and stiffness methods- Analysis of single bay single storey portal frames using stiffness method - Shear force and bending moment diagrams - Elastic curve.

UNIT- V

INFLUENCE LINES FOR INDETERMINATE BEAMS: Introduction – influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia - influence line diagram for shear force and bending moment for propped cantilever beams.

Course Outcomes

After the completion of the course student should be able to

- **Analyze** the two hinged arches.
- **Solve** statically indeterminate beams and portal frames using classical methods
- **Sketch** the shear force and bending moment diagrams for indeterminate structures.
- **Formulate** the stiffness matrix and analyze the beams by matrix methods

Text Books:

1) Structural Analysis Vol – I & II by Vazharani and Ratwani, Khanna Publishers.
2) Structural Analysis Vol I & II by G.S. Pandit S.P. Gupta Tata McGraw Hill Education Pvt. Ltd.
3) Indeterminate Structural Analysis by K. U. Muthu et al., I. K. International Publishing House Pvt. Ltd.
4) Structural Analysis, Volume II, S S Bhavikatti, Vikas publishing house pvt. Ltd., 4th edition

References:

1) Structural analysis T.S Thandavamoorthy, Oxford university Press
2) Mechanics of Structures Vol –II by H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt. Ltd.
3) Basic Structural Analysis by C. S. Reddy., Tata McGraw Hill Publishers.
4) Examples in Structural Analysis by William M. C. McKenzie, Taylor & Francis.
4) Structural Analysis by R. C. Hibbeler, Pearson Education
5) Structural Analysis by Devdas Menon, Narosa Publishing House.
6) Advanced Structural Analysis by A. K. Jain, Nem Chand & Bros.

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L	T	P	C
3	0	0	3

GEOTECHNICAL ENGINEERING (18PC0CE15)

Objectives: The objectives of the course are to

- Understand the formation of soil and classification of the soils
- Determine the index & Engineering properties of Soils
- Determine the flow characteristics & stresses due to externally applied loads
- Estimate the consolidation properties of soils
- Estimate the shear strength and seepage loss

UNIT – I

INTRODUCTION: Soil formation and structure – moisture content – Mass, volume relationships – Specific Gravity - Field density by core cutter and sand replacement methods - Relative density.

INDEX PROPERTIES OF SOILS: Grain size analysis – consistency limits and indices – I.S. Classification of soils.

UNIT –II

PERMEABILITY: Soil water – capillary rise – flow of water through soils – Darcy's law- permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered soils.

EFFECTIVE STRESS & SEEPAGE THROUGH SOILS: Total, neutral and effective stress – principle of effective stress - quick sand condition – seepage through soils – Flow nets: characteristics and uses.

UNIT –III

STRESS DISTRIBUTION IN SOILS: Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.

COMPACTION: Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

UNIT – IV

CONSOLIDATION: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e - logp curves – normally consolidated soil, over consolidated soil and under consolidated soil - preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.

UNIT - V

SHEAR STRENGTH OF SOILS: Importance of shear strength **–** Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelops – Shear strength of sands - dilatancy – critical void ratio

Course Outcomes

At the end of the course the student will able to

- Characterize and classify the soils
- Able to estimate seepage, stresses under various loading conditions and compaction characteristics
- Able to analyse the compressibility of the soils
- Able to understand the strength of soils under various drainage conditions

Text books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt. Ltd.,
2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.
3. Foundation Engineering by P. C. Varghese, PHI

References:

1. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
2. Principals of Geotechnical Engineering by Braja M.Das, Cengage Learning Publishers.
3. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).
4. Geotechnical Engineering Principles and Practices by Cuduto, PHI International.
5. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc. Grawhill Publishers New Delhi.
6. Soil Mechanics and Foundation by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi.

III Year, B. Tech, Civil Engg. I-Sem. **L T P C**

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STRUCTURAL ENGINEERING (18PC0CE16)

Course Objectives

The objectives of the course are to

- Identify the basic components of any structural system and the standard loading for the RC structure
- Identify and explain the various codal provisions given in IS 456
- Describe the salient feature of limit state method, compare with other methods and the concepts of limit state of collapse and limit state of serviceability
- Evaluate the behavior of RC member under flexure, shear and compression, torsion and bond.

UNIT -I

Introduction- Structure - Components of structure - Safety and Stability - Loads – Different types of Loads – Different types of materials – Planning of structural elements- Concepts of RCC Design – Different methods of design - Working stress method and limit state method – Load combinations as per Limit state method - Materials - Characteristic Values – Partial safety factors – Behavior and properties of concrete and steel - Stress block parameters as per IS 456 -2000.

Limit state Analysis and design of sections in Flexure – Behavior of RC section under flexure - Rectangular, T and L-sections, singly reinforced and doubly reinforced beams – Detailing of reinforcement.

UNIT – II

Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear using limit state concept – Design for Bond – Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement.

UNIT - III

Design of two-way slabs with different end conditions, one way slab, and continuous slab Using I S Codes - Design of dog - legged staircase – Limit state design for serviceability for deflection, cracking and codal provisions.

UNIT – IV

Design of compression members - Short column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - I S Code provisions.

UNIT – V

Design of foundation - different types of footings – design of flat isolated square, rectangular, circular footings and combined footings for two columns.

Course Outcomes

After the completion of the course student should be able to

- Compare and Design the singly reinforced, doubly reinforced and flanged sections.
- Design the axially loaded, uniaxial and biaxial bending columns.
- Classify the footings and Design the isolated square, rectangular and circular footings
- Distinguish and Design the one-way and two-way slabs.

TEXT BOOKS:

1. Limit state designed of reinforced concrete – P. C. Varghese, PHI Learning Pvt. Ltd.
2. Reinforced concrete design by S. Unnikrishna Pillai & Devdas Menon, Tata Mc. Graw Hill.
3. Reinforced concrete design by N. Krishna Raju and R. N. Pranesh, New age International Publishers.

REFERENCES:

1. Reinforced Concrete Structures, Vol.1, by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi publications Pvt. Ltd.
2. Fundamentals of Reinforced concrete design by M. L. Gambhir, Printice Hall of India Pvt. Ltd.,
3. Design of Reinforced Concrete Structures by N. Subramanian, Oxford University Press
4. Design of concrete structures by J. N. Bandhyopadhyay PHI Learning Private Limited.
5. Design of Reinforced Concrete Structures by I. C. Syal and A. K. Goel, S. Chand & company.
6. Design of Reinforced Concrete Foundations – P.C. Varghese Prentice Hall of India.

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L	T	P	C
3	0	0	3

TRANSPORTATION ENGINEERING - I (18PC0CE17)

Prerequisites: Nil

Objectives: This course aims at providing a comprehensive insight of various elements of Highway transportation engineering. Topics related to the highway development, characterisation of different materials needed for highway construction, structural and geometric design of highway pavements along with the challenges and possible solutions to the traffic related issues will be covered as a part of this course.

UNIT – I

Introduction, History and importance of highways, characteristics of road transport, current road development plans in India, highway development in India, highway planning, highway alignment, Engineering surveys for highway alignment, highway projects, highway drawings and reports, detailed project report preparation, PPP schemes of Highway Development in India, Government of India initiatives in developing the highways and expressways in improving the mobility and village road development in improving the accessibility.

UNIT – II

Introduction to highway, Geometric design; Width of pavement, Formation and land, Cross Slopes etc; Concept of friction: Skid and slip; Elements of geometric design of highways; Sight distances: Stopping sight distance, Overtaking sight distance and intermediate sight distance; Horizontal alignment: Design of horizontal curves, super elevation, extra widening of pavement at curves; Vertical alignment: Gradients, compensation in gradient, design of summit curves and valley curves using different criteria; Integration of horizontal and vertical Curves.

UNIT – III

Basic traffic characteristics: Speed, volume and concentration, relationship between flow, speed and concentration; Highway capacity and level of service (LOS) concepts: Factors affecting capacity and LOS, relationship between V/C ratio and LOS; Traffic volume and spot speed studies: Methods; Road Safety; Traffic Signals: Types, warrants for signalization, design of isolated traffic signal by IRC method; Parking and road accidents: Types of parking facilities – onstreet and off street, introduction to parking studies; Accident studies, road safety auditing; Introduction to street lighting; road intersections: Design considerations of at-grade intersections, introduction to interchanges

UNIT – IV

Tests on soils: CBR, Field cbr, modulus of sub-grade reaction, Tests on Aggregates: specific gravity, shape (flakiness and elongation indices), angularity number, water absorption, impact, abrasion, attrition, crushing resistance, durability (weathering resistance), stone polishing value of aggregates; Tests on bitumen: spot, penetration, softening point, viscosity, ductility, elastic recovery, flash and fire points, Introduction to modified bituminous binders like crumb rubber modified, natural rubber modified and polymer modified bitumen binders; Bituminous Concrete: Critical parameters controlling bituminous concrete mixture design, aggregate blending concepts viz. Rothfuch's method, trial and error procedure. Introduction to advanced concretes for road applications.

UNIT –V

Introduction to Pavement Design: Types of pavements and their typical cross sections: flexible, rigid and composite; Flexible pavement analysis and design: Introduction to multi layered analysis, IRC 37 - 2012 method of flexible pavement design; rigid pavement analysis and design: Factors controlling rigid pavement design, types of stresses in rigid pavements, critical load positions, load stresses and temperature stresses in interior, corner and edge locations of jointed plain cement concrete pavement slabs, IRC 58 - 2015method of rigid pavement design; Overlay designs: Types of overlays on flexible and rigid pavements.

Course Outcomes:

At the end of this course, the students will develop:

1. An ability to apply the knowledge of mathematics, science and engineering in the areas of traffic engineering, highway development and maintenance
2. An ability to design, conduct experiments to assess the suitability of the highway materials like soil, bitumen, aggregates and a variety of bituminous mixtures. Also the students will develop the ability to interpret the results and assess the suitability of these materials for construction of highways.
3. An ability to design flexible and rigid highway pavements for varying traffic compositions as well as soil subgrade and environmental conditions using the standards stipulated by Indian Roads Congress.
4. An ability to evaluate the structural and functional conditions of in-service highway pavements and provide solution in the form of routine maintenance measures or designed overlays using Indian Roads congress guidelines.
5. An ability to assess the issues related to road traffic and provide engineering solutions supported with an understanding of road user psychological and behavioral patterns.

TEXT BOOKS:

1. Khanna, S.K, Justo, A and Veeraragavan, A, 'Highway Engineering', Nem Chand & Bros. Revised Tenth Edition, 2014
2. Kadiyali L.R. and Lal N B, Principles and Practices of Highway Engineering; Seventh Edition, First Reprint; Khanna Publishers, New Delhi, 2018

Code of Provisions:

Design Codes: IRC 37-2012, IRC 58-2015, IRC 81-1997

Reference books:

1. Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, Third Edition, Third Impression; Pearson Education, 2018.
2. Khisty C J and Lall B Kent; Transportation Engineering: An Introduction, Third Edition, 1st Indian Adaptation; Pearson India Education Service Pvt. Ltd, New Delhi 2017.
3. Subhash C Saxena, Text Book of Highway and Traffic Engineering; First Edition; CBS Publishers and Distributors. New Delhi, 2014
4. C Venkatramaih, Transportation Engineering Volume 1 – Highway Engineering, 1st Edition, Universities Press, 2016
5. Garber, N.J. and Hoel, L.A. Traffic and Highway Engineering, Fourth Edition; Cengage Learning, Stamford, CT, USA, 2010
6. Partha chakroborty and Animesh Das, Principles of Transportation Engineering, PHI, 2013
7. Nicholas J Garber and Lester A Hoel, Traffic and Highway Engineering, 5th Edition, Cengage Learning India Private Limited, New Delhi, 5th Indian Reprint.

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III Year, B. Tech, Civil Engg. I-Sem.

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3	0	0	3

PROFESSIONAL ELECTIVE - I
CONCRETE TECHNOLOGY (18PE0CE1A)

Prerequisites: Building Materials

Course Objectives: The objectives of the course are to

- Know different types of cement as per their properties for different field applications.
- Understand design economic concrete mix proportion for different exposure conditions and intended purposes.
- Know field and laboratory tests on concrete in plastic and hardened stage.

UNIT – I

CEMENT: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Tests on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.

UNIT - II

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, manufactured sand and coarse aggregates – Gap graded aggregate – Maximum aggregate size - Properties recycled aggregate.

UNIT - III

FRESH CONCRETE: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing, vibration and revibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT – IV

HARDENED CONCRETE : Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturityconcept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing.

TESTING OF HARDENED CONCRETE: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT.

ELASTICITY, CREEP & SHRINKAGE – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

UNIT - V

MIX DESIGN: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

SPECIAL CONCRETES: Introduction to light weight concrete – Cellular concrete – No fines concrete – High density concrete – Fiber reinforced concrete – Polymer concrete – High performance concrete – Self

compacting concrete.

Course Outcomes:
After the completion of the course student should be able to

- Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.
- Apply the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties
- Use advanced laboratory techniques to characterize cement-based materials.
- Perform mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fiber reinforced concrete.

Textbooks:
1. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford university press, New Delhi
3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

References:
1. Properties of Concrete by A. M. Neville – Low priced Edition – 4th edition
2. Concrete: Micro structure, Properties and Materials – P. K. Mehta and J. M. Monteiro, Mc-Graw Hill Publishers

IS Codes: IS 383, IS 516, IS 10262 – 2009

III Year, B. Tech, Civil Engg. I – Sem.

L	T	P	C
3	0	0	3

PROFESSIONAL ELECTIVE - I
EARTHQUAKE ENGINEERING (18PE0CE1B)

Course Objectives:

The objectives of the course are to

- Understand Engineering Seismology
- Explain and discuss single degree of freedom systems subjected to free and forced vibrations
- Acquire the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes understand importance of ductile detailing of RC structures

UNIT-I

Engineering Seismology: Earthquake phenomenon cause of earthquakes - Faults- Plate tectonics- Seismic waves - Terms associated with earthquakes - Magnitude/Intensity of an earthquake – scales - Energy released - Earthquake measuring instruments - Seismoscope, Seismograph, accelerograph - Characteristics of strong ground motions - Seismic zones of India.

Introduction - Functional planning - Continuous load path - Overall form - simplicity and symmetry - elongated shapes - stiffness and strength - Seismic design requirements - regular and irregular configurations - basic assumptions.

UNIT-II

Conceptual design: Introduction - Functional planning - Continuous load path - Overall form-simplicity and symmetry - elongated shapes - stiffness and strength - Horizontal and Vertical members - Twisting of buildings – Ductility – definition - ductility relationships - flexible buildings - framing systems - choice of construction materials - unconfined concrete - confined concrete – masonry - reinforcing steel.

Introduction to earthquake resistant design: Seismic design requirements - regular and irregular configurations - basic assumptions - design earthquake loads - basic load combinations -permissible stresses - seismic methods of analysis - factors in seismic analysis - equivalent lateral force method.

UNIT-III

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members- Structural models for frame buildings- Seismic methods of analysis- Seismic deign methods- IS code based methods for seismic design - Seismic evaluation and retrofitting - Vertical irregularities - Plan configuration problems - Lateral load resisting systems - Determination of design lateral forces - Equivalent lateral force procedure - Lateral distribution of base shear.

UNIT-IV

Masonry Buildings: Introduction - Elastic properties of masonry assemblage - Categories of masonry buildings - Behaviour of unreinforced and reinforced masonry walls - Behaviour of walls - Box action and bands - Behaviour of infill walls - Improving seismic behaviour of masonry buildings - Load combinations and permissible stresses - Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT-V

Structural Walls and Non-Structural Elements: Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of non-structures- Effects of non-structural elements on structural system- Analysis of non-structural elements- Prevention of non-structural damage- Isolation of non-structures. Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility - Requirements for Ductility - Assessment of

Ductility - Factors affecting Ductility - Ductile detailing considerations as per IS 13920. Behaviour of beams, columns and joints in RC buildings during earthquakes -Vulnerability of open ground storey and short columns during earthquakes.

OUTCOMES:

After the completion of the course student should be able to

- Explain and derive fundamental equations in structural dynamics
- Discuss and explain causes and Theories on earthquake, seismic waves, measurement of earthquakes
- Evaluate base shear using IS methods
- Design and Detail the reinforcement for earthquake forces

Text Books:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

References:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Earthquake Resistant Design of Building structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R. N. Iyengar, I. K. International Publishing House Pvt. Ltd.
4. Masonry and Timber structures including earthquake Resistant Design –Anand S. Arya, Nem chand & Bros
5. Earthquake Tips – Learning Earthquake Design and Construction, C.V.R. Murthy

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III Year, B. Tech, Civil Engg. I – Sem.

L	T	P	C
3	0	0	3

PROFESSIONAL ELECTIVE - I
INTRODUCTION TO OFFSHORE STRUCTURES (18PE0CE1C)

Prerequisites: FM & Hydraulics, Structural Analysis

Course Objectives: The subject provide a knowledge on offshore structures, analysis and design of offshore structures.

UNIT-I

Types of offshore structures. Selection. Function - Physical, Environmental and Geotechnical aspects of marine and offshore construction. Loads and responses of offshore structures. Foundations for offshore structures. Introduction to design and installation of offshore piled platforms, concrete offshore platforms, Moored floating structures and Submarine pipelines.

UNIT II

Wave Theories: Wave generation process, small and finite amplitude wave theories.

UNIT III

Forces Of Offshore Structures: Wind forces, wave forces on vertical, inclined cylinders, structures - current forces and use of Morison equation.

UNIT IV

Offshore Soil And Structure Modeling**:** Different types of offshore structures, foundation modeling and structural modeling

UNIT V

Analysis And Design Of Offshore Structures: Static method of analysis, foundation analysis and dynamics of offshore structures. Design of platforms, helipads, Jacket tower and mooring cables and pipe lines.

Outcomes: Able to understand & design offshore structures

Text Books:

1. Gerwick, C., Construction of Marine and Offshore structures, CRC Press.
2. Alonzo Def. Quinn., Design and construction of Port and Marine structures Mc. Graw Hill Book co.
3. Chakrabarti., S.K., Hand Book of Offshore Engineering (Vols. 1 & 2)" Elsevier Publications

References:

1. Brebbia C.A. and Walker, 'Dynamic Analysis of Offshore Structures', Newnes Butterworth, London, 1978.
2. Sarpakaya T and Isaacson M., 'Mechanics of Wave Forces on Offshore Structures', Van Nostrand Reinhold, New York, 1981.
3. Hallam M.G., Heaf N.J. and Wootton, L.R., 'Dynamics of Marine Structures', CIRIA Publications, Underwater Engg., Group, London, 1978.
4. Graff W.J., 'Introduction to Offshore Structures', Gulf Publishing Co., Houston, Texas, 1981.
5. Clough R.W. and Penzien J., 'Dynamics of Structures', II Edition, Mc.Graw-Hill, 1992.
6. Simiu E. and Scanlan R.H., 'Wind Effects on Structures', Wiley, New York, 1978.
7. Codes of Practices (latest versions) such as API RP-2A, Bureau Veritas etc.
8. Proceedings of Offshore Technology Conference (O.T.C.), Behaviour of Offshore Structures (BOSS) and other Conferences on Offshore Engineering.

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III Year B.Tech. Civil Engg. II – Sem.

L	T	P	C
3	0	0	3

OPEN ELECTIVE - I
DISASTER PREPAREDNESS & PLANNING MANAGEMENT (18OE0CE1A)

Course Objectives:

The objectives of the course are

- 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

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 program 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, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Course Outcomes:

The student will develop competencies in

- the application of disaster concepts to management

- Analyzing relationship between development and disasters.
- Ability to understand categories of disasters and
- realization of the responsibilities to society

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

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS) HYDERABAD

III Year, B. Tech, Civil Engg. I-Sem.

L	T	P	C
0	0	3	1.5

HIGHWAY ENGINEERING & CONCRETE TECHNOLOGY LAB (18PC0CE18)

Pre-Requisites: Building Materials, Concrete Technology, Highway Materials

Course Objectives: The objectives of the course are to

- To learn laboratory tests and their procedures cement, fine aggregate, coarse aggregates and bitumen
- To evaluate fresh concrete properties
- To understand the test procedures for characterization of Concrete and bituminous mixes

Student shall be able to

- Categorize the test on materials used in Civil Engineering building & pavement constructions.
- To perform the tests on concrete for its characterization.
- To design concrete mix proportioning by using Indian standard method.
- Examine the tests performed for bitumen mixes.
- To prepare a laboratory report

I. Test on Cement

1. Normal Consistency and fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity of cement
4. Soundness of cement
5. Compressive strength of cement

II. Test on Aggregates (Coarse and Fine)

1. Specific gravity, water absorption
2. Shape (flakiness and elongation indices)
3. Impact and abrasion value tests
4. Bulking of sand and sieve analysis

III. Test on Fresh Concrete

1. Slump test
2. Compaction factor test
3. Vee - bee Test

IV. Test on hardened concrete

1. Compression test on cubes & Cylinders
2. Split Tension Test

V. Tests on Bitumen and Bituminous concrete

1. Penetration, softening point
2. Flash and fire points and specific gravity
3. Marshall's Stability

TEXT BOOKS:

1. Concrete Manual by M.L. Gambhir, Dhanpat Rai & Sons
2. Highway Material Testing manual, Khanna & Justo and Veeraraghavan, Nemchand Brothers

IS CODES:

1. IS 10262 :2009 Concrete Mix Proportioning – Guidelines
2. 1S 516:2006 Methods of Tests on Strength of Concrete
3. IS 383 :1993 Specification For Coarse And Fine Aggregates From Natural Sources For Concrete
4. 1S 1201 -1220 (1978) Methods for testing tars and bituminous materials
5. IRC SP 53 - 2010 Guidelines on use of modified bitumen
6. MS-2 Manual for Marshalls Mix design

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS) HYDERABAD

III Year, B. Tech, Civil Engg. I – Sem.

L	T	P	C
0	0	3	1.5

GEOTECHNICAL ENGINEERING LABORATORY (18PC0CE19)

Pre Requisites: Soil Mechanics (Co-requisite)

Course Objectives: To obtain index and engineering properties of locally available soils and to understand the behavior of these soil under various loads.

Course Outcomes: At the end of the course, the student will be able to classify and evaluate the behavior of the soils subjected to various loads.

LIST OF EXPERIMENTS

1. Atterberg limits (Liquid Limit, Plastic Limit)
2. Field density by core cutter method
3. Field density by sand replacement method
4. Determination of Specific gravity of soil
5. Grain size distribution by sieve analysis
6. Permeability of soil by constant and variable head test methods
7. Standard Proctor compaction test
8. Determination of coefficient of consolidation (square root time fitting method)
9. Unconfined compression test
10. Direct shear test
11. Vane shear test
12. Differential free swell index (DFSI) test

REFERENCE:

Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International.

III Year, B. Tech, Civil Engg. I-Sem.

L	T	P	C
0	0	2	1

Advanced Communication Skills Lab (18HSOENO3)

Introduction

The introduction of the Advanced Communication Skills Lab is considered essential at 31.6 year level. At this stage, the students need to prepare themselves for their careers which may require them to listen, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

Syllabus:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation — responding appropriately and relevantly — using the right body language — Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. Activities on Reading Comprehension —General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. Activities on Writing Skills — Structure and presentation of different types of writing — *letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing* — planning for writing — improving one's writing.
4. Activities on Presentation Skills — Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/e-mails/assignments etc.
5. Activities on Group Discussion and Interview Skills — Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

Books Recommended:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. English Language Communication : A Reader cum Lab Manual Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
3. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. Business and Professional Communication: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
6. The Basics of Communication: A Relational Perspective. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
7. English Vocabulary in Use series, Cambridge University Press 2008.
8. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008
9. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
10. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
11. Handbook for Technical Writing by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
12. Job Hunting by Colm Downes, Cambridge University Press 2008.
13. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
14. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata McGraw-Hil 2009.
15. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/Cambridge University Press.
16. International English for Call Centres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

III Year, B. Tech, Civil Engg. I – Sem.

L	T	P	C
3	0	0	0

CONSTITUTION OF INDIA (18MCOEN01)

Course Objective:

The course is structured and taught to enable a non social science students to appreciate and • understand the evolution of the institutions and dynamics of functioning of the institutions. This constitutes itself as political process and affects and effects the individual and the society in its life as a person and citizen and develops and forms an attitude towards the political system. The main aim is to help individuals develop into responsible, critical, reflective and productive citizens.

Unit- I Evolution of Indian Constitution

1. Constitutionalism

2.1909, 1919 and 1935 Acts

3. Constituent Assembly- Composition and Functions

UNIT-II Major features and Provisions

1. Salient features

2. Fundamental Rights and Duties

3 Directive Principles of State Policy

Unit-III Constitutional Institutions

1. Union Government-Executive (President, Prime Minister and Council of Ministers)

- Legislature (Parliament-Loksabha, Rajyasabha)
- Judiciary- Supreme Court and High Court

2. State Government-Executive (Governor, Chief Minister and Council of Ministers)

- Legislature (Legislative Assembly and Legislative Council)

3. Panchayat Raj institutions and Urban local bodies

Unit- IV Federalism

1. Union — State relations(Legislative, Administrative and Financial)
2. Politics of federal governance and Frictions in Federal polity

Unit-V- Political Process

1. Political Parties-National and Regional
2. Pressure groups
3. Civil Society and Popular movements
4. Election Commission of India

Course Outcome:

It facilitates the understanding of various Government of Indian acts their provisions and reforms.lit helps to know the salient features in making of Indian constitution and appreciate the constitutional principles and institutional arrangements and makes them learn about the fundamental rights and duties and the directive principle of state policy. It inculcates skills to evaluate the evolution, functioning and consequences of political parties in India and to identify how electoral rules and procedure in India effect election outcomes.

Reading List:

1. D. D. Basu (2015) Introduction to the Constitution of India, New Delhi: LexisNexis.
2. Peu Gosh(2018) Indian Government and Politics, Delhi, PHI Pvt Ltd
3. Granville Austin (1999), The Indian Constitufiqn Corner Stone of a Nation, NewDelhi: Oxford.
4. P.M.Bakshi (2018),The Constitution of, di-Le ,Delhi

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS
(AUTONOMOUS)

III Year B.Tech. I / II-Sem

L	T	P	C
3	0	0	0

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE (18MC0CS01)
(Common to CSE, IT, ECE, EEE, ME, CE)

PRE-REQUISITES: NIL

COURSE OBJECTIVE:

The course is introduced to familiarize the basic concepts of artificial intelligence, its relevance in the modern era and various applications

SYLLABUS:

UNIT- I

Introduction – What is artificial intelligence, foundations of artificial intelligence, history of artificial intelligence
Intelligent Agents – agents and environments, the structure, good behaviour: the concept of rationality, the nature of environments, the structure of agents, applications of AI.

UNIT - II

Solving Problem by Searching – Problem solving agents, example problems, searching for solutions.
Uninformed Search Strategies – Breadth first search, uniform-cost search, depth first search, depth limited search, iterative deepening search, bidirectional search, comparing uninformed search strategies.

UNIT - III

Logical Agents – Knowledge-based agents, the wumpus world, logic, propositional logic: the very simple logic.
Knowledge Representation – Introduction, approaches to knowledge representation-relational knowledge, knowledge represented as logic, procedural knowledge, knowledge representation using semantic networks, inheritance in semantic net.

UNIT - IV

Expert System & Applications – Introduction, phases in building expert systems-knowledge engineering, knowledge representation, expert systems architecture-knowledgebase, inference engine, knowledge acquisition, expert systems versus traditional systems-characteristics of expert systems, evolution of expert systems, advantages and disadvantages of expert systems, languages for expert system development., applications of expert systems.

UNIT - V

Machine Learning Paradigm – Introduction, machine learning system-components of learning system, rote learning, learning by taking advice.
Supervised & Unsupervised Learning – supervised concept learning, unsupervised concept learning, reinforcement learning.

TEXT BOOKS:

1. Artificial Intelligence-A Modern Approach, 3rd Edition, Stuart J. Russell, Peter Norvig, Pearson Education.
2. Artificial Intelligence, Saroj Kaushik, Cengage Publication

REFERENCE BOOKS:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B. Nair, 3rd Edition, McGraw Hill.
2. Principles of Artificial Intelligence, Nils J. Nilson, Morgan Kaufmann Publishers.
3. Artificial Intelligence, 3rd Edition, Patric Henry Winston, Pearson Education.
4. Artificial Intelligence Illuminated, Ben Coppin, Narosa Publication

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: identify the importance of artificial intelligence
CO 2: apply various search strategies to provide efficient solutions for problem space
CO 3: comprehend various approaches for knowledge representation
CO 4: employ expert systems for knowledge engineering applications
CO 5: develop models using machine learning techniques

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
HYDERABAD

III Year, B. Tech, Civil Engg. II-Sem.

L	T	P	C
3	0	0	3

HYDROLOGY & WATER RESOURCES ENGINEERING (18PC0CE20)

Course Objectives:

This course provides the description of hydrological cycle and derive various formulas used in estimationof different basic components of surface and ground water cycle and its components. It will explain thewater requirement for irrigation and connectivity of hydrology to the field requirement.

Unit - I

Introduction: Concepts of hydrologic cycle, global water budget, applications in Engineering. Sources of data.

Precipitation

Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area: Arithmetic, Theissen's and Isohyetal methods, Missing rainfall data – Estimation, consistency of rainfall records, depth area - duration relationships, maximum intensity/depth – duration -frequency relationship, Probable maximum precipitation (PMP), rainfall data in India.

Unit - II

Abstractions from precipitation

Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney & Criddle methods, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.

Runoff

Components of runoff, factors affecting runoff, basin yield, SCS-CN method of estimating runoff, flow duration curves, mass curve of runoff – analysis.

Unit - III

Hydrographs

Hydrograph – Distribution of runoff – Hydrograph analysis flood hydrograph – Effective rainfall – Base flow- Base flow separation - Direct runoff hydrograph unit pulse and unit step function - Unit hydrograph, definition, limitations and applications of unit hydrograph, derivation of unit hydrograph from direct runoff hydrograph and vice versa - S-hydrograph, Synthetic unit hydrograph.

Unit - IV

Ground water Hydrology

Occurrence, movement and distribution of groundwater, aquifers – types, specific yield, permeability, storage coefficient, transmissibility, Darcy's law. Well hydraulics - Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants.

Crop Water Requirements – Water requirement of crops - Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil - water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

Unit - V

Canal Systems: Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, regime channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals-Types of lining - Advantages and disadvantages. Drainage of irrigated lands- necessity, methods.

Course Outcomes:

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

- Understand the different concepts and terms used in engineering hydrology
- To identify and explain various formulae used in estimation of surface and ground water hydrology components
- Demonstrate their knowledge to connect hydrology to the field requirement

Text Books

1. Hydrology by K. Subramanya (Tata McGraw-Hill)
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers
3. G L Asawa, Irrigation Engineering, Wiley Eastern

Reference Books

1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill)
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications)
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
   Elements of Water Resources Engineering by K. N. Duggal and J. P. Soni (New Age International)

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)
HYDERABAD

III Year, B. Tech, Civil Engg. II-Sem.

L	T	P	C
3	0	0	3

ENVIRONMENTAL ENGINEERING - I (18PC0CE21)

Course Objectives: This subject provides the knowledge of water sources, water treatment, design of distribution system, waste water treatment and safe disposal methods. The topics of characteristics of waste water, sludge digestion are included.

UNIT – I

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

UNIT – II

Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation - flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

UNIT - III

Characteristics of sewage – waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings - traps – one pipe and two pipe systems of plumbing **–** ultimate disposal of sewage – sewage farming – self purification of rivers.

UNIT – IV

Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters – ASP – Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

UNIT – V

Air pollution – classification of air pollution– Effects air pollution – Global effects–Meteorological parameters affecting air pollution – Atmospheric stability – Plume behavior –Control of particulates – Gravity settlers, cyclone filters, ESPs – Control of gaseous pollutants–automobile pollution and control.

Course Outcomes: At the end of the course, the student will be able to:

- Assess characteristics of water and wastewater and their impacts
- Estimate quantities of water and waste water and plan conveyance components

- Design components of water and waste water treatment plants
- Be conversant with issues of air pollution and control

TEXT BOOKS:

1. Environmental Engineering by H.S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) pvt. Ltd, 2014
2. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.
3. Environmental Engineering I and II by B C Punmia, Std. publications.
4. Environmental Engineering I and II by S K Garg, Khanna Publications.
5. Environmental Pollution and Control Engineering C S Rao, Wiley Publications

REFERENCES:

1. Water and Waste Water Technology by Steel, Wiley
2. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
3. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
4. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.Wiley, 2007.
5. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
6. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
   Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. Mc.Graw Hill Publication

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HYDERABAD

III Year, B. Tech, Civil Engg. II-Sem.

L	T	P	C
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FOUNDATION ENGINEERING (18PC0CE22)

Course Objectives: To plan soil exploration programme for civil Engineering projects, to check the stability of slopes, to determine the lateral earth pressures and design retaining walls, to determine the bearing capacity of soil and to design pile group foundation.

UNIT – I

SOIL EXPLORATION: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test– planning of soil exploration programme, Bore logs and preparation of soil investigation report.

UNIT – II

SLOPE STABILITY: Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish slip circle method, method of slices, Bishop's Simplified method of slices – Taylor's stability Number.

UNIT – III

EARTH PRESSURE THEORIES: Active, passive and at rest soil pressures Rankine's theory of earth pressure – Coulomb's earth pressure theory.

RETAINING WALLS: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.

UNIT –IV

SHALLOW FOUNDATIONS - Types - choice of foundation – location and depth - safe bearing capacity – Terzaghi's, and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

UNIT -V

PILE FOUNDATION: Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae – Pile Capacity through SPT results - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction

Outcomes:

At the end of the course the student will able to

- understand the principles and methods of Geotechnical Exploration
- decide the suitability of soils and check the stability of slopes
- calculate lateral earth pressures and check the stability of retaining walls
- analyze and design the shallow and deep foundations

Textbooks:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt. Ltd, New Delhi
2. Principals of Geotechnical Engineering by Braja M.Das, Cengage Learning Publishers.

References:

1. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.
2. Geotechnical Engineering Principles and Practices by Cuduto, PHI Intrernational.
3. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt. Ltd. (1998).
4. Geotechnical Engineering by S. K.Gulhati & Manoj Datta – Tata Mc.Graw Hill Publishing company New Delhi. 2005.

Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, Newyork.

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

III Year, B. Tech, Civil Engg. II-Sem. **L T P C**
3 1 0 4

DESIGN OF STEEL STRUCTURES

The objectives of the course is to

- Explain the mechanical properties of structural steel, plasticity, yield.
- Describe the salient features of limit state method of design of steel structures.
- Identify and explain the codal provisions given in IS. 800.
- Analyze the behavior of steel structures under tension, compression and flexure.
- Design the tension, compression, flexural members and plate girder
- Design the connection in steel structure, build -up member and (bolted and welded).

UNIT – I

Materials – Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behavior of steel. Concepts of limit State Design – Different Limit States – Load combinations for different Limit states - Design Strengths - deflection limits – serviceability – stability check.

Design of Connections– Different types of connections – Bolted connections – Design strength – efficiency of joint– prying action - Welded connections – Types of welded joints – Design requirements - Design of Beam-column connections - Eccentric connections - Type I and Type II connection – Framed connection– stiffened / seated connection.

UNIT – II

Design of tension members –Simple and built up members - Design strength – Design procedure for splicing - lug angle.

Design of compression members – Buckling class – slenderness ratio – Design of simple compression members - laced – battened columns – splice – column base – slab base.

UNIT – III

Plastic Analysis; Plastic moment – Plastic section modulus - Plastic analysis of continuous beams

Design of Flexural Members – Laterally supported Beams – Design of laterally supported beams - Bending and shear strength/buckling – Built-up sections - Beam splice

UNIT – IV

Design of welded plate girders – elements – economical depth – design of main section – connections between web and flange – design of stiffeners - bearing stiffener– intermediate stiffeners – Design of web splice and flange splice.

UNIT – V

Design of Industrial Structures; Types of roof trusses - loads on trusses – wind loads - Purlin design – truss design – Design of welded Gantry girder

Note: Design of structural members include detailed sketches.

Course Outcomes:

After the completion of the course student should be able to

- Analyze the tension and compression members.
- Design the tension members, compression members and column bases and joints and connections
- Analyze and Design the beams including built-up sections and beam and connections.
- Identify and Design the various components of welded plate girder including stiffeners

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HYDERABAD

III Year, B. Tech, Civil Engg. II-Sem.

L	T	P	C
0	0	2	1

ENVIRONMENTAL ENGINEERING LABORATORY (18PC0CE24)

Course Objectives: The objectives of the course are to perform the experiments to determine water and waste water quality, understand the water and waste water sampling, their quality standards. Estimate the quality of water, wastewater and Industrial water.

Practical Work: List of Experiments

1. Determination of p_H
2. Determination of electrical conductivity
3. Determination of total solids (Organic and inorganic)
4. Determination of acidity
5. Determination of alkalinity
6. Determination of hardness (Total, Calcium and Magnesium Hardness)
7. Determination of chlorides
8. Determination of optimum coagulant dosage
9. Determination of dissolved oxygen (Winkler Method)
10. Determination of COD
11. Determination of BOD/DO
12. Determination of Residual Chlorine

Course outcomes:

After completion of the course, student should be able to understand the equipment used to conduct the test. Perform the experiments in the lab to examine and estimate quality of water, wastewater, air and soil quality. Compare the water, air quality standards with prescribed standards set by the local governments. Prepare a report on the quality aspect of the environment.

Text/Reference Books:

1. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.

2. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.

3. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.

4. MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.

5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.

6. Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999.

7. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication

III Year, B. Tech, Civil Engg. II-Sem.

L	T	P	C
0	0	2	1

COMPUTER AIDED DESIGN LAB (18PC0CE25)

Pre-Requisites: Computer Aided Civil Engineering drawing or AUTOCAD principles, excel- structural Engineering - 1 & 2.

Course Objectives: The objectives of the course are to learn the usage of any fundamental software for design to create geometries using pre-processor, analyze and interpret the results using post processor. Design the structural elements

LIST OF EXPERIMENTS

1. Analysis & Design of determinate structures using a software
2. Analysis & Design of fixed & continuous beams using a software
3. Analysis & Design of Plane Frames
4. Analysis & Design of space frames subjected to DL & LL
5. Analysis & Design of residential building subjected to all loads (DL,LL)
6. Analysis & Design of Roof Trusses
7. Design and detailing of built up steel beam
8. Developing a design program for foundation using EXCEL Spread Sheet
9. Detailing of RCC beam and RCC slab
10. Detailing of Steel built up compression member

Course Outcomes

After the completion of the course student should be able to model the geometry of real world structure, represent the physical model of structural element/structure, perform analysis**, i**nterpret from the post processing results and design the structural elements and a system as per IS Codes.

Note: Drafting of all the exercises is carried out using commercially available design software.

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS
(AUTONOMOUS)

B.Tech. III Year I / II Sem

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FUNDAMENTALS OF CYBER SECURITY (18MC0CS02)
(Common to CSE, IT, ECE, EEE, ME, CE)

PRE-REQUISITES: NIL

COURSE OBJECTIVE:
This course is introduced to familiarize the need for cyber security, various threats, counter measures and cyber laws.

SYLLABUS:

UNIT-I

Introduction to Cyber Security: Basic cyber security concepts, motive of attackers, active attacks, passive attacks, cyber crime and information security, computer criminals, classification of cyber crimes: E-Mail spoofing, spamming, cyber defamation, internet time threat, salami attack, data diddling, forgery, web jacking, newsgroup spam, industrial espionage, hacking, online frauds, software piracy, computer sabotage, email bombing, usenet newsgroup as the source of cybercrimes, computer network intrusions, password sniffing, identity theft, cyber threats-cyber warfare, CIA traid.

UNIT-II

Cybercrime: Mobile and Wireless Devices :Introduction, proliferation of mobile and wireless devices, trends in mobility, credit card frauds in mobile and wireless computing era, security challenges posed by mobile devices, authentication service security, attacks on mobile/cell phones. Tools and methods used in cyber crime: phishing, password cracking.

UNIT-III

Cyber Law – The Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, Why do we need cyberlaws: the indian context, the indian IT act.

Cyber Forensics: Introduction, historical background of cyber forensics, digital forensics science, the need for computer forensics, cyber forensics and digital evidence, digital forensics lifecycle, challenges in computer forensics.

UNIT-IV

Cyber Security - Organizational implications: Introduction, cost of cyber crimes and IPR issues, web threats for organizations, security and privacy implications from cloud computing, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes, the psychology, mindset and skills of hackers and other cyber criminals.

UNIT-V

Cyber Crime Examples: Introduction, Real-life Examples: Official website of Maharashtra Government hacked, E-Mail spoofing instances, Indian banks lose millions of rupees, Parliament attack, Pune city police bust Nigerian racket.

Mini-Cases: The Indian case of online gambling, an Indian case of intellectual property crime, illustrations of financial frauds in cyber domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, “Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives”, CRC Press.

REFERENCE BOOKS:

1. James Graham, Richard Howard and Ryan Otson, “Cyber Security Essentials”, CRC Press.
2. Chwan-Hwa(john) Wu, J. David Irwin, “Introduction to Cyber Security”, CRC Press.

COURSE OUTCOMES:

By the end of the course, students will be able to

CO 1: comprehend the basics of cyber security
CO 2: acquire knowledge on security for mobile and wireless devices
CO 3: realize the Indian and Global Act concerning cyber crimes
CO 4: identify the cyber etiquette and correlate to the organization
CO 5: employ security and privacy methods in the development of modern applications

III Year, B. Tech, Civil Engg. II-Sem.

L	T	P	C
3	0	0	3

PROFESSIONAL ELECTIVE II
PRESTRESSED CONCRETE (18PE0CE2A)

Pre-Requisites: Reinforced Concrete Design

Course Objectives

The objectives of the course are to

- Understand the principles & necessity of prestressed concrete structures.
- Know different techniques of prestressing.
- Get the knowledge on various losses of prestress.Understand Analysis and design of prestressed concrete members.

UNIT I:

Introduction: Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC - Classification and types of prestressing – Materials - High strength concrete and high tensile steel their characteristics.

UNIT II:

Methods and Systems of prestressing: Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford - Udall System - Lee McCall system. Losses of prestress: Loss of prestress in pretensioned and posttesnioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.

UNIT III:

Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons - stress diagrams - Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout.

Shear: General Considerations - Principal tension and compression - Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables - Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions**.**

UNIT IV:

Transfer of Prestress in Pretensioned Members : Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by Guyon, Magnel, Zienlinski and Rowe's methods – Anchorage zone reinforcement - IS Provisions

UNIT V

Composite Beams: Different Types - Propped and unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.

Deflections: Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

Course Outcomes

After the completion of the course student should be able to

- Acquire the knowledge of evolution of process of prestressing.
- Acquire the knowledge of various prestressing techniques.
- Develop skills in analysis design of prestressed structural elements as per the IS codal provisions

References:

1. Prestressed concrete by Krishna Raju, Tata Mc. Graw Hill Book – Co. New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi.
4. Prestressed Concrete by N. Rajagopalan Narosa Publishing Hous

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III Year B.Tech. Civil Engg. II – Sem.

L	T	P	C
3	0	0	3

PROFESSIONAL ELECTIVE - II

OPTIMIZATION TECHNIQUES IN STRUCTURAL ENGINEERING (18PE0CE2B)

Pre-Requisites: Mathematics I & II

Course Objectives: To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.

UNIT I

Introduction to Optimization: Introduction - Historical developments - Engineering applications of Optimization - Statement of an Optimization problem - Classification of Optimization problems - Optimization Techniques. Optimization by calculus: Introduction - Unconstrained functions of a single variable - Problems involving simple constraints - Unconstrained functions of several variables - treatment of equality constraints - Extension to multiple equality constraints - Optimization with inequality constraints - The generalized Newton-Raphson method.

UNIT II

Linear Programming: Introduction - Applications of linear programming - standard form of a linear programming problem - Geometry of linear programming problems - Definitions and theorems - Solution of a system of Linear simultaneous equations - Pivotal reduction of a general system of equations - Motivation of the Simplex Method - Simplex Algorithm - Two phases of the simplex method. non-Linear Programming: Introduction - Unimodal Function - Unrestricted search - Exhaustive search - Dichotomous search - Interval Halving method - Fibonacci method - Golden section method - Comparison of elimination methods - Unconstrained optimization techniques - Direct search methods - Random search methods - grid search method - Univariate method - Powell's method - Simplex method - Indirect search methods - Gradient of a function - Steepest descent method - Conjugate gradient - Newton's method.

UNIT III

Dynamic Programming: Introduction - Multistage decision processes - concept of sub-optimization and the principle of optimality - computational procedure in dynamic programming - example illustrating the Calculus method of solution - example illustrating the Tabular of solution - conversion of a final value problem into an initial value problem - continuous dynamic programming - Additional applications.

UNIT IV

Network Analysis: Introduction - Elementary graph theory - Network variables and problem types – Minimum - cost route - Network capacity problems - Modification of the directional sense of the network.

UNIT V

Application of Optimization techniques to trusses, Beams and Frames.

Course Outcomes: The student will be able to understand the basic principles of optimization, and in a position to formulate optimization models for a wide range of civil engineering problems and able to solve them.

TEXT BOOKS:

1. Introduction to Optimum Design by J. S. Arora. McGraw Hill New York
2. Optimization: Theory and Applications by S. S. Rao. Wiley & Sons

REFERENCES:

1. Numerical Optimization Techniques for Engineering Design with applications by G. N. Vanderplaats McGraw-Hill, New York
2. Elements of Structural Optimization by R. T. Haftka and Z. Gurdal. Kluwer Academic Publishers, Dordrecht, 1992
3. Optimum Structural Design by U. Kirsch. McGraw-Hill, New York
4. Optimum Design of Structures by K. I. Majid. Wiley, New York

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III Year B.Tech. Civil Engg. II – Sem.

L	T	P	C
3	0	0	3

PROFESSIONAL ELECTIVE - II

INTRODUCTION TO COMPOSITE MATERIALS (18PE0CE2C)

Pre-Requisites: Design of Reinforced Concrete Structures

Course Objectives

The objectives of the course are to

- To Study the properties of Composite Laminate and its macro mechanical analysis
- To study the behavior of glass fibre reinforced laminates.
- To design GRP box beams and stressed skinned roof structures.

UNIT-1

Introduction: Requirements of structural materials, influence of nature of materials in structural form, Nature of structural materials - Homogeneous materials, composite materials.

UNIT-II

Macro mechanical Properties of composite Laminae: Introduction, Assumptions and Idealizations, Stress Strain relationships for composite Laminae- Isotropic, Orthotropic laminae, Strength Characteristics- Basic concepts, Strength hypothesis for isotropic and Orthotropic laminae. Macro mechanical Analysis of composite Laminae: Introduction, Assumptions and Limitations, Stiffness characteristics of glass reinforced laminae- Stress- Strain relationships in continuous, discontinuous fibre laminae, Strength characteristics of glass reinforced laminae- Strengths in continuous, discontinuous fibre laminae.

UNIT-III

Behaviour of Glass Fibre - Reinforced laminates: Introduction, Stiffness characteristics of Laminated composites - Behaviour of Laminated beams and plates, Strength characteristics of Laminated composites - Strength analysis and failure criteria, Effect of inter laminar structures. Glass Reinforced Composites: Introduction, Continuously reinforced laminates - uni-directionally and multi directionally continuously reinforced laminates, discontinuously reinforced laminates – Stiffness and Strength properties.

UNIT-IV

GRP properties relevant to structural Design: Introduction, Short-term strength and stiffness-Tensile, Compressive, Flexural and Shearing. Long term strength and stiffness properties, Temperature effects, Effect of fire, Structural joints- Adhesive, mechanical, Combinational, Transformed sections.

UNIT-V

Design of GRP Box Beams: Introduction, loading, span and cross-sectional shape, Selection of material, Beam manufacture, Beam stresses, Experimental Behaviour, Effect on Beam performance - Modulus of Elasticity, Compressive Strength, I value, prevention of compression buckling failure, Behaviour under long term loading.

Design of Stressed skinned roof structure: Introduction, loading and material properties, preliminary design, and computer analysis.

Course Outcomes

After the completion of the course the student will be able to

- Acquire the knowledge about the composite laminae, glass fibre reinforced laminae and their strength characteristics
- Develop skills in design of GRP box beams & Stressed skinned roof structure.

Text Books:

1. GRP in Structural Engineering M.Holmes and D.J.Just.
2. Mechanics of Composite materials and Structures by Madhujith Mukhopadhyay; Universities Press

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III Year B.Tech. Civil Engg. II – Sem.

L	T	P	C
3	0	0	3

OPEN ELECTIVE - II

REMOTE SENSING AND GIS APPLICATIONS (18OE0CE2A)

Course Objectives:

The objectives of the course are to

- Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digital images
- know the concept of Geographical Information System (GIS), coordinate system GIS Data and its types
- Understand the students managing the spatial Data Using GIS.
- Understand Implementation of GIS interface for practical usage.

UNIT – I

Concepts of Remote Sensing Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

UNIT- II:

Introduction to GIS: Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co-ordinate systems, Map projections, Map transformation, Geo-referencing.

UNIT- III:

Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization. **Data models and data structures:** Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata

UNIT- IV:

Spatial Data input and Editing: Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS.

Spatial Analysis: Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques

UNIT- V: Implementing a GIS and Applications

Implementing a GIS: Awareness, developing system requirements, evaluation of alternative systems,

decision-making using GIS. **Applications of GIS:** GIS based road network planning, Mineral mapping using GIS, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications.

Course Outcomes

After the completion of the course student should be able to

- **Describe** different concepts and terms used in Remote Sensing and its data
- Understand the Data conversion and Process in different coordinate systems of GIS interface
- **Evaluate** the accuracy of Data and implementing a GIS
- **Understand the applicability of** RS and GIS for various applications.

TEXT BOOKS

1. Remote Sensing and GIS by Basudeb Bhatta , Oxford University Press, 2nd Edition, 2011.
2. Introduction to Geographic Information systems by Kang-tsung Chang, McGrawHill Education (Indian Edition), 7th Edition, 2015.
3. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, Wiley Publishers, 2012.

REFERENCES

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W.Kiefer, Wiley Publishers, 7th Edition, 2015.
2. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3rd Edition, 2010.
3. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R.Sathi Kumar, N. Madhu, Pearson Education, 1st Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M.Anji Reddy