

## B. Tech Civil Engineering(R21)

### III Year I Semester

S.No	CourseCode	Course Title	Category	L	T	P	C
1.	21CE3111	Design of Reinforced Concrete Structures	PC	3	1	-	4
2.	21CE3112	Water Resource Engineering	PC	3	-	-	3
3.	21CE3113	Soil Mechanics	PC	3	-	-	3
4.	<b>Open Elective-I</b>		OE	3	-	-	3
5.	<b>Professional Elective-I</b>		PE	3	-	-	3
	21CE3171	Sustainable Construction Technology					
	21CE3172	Advanced Structural Analysis					
	21CE3173	Environmental Impact Assessment					
	21CE3174	Air Pollution and Control					
6.	21CE3151	Soil Mechanics Lab	PC	-	-	3	1.5
7.	21CE3152	Building Information Modelling Lab	PC	-	-	2	1
8.	21MC0005	Indian Constitution	MC	3	-	-	0
9.	21MC0006	Aptitude and Logical Reasoning	MC	3	-	-	0
10.	21CE3181	Summer Internship	PW	-	-	-	1
<b>Total</b>				<b>18</b>	<b>1</b>	<b>7</b>	<b>19.5</b>

### III Year II Semester

S.No	CourseCode	Course Title	Category	L	T	P	C
1.	21CE3211	Transportation Engineering	PC	3	-	-	3
2.	21CE3212	Design of Steel Structures	PC	3	1	-	4
3.	21CE3213	Environmental Engineering	PC	3	-	-	3
4.	<b>Open Elective-II</b>		OE	3	-	-	3
5.	<b>Professional Elective-II</b>		PE	3	-	-	3
	21CS3271	Applications of Machine Learning					
	21CE3272	Advanced Structural Design					
	21CE3273	Foundation Engineering					
	21CE3274	Geo-Environmental Engineering					
6.	21CE3251	Transportation Engineering Lab	PC	-	-	3	1.5
7.	21CE3252	Computer Aided Structural Design Lab	PC	-	-	3	1.5
8.	21HS3253	Advanced English Communication Skills Lab	S	-	-	2	1.0
9.	21MC0007	Yoga and Indian Philosophy	MC	3	-	-	-
<b>Total</b>				<b>18</b>	<b>1</b>	<b>10</b>	<b>20</b>

## 21CE3111: DESIGN OF REINFORCED CONCRETE STRUCTURES

**B.Tech. III Year I Sem**

**Pre-requisite:** SOM, SA & CT

	L	T	P	C
<b>Course Objectives:</b> The objectives of the course are to	3	1	-	4

- Acquire knowledge about various design philosophies theory and application of analysis and design of reinforced concrete structures.
- Evaluate the behaviour of RC member under flexure, Shear, torsion and bond.
- Understand various slabs design by using codal Provisions given in IS 456:2000.
- Understand the behaviour of RC member under compression loading, design suitable columns sections.
- Understand the types of footings, design different sections of footings.

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

- Design the singly reinforced, doubly reinforced and flanged sections under flexure.
- Design the singly reinforced, doubly reinforced and flanged sections under Shear, torsion and bond.
- Distinguish and Design the one-way, two-way slabs and Dog legged staircase.
- Design the axially loaded, uniaxial and biaxial bending columns.
- Classify the footings and Design the isolated square, rectangular and circular footings.

### UNIT – I

Design philosophies-Working Stress Method (WSM), Ultimate Load Method (ULM), and Limit State Method (LSM) – Material - Stress- Strain Curves – Safety factors – Characteristic values. Stress Block parameters – IS 456:2000 codal provisions.

Limit state analysis and design of singly reinforced, doubly reinforced, Flanged sections- Tand L beam sections.

### UNIT – II

Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length along with I.S. code provisions. Limit state of serviceability for deflection and cracking.

Design of cantilever, simply supported and continuous beams with detailing.

### UNIT – III

Design of one-way slab, Two-ways slabs and continuous slab Using IS Coefficients, Design of dog legged staircase.

### UNIT – IV

Design of axially loaded Short rectangular and circular columns, Design of columns under uni- axial bending and bi-axial bending using SP-16 charts.

## **UNIT - V**

Different types of footings, design loads for foundation, Design of isolated-Square, rectangular and circular footings.

### **TEXT BOOKS:**

1. Reinforced concrete design by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill, New Delhi.
2. Reinforced Concrete Design: Principles and Practice N. Krishna Raju and R.N. Pranesh. New age International Publishers, New Delhi, 4th Edition, 2018.
3. Limit state design of reinforced concrete – P. C. Varghese, Prentice Hall of India, New Delhi.

### **REFERENCES:**

1. Reinforced concrete design by N. Subrahmanian Oxford University Press.
2. B.C. Punmia, Ashok Kumar Jain and Arun Kumar — Reinforced concrete structures, Vol.1, Laxmi publications Pvt. Ltd., 3rd Edition, 2011.
3. P. Purushotham — Reinforced concrete structural elements—behaviour, Analysis and design, Tata Mc. Graw-Hill, 3rd Edition, 2014.
4. Design of Reinforced Concrete Structures by I. C. Syal and A. K. Goel, S. Chand & company.
5. Fundamentals of reinforced concrete by N.C. Sinha and S.K Roy, S. Chand publishers
6. Design of concrete structures – Arthur H. Nilson, David Darwin, and Charles W. Dolar, Tata McGraw-Hill, 3rd Edition, 2005
7. M.L. Gambhir — Fundamentals of Reinforced concrete design, Prentice Hall of India Private Ltd., New Delhi, 3rd Edition, 2006.

### **CODE BOOKS**

1. IS 456 : 2000 Plain and Reinforced Concrete-Code of Practice
2. SP-16 Design Aids for Reinforced Concrete

## 21CE3112: WATER RESOURCE ENGINEERING

**B.Tech. III Year I Sem**

**L T P C**

**Pre-requisite:** FM & HHM

**3 - - 3**

**Course Objectives:** To introduce

- Various abstractions and components of hydrological cycle
- Different Runoff estimation methods
- Occurrence and Movement of Ground water
- Duty and Delta requirements for irrigation
- The various theories involved in designing the canal and canal discharge

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

- Explain the various meteorological parameters
- Estimate the runoff by using different hydrographs
- Compute the yields of surface and sub-surface flow in soil
- Implement the various methods on irrigation
- Compute the discharge and flood frequency of a canal

### **UNIT - I**

Introduction to engineering hydrology and its applications, Hydrologic cycle, types and forms of precipitation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data - Adjustment of record - Rainfall Double Mass Curve. Runoff-Factors affecting Runoff - Runoff over a Catchment - Empirical and Rational Formulae.

Abstraction from rainfall-evaporation, factors affecting evaporation, measurement of evaporation-Evapotranspiration- Penman and Blaney & Criddle Methods - Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

### **UNIT - II**

Distribution of Runoff - Hydrograph Analysis Flood Hydrography - Effective Rainfall - Base Flow - Base Flow Separation - Direct Runoff Hydrograph - Unit Hydrograph, definition, and limitations of applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

### **UNIT - III**

Ground water Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers. Types of well's, Well Construction - Well Development.

### **UNIT - IV**

Necessity and Importance of Irrigation, advantages and ill effects of irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility - Crop Rotation, preparation of land for Irrigation, standards of quality for Irrigation water.

Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Duty and delta, factors affecting duty- Design discharge for a water course. Depth and frequency of Irrigation, irrigation efficiencies-Water Logging.

## **UNIT - V**

Classification of canals, Design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standard for a canal design canal lining.

Design Discharge over a catchment, Computation of design discharge rational formula, SCS curve number method, flood frequency analysis- Introductory Part Only. Stream Gauging - measurement and estimation of stream flow.

### **TEXT BOOKS:**

1. Engineering hydrology by Jayram Reddy, Laxmi publications pvt. Ltd., New Delhi.
2. Irrigation and water power engineering by Punmia & Lal, Laxmi publications pvt. Ltd., New Delhi.

### **REFERENCES:**

1. Elementary hydrology by V. P. Singh, PHI publications.
2. Irrigation and Water Resources & Water Power by P. N. Modi, Standard Book House.
3. Water Resources Engineering - I by Dr. G. Venkata Ramana, Academic Publishing Company.
4. Irrigation Water Management by D. K. Manjundar, Printice Hall of India.
5. Irrigation and Hydraulic structures by S. K. Grag.
6. Applied hydrology by Ven Te Chow, David R. Maidment larry W. Mays Tata Mc. Graw Hill.
7. Introduction to hydrology by Warren Viessvann, Jr, Garyl. Lewis, PHI.

## 21CE3113: SOIL MECHANICS

B.Tech. III Year I Sem

L T P C

Course Objectives: To

3 - - 3

- Understand the formation of soil and Index properties of soils.
- Determine the flow characteristics & effective stresses of soils.
- Determine the stresses and compaction characteristics in soil due to externally applied loads.
- Estimate the consolidation properties of soils.
- Estimate the shear strength property of soils.

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

- Characterize and classify the soils.
- Estimate seepage, effective stress, flow net characteristics of soil.
- Estimate stresses and compaction characteristics under various loading conditions.
- Analyze the compressibility characteristics of the soils.
- Analyze the shear strength of soil under various drainage conditions.

### UNIT – I

**Introduction:** Soil formation and structure – moisture content, Three-phase system, volumetric relationships, Volume-mass-weight relationship – Specific Gravity - Field density by core cutter and sand replacement methods - Relative density.

**Index Properties of Soils:** Grain size analysis – consistency limits and indices – Unified and 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 – one dimensional flow, two - dimensional flow, Flownets: Characteristics and Uses, uplift pressure, piping.

### 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, contact pressure.

**Compaction:** Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties- laboratory methods – standard proctor test, modified proctor test - field methods - proctor needle test, Types of Field compaction Equipment – compaction quality control for road works - embankments, subgrade.

### UNIT – IV

**Consolidation:** Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation -Spring analogy, stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil – pre consolidation 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 envelopes – Shear strength of sands, effective and total shear strength parameters, Stress-Strain characteristics of clays and sand; Stress paths - dilatancy – critical void ratio.

Introduction to foundations

### **TEXTBOOKS:**

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt Ltd (2007).
2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors (2018).
3. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers, 8th edition (2015).

### **REFERENCES:**

1. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi (2007).
2. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).
3. Soil Mechanics and Foundation by by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi, 16<sup>th</sup> Edition.

## 21CE3171: SUSTAINABLE CONSTRUCTION TECHNOLOGY

### (Professional Elective-I)

#### B.Tech. III Year I Sem

Pre-requisite: BMCP

L T P C

Course objectives: To

3 - - 3

- Describe the housing strategies for the urban poor
- Identify the various technology and their applications in sustainable Housing
- Introduce low-cost housing infrastructure services
- Describe different sustainable alternative materials for construction
- Describe construction in disaster prone areas

**Course outcomes:** After completion of the course, the student should be able to

- Decide the type of schemes for housing the urban poor
- Develop the suitable sustainable construction techniques in Housing.
- Apply knowledge of innovative cost-effective construction techniques
- Describe different sustainable alternative materials for construction of low-cost Infrastructure services
- Decide the type of construction in disaster prone areas for different engineering structures

#### UNIT – I

**Alternative Building Materials for Sustainable Construction:** Introduction- Substitute for scarce materials- Ferro-cement- Gypsum boards- Timber substitutions- Industrial wastes- Agricultural wastes – cement-soil blocks for masonry – stabilized mud construction.

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

#### UNIT – II

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

#### UNIT – III

**Low-Cost Infrastructure Services:** Introducing- Present status- Technological options- Low cost sanitation's- Domestic wall- Water supply- energy.

#### UNIT – IV

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



## **UNIT – V**

**Construction in Disaster Prone Areas:** Introduction to disasters and their effects on building and infrastructures- Damages to houses- Traditional Housing in disaster prone areas- Type of Damages of non-engineered and Engineered buildings- Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions

### **TEXTBOOKS:**

1. Modern Trends in Housing in Developing Countries by A.G.Madhava Rao, D.S.Ramachandra Murthy & G.Annamalai
2. Properties of Concrete by A.M.Neville, Pearson Publishing Limited, London

### **REFERENCES:**

1. Building Materials for Low–Income Houses, International Council for Building Research Studies and Documentation.
2. Handbook of Low-Cost Housing by A.K.Lal, New Age International Publishers.
3. Light Weight Concrete by Academic kiado,Rudhai G.,Publishing Home of Hungarian Academy of Sciences, 1963.
4. Low-Cost Housing by G.C.Mathur

## 21CE3172: ADVANCED STRUCTURAL ANALYSIS

### (Professional Elective-I)

B.Tech. III Year I Sem

Pre-requisite: SOM & SA

L T P C

Course Objectives:

3 - - 3

- To understand the classical methods of analysis for statically indeterminate structures.
- To understand the analysis of continuous beam by kani's method.
- To differentiate the approximate and numerical methods of analysis for indeterminate structures.
- To differentiate the matrix methods of analysis.
- To analyze the frame using stiffness method.

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

- Solve statically indeterminate beams and portal frames using classical methods
- Analyze two hinged arches and cables
- Analyze the beams and frames by approximate and numerical methods of analysis.
- Analyze the beams by Matrix methods.
- Analyze the frames and beams using displacement methods.

#### UNIT-I

**Slope Deflection Method:** Analysis of single bay single story portal frames with and without side sway- Analysis of inclined frames – Shear force and bending moment diagrams, Elastic Curve.

**Moment Distribution Method:** Analysis of single bay single story portal frames with and without side sway-analysis of inclined frames- shear force and bending moment diagrams.

#### UNIT-II

Analysis of Two hinged arches and cables.

#### UNIT-III

**Approximate Methods of analysis:** Introduction – analysis of multi storey frames for lateral loads. Portal method, cantilever method – analysis of multi storey frames for gravity loads- substitute frame method.

**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.

#### UNIT-IV

**Introduction to Matrix Methods of Analysis:** Introduction to Flexibility and stiffness matrix methods of analysis using system approach upto three degree of indeterminacy – Analysis of continuous beam including settlement of supportss using flexibility and stiffness Methods.

#### UNIT-V

Stiffness method of analysis of pin-jointed determinate plane frames using stiffness Methods – Analysis of single bay single storey portal frames with and without side sway using stiffness method – shear force and bending moment diagrams – Elastic Curve.

**TEXT BOOKS :**

1. Structural Analysis vol I &II by G.S Pandit S.P. Gupta Tata McGraw Hill Education Pvt.ltd.third Edition.
2. Advanced Structural Analysis by Ashok k.Jain ,Nem Chand brothers 2<sup>nd</sup> Edition.

**REFERENCES:**

1. Basic Structural Analysis by C S Reddy, Tata Mc-Grawhill
2. Structural Analysis Vol -I &II by vazarani and rathwani , Khanna Publishers.
3. Structural Analysis by S.S Bhavikatti, Vikas Publications.

## 21CE3173: ENVIRONMENTAL IMPACT ASSESSMENT

### (Professional Elective-I)

B.Tech. III Year I Sem

L T P C

#### Course Objectives: To

3 - - 3

- Understand the basic terminologies of EIA and methodologies of EIA.
- Understand the assessment of deforestation and its impact predictions.
- Explain assessment of soil quality and its impact prediction.
- Understand environment Audits and its methods.
- Understand various Acts and case studies.

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

- Discuss the objectives of EIA studies and identify the methodologies to prepare EIA.
- Identify and incorporate mitigation measures of deforestation.
- Identify and incorporate mitigation measures of soil quality.
- Execute Audit report.
- Apply various environmental acts in the preparation of case study reports.

#### UNIT – I

Basic concept of EIA: Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A method, Ad-hoc method, matrix method, Network method and overlay method.

#### UNIT- II

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

#### UNIT- III

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures.

#### UNIT – IV

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

#### UNIT – V

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries-Water resource projects, sewage treatments plant, municipal solid waste processing plant, thermal plant and airport.

#### TEXT BOOKS:

1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications

#### REFERENCES:

1. Environmental Pollution by R.K. Khitoliya S. Chand, 2014.
2. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers
3. Suresh K. Dhaneja - Environmental Science and Engineering, S.K. Kataria & Sons Publication. New Delhi.
4. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.
5. Wathern, P. – Environmental Impact Assessment: Theory & Practice, Publishers- Rutledge, London, 1992.

## 21CE3174: AIR POLLUTION AND CONTROL

### (Professional Elective-I)

#### B.Tech. III Year I Sem

L	T	P	C
3	-	-	3

#### Course Objectives:

- To impart the knowledge on sources and pollutants that are responsible for air pollution
- To understand the effects of air pollution on human and environments.
- To pursue knowledge of plume behaviour and meteorology conditions.
- To learn various control techniques to measure and reduce particulate matter
- To learn various control techniques to measure and reduce gaseous emissions various standards and management techniques to control air pollution.

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

- Identify various sources and pollutants that effect human and environment through air pollution
- Explain various effects of air pollution on Humans, material and vegetation with the help of case studies.
- Classify various methods for control of air pollution
- Suggest suitable method for removing particulate matter.
- Suggest suitable method for controlling gaseous emissions and to monitor air pollution.

#### UNIT -I

Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non-Point, Line and Areal Sources of air pollution-stationary and mobile sources.

#### UNIT – II

Effects of Air pollutants on man, material and vegetation; Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.- Case studies on effects of Air pollution.

#### UNIT - III

Thermo dynamics and Kinetics of Air-pollution – Applications in the removal of gases like SO<sub>x</sub>; NO<sub>x</sub>; CO; HC etc., air-fuel ratio. Computation and Control of products of combustion. Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity; Influence of Meteorological phenomena on Air Quality wind rose diagrams.

#### UNIT – IV

Lapse Rates, Pressure Systems, Winds and moisture plume behavior and plume Rise Models; Gaussian Model for Plume Dispersion. Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control. Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electro static precipitators.

## **UNIT-V**

General Methods of Control of Nox and SOx emissions–In-plant Control Measures, process changes, dry and wet methods of removal and recycling. Air Quality Management– Monitoring of SPM, SOx; NOx and CO Emission Standards.

### **TEXT BOOKS:**

1. Air pollution By M. N. Rao and H. V. N. Rao – Tata McGraw Hill Company.
2. Air pollution by Wark and Warner.- Harper & Row, New York.

### **REFERENCE:**

1. Air pollution and control By K.V.S.G.Murali Krishna, Kaushal Publishers. Kakinada

## 21CE3151: SOIL MECHANICS LAB

**B.Tech. III Year I Sem**

**Pre-requisite:**

L	T	P	C
-	-	3	1.5

**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, and shrinkage limit)
  - a) Field density by core cutter method and
  - b) Field density by sand replacement method
2. Grain size distribution
3. Specific gravity and Differential free swell index (DFSI) test
4. Permeability of soil by constant and variable head test methods
5. Standard Proctor's Compaction Test
6. Determination of Coefficient of consolidation
7. Unconfined compression test
8. Direct shear test
9. Vane shear test
10. Tri-axial compression test

### REFERENCES:

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International
2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.

## 21CE3152: BUILDING INFORMATION MODELING LAB

**B.Tech. III Year I Sem**

**L T P C**

**Pre-requisite:** AUTOCAD

**- - 2 1**

### **Course Objectives:**

- To create Building Information Modelling solutions for architecture
- To accomplish Building Information Modelling concepts using required architectural software tools

### **Course Outcomes:**

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

- Develop high quality, more accurate architectural designs.
- Visualize the components of building with understanding of levels in BIM
- Use tools specially built to support Building Information Modelling workflows
- Learn to capture analyze concepts and maintains vision through design, documentation and construction
- Develop designs for exterior and interior view of a building

### **EXPERIMENTS:**

1. Modelling of building components in Revit
2. Working with Design of walls
3. Placing and modifying building components
4. Taking out schedule of quantities
5. Working on landscapes
6. Rendering and walkthrough
7. Importing and exporting files
8. Hands on Model based scheduling

### **REFERENCE:**

1. Autodesk Revit 2022 Architecture fundamentals by ASCENT



## **21MC0005: INDIAN CONSTITUTION**

**B. Tech. III Year I Sem**

**L T P C**

**3 0 0 0**

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments.

The Constitution of India reflects the idea of "Constitutionalism" –a modern and progressive concept historically developed by the thinkers of "liberalism" –an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950.

The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

### **COURSE CONTENT:**

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status

6. The Directive Principles of State Policy –Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India –The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government –Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

## 21MC0006: APTITUDE AND LOGICAL REASONING

**B.Tech. III Year I Sem**

**L T P C**

**Course Objectives:**

**3 - 0 0**

- Student learns the techniques to solve all the problems in his real life.
- It can improve the numerical ability.
- The quicker methods are useful to solve the problems within the time and it is helpful in his duties.
- Quantative Aptitude helps in solving the practical life problems.
- Students can use Quantitative Aptitude in everyday life to figure out mathematically.
- Student can improve his mental capacity.
- It helps in sharpening their minds.

### **UNIT- I**

Number System, Percentages, Profit and Loss, Simple Interest - Compound Interest, Partnership Ratio and Proportion, Chain Rule, Time and Work - Pipes and Cistern, Time And Distance - Problems On Trains, Boats And Streams, Races And Games Of Skill

### **UNIT- II**

Average, Alligation And Mixture, Permutation-Combination, Probability, Geometry (Co-Ordinate, Solid-2d Areas & 3d Volumes), D I (Tabulation, Bar Graphs, Pie Charts & Line Graphs), Elementary Statistics

### **UNIT- III**

Series Completion, Analogy, Classification / Odd One Out, Coding – Decoding, Blood Relations, Deciphering Jumbled up Descriptions,

### **UNIT- IV**

Relation Puzzle, Direction sense test, Number, Ranking & Time Sequence Test, Puzzle Test, Seating Arrangements Comparison Type Questions, Sequential Order of Things, Selection Based on gave conditions,

### **UNIT- V**

Family – Based Puzzles, Jumbled Problems. Logical Venn Diagrams, Alpha Numeric Sequence Puzzle, Cubes, Dice, Clocks, Calendar, Data Sufficiency, Syllogism.

### **TEXT BOOKS:**

1. Quantitative Aptitude by R.S.Agarwal
2. Quantitative Aptitude by Abhijit Guha
3. Quantitative Aptitude for Competative Examinations, U.Mohan Rao, Scitech Publication.

**21CE3181: SUMMER INTERNSHIP**

**B.Tech III Year I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>

## 21CE3211: TRANSPORTATION ENGINEERING

B.Tech. III Year II Sem

Pre-requisite: Surveying

L	T	P	C
3	-	-	3

Course Objectives: To learn

- A comprehensive insight of various geometrical design, horizontal and vertical alignment of Highways
- The tests to be conducted on soil, aggregates, bitumen and modified binders for characterization of different materials needed for highway construction along with bitumen concrete mix design and advanced concretes for road application
- The various types of pavements, analysis and design of flexible & rigid pavement as per IRC code specifications and also overlay designs
- The various traffic engineering studies, design of traffic signal & road intersection and possible solutions to the traffic related issues

Course outcomes: After completion of the course, the student must be able to

- Describe the various elements of a highway.
- Develop Geometric Design for highways.
- Judge the suitability of the highway materials
- Design flexible and rigid pavements.
- Describe traffic characteristics and signal systems.

### UNIT-I

**Highway Alignment :** Classification of Urban and Rural roads, Requirements of Ideal Alignment, Factors Controlling Highway Alignment, Engineering Surveys for Alignment - Conventional Methods, Highway Cross Sectional Elements - Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards], Cross sections of different Class of Roads.

### UNIT-II

**Highway Geometric Design:** Design of Horizontal Alignments –Sight Distances – Factors affecting Sight Distances, PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination of Sight Distance [Derivations and Problems in SSD and OSD], Super elevation, Design Speed, Radius of horizontal curve, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves, Geometric Design of Hill Roads [IRC Standards Only]

### UNIT-III

**Highway Materials and Construction Practice:** Desirable Properties and Testing of Highway Materials: - (Tests have to be demonstrated in Highway Engineering Laboratory) Soil - California Bearing Ratio Test, Field Density Test, Aggregate - Crushing, Abrasion, Impact Tests, Water absorption, Flakiness and Elongation indices. Bitumen - Penetration, Ductility, Viscosity, Binder content and Softening point Tests.

Construction Practice – Subgrade, Granular Sub Base, Wet Mix Macadam, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications] Highway Drainage [IRC Recommendations]

#### **UNIT- IV**

**Pavement Design:** Introduction to Pavement Design:Types of pavements and their typical cross-sections: flexible, rigid and composite; Flexible Pavement analysis and design: Introduction to multilayered 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 58-2002 method of rigid pavement design; Overlay :Types of overlays on flexible and rigid pavements.

#### **UNIT-V**

**Traffic Engineering:** Traffic Characteristics, Traffic Studies – Volume study, Speed studies-spot speed, speed and delay, OD studies, Traffic flow characteristics on flow, Capacity studies-PCU, Fundamental relationships Control devices- Traffic Signs and signals (Webster’s method), Intersection, At Grade, Channelized, Rotary Intersection.

#### **TEXTBOOKS:**

1. Khanna,S.K,Justo,AandVeeraragavan,A,‘HighwayEngineering’,NemChand&Bros.Revised Tenth Edition, 2015
2. Kadiyali L.R. and Lal N B, Principles and Practices of Highway Engineering; SeventhEdition,First Reprint; KhannaPublishers, NewDelhi,2018

#### **REFERENCES:**

1. Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, ThirdEdition,ThirdImpression; PearsonEducation, 2018.
2. Khisty C J and Lall B Kent; Transportation Engineering: An Introduction, ThirdEdition, 1st Indian Adaptation; Pearson India Education Service Pvt. Ltd, New Delhi2017.
3. C Venkatramaih, Transportation Engineering Volume 1 – Highway Engineering, 1stEdition,Universities Press, 2016
4. Nicholas J Garber and Lester A Hoel, Traffic and Highway Engineering, 5th Edition,CengageLearning IndiaPrivateLimited, NewDelhi, 5thIndian Reprint,2015.
5. SubhashCSaxena,TextBookofHighwayandTrafficEngineering;FirstEdition;CBSPublishersand Distributors. New Delhi, 2014

#### **Codal Provisions:** DesignCodes:

1. IRC37-2018 Guidelines for the design of flexible pavements
2. IRC 58 – 2015 Guidelines for the design of plain jointed pavements for highways
3. IRC81-1997 Guidelines for Strengthening of flexible road pavements usingBenkelman beam deflection technique

## 21CE3212: DESIGN OF STEEL STRUCTURES

**B.Tech. III Year II Sem**

**L T P C**

**Pre-requisite: SOM & SA**

**3 1 - 4**

### **Course Objectives:**

- To impart the knowledge of mechanical properties, loads and load combinations, design philosophies and design of general and eccentric connections in steel structures.
- To comprehend design of tension members and compression members of steel structures.
- To perceive knowledge on design of flexural members of steel structures.
- To apprehend the knowledge on design of plate girders
- To acquire knowledge on design of roof trusses, purlins and gantry girders.

**Course Outcomes:** After completion of the course, the student must be able to

- Understand material behaviour, recognize various design philosophies in Steel structures and use limit state concepts to design general and eccentric connections in steel structures.
- Use limit state method to design tension members, compression members with battened and laced column and base plates.
- Use limit state method to design beams in steel structures.
- Use limit state method to design the various components of welded plate girder including end and bearing stiffeners.
- Use limit state method to design the industrial structures and welded gantry girder.

### **UNIT- I**

**Materials** – Types of structural steel –chemical and mechanical properties of steel , fire and fatigue behaviour 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 – Framedconnection– 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 and unsupported Beams – Design of laterally supported beams - Bending and shear strength/buckling – I section with plates- 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**

**Steel Structural Systems-** Various steel structural systems -Types of roof trusses - Loads on trusses – Wind loads - Purlin design –Truss design.

#### **TEXT BOOKS:**

1. Design of Steel Structures, Subramanian N, Oxford University Press, New Delhi 2008.
2. Design of Steel Structures, Dayaratnam P, S. Chand & Co., New Delhi, 2003.

#### **REFERENCES:**

1. Limit state Design of steel structures, S.K. Duggal, Tata McGrawhill
2. Design of Steel Structures, Arya, A.S and Ajmani, A.L., Nemchand and brothers, Roorkee, 1992..
3. Comprehensive Design of Steel Structures, Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain. Laxmi Publications Pvt. Ltd., New Delhi 2000.
4. IS 800-2007, Code of practice for general construction in steel, Bureau of Indian Standards, New Delhi.



## 21CE3213: ENVIRONMENTAL ENGINEERING

### B.Tech. III Year II Sem

L T P C

**Course Objectives:** To impart

3 - - 3

- The knowledge on various water supply schemes and forecasting methods of population
- The knowledge on various water treatment units
- The knowledge on various distribution system and waste water characteristics
- The knowledge on treatment units and stages in wastewater treatment plant
- The Knowledge and necessity of various treatment methods and disposal methods of wastewater

**Course Outcomes:** At the end of the course the students will be able

- Explain the water supply schemes and Forecasting methods
- Apply the design considerations for water treatment plant units
- Demonstrate the different sewer appurtenances and suitable disposal systems
- Operate the different stages involved in wastewater treatment.
- Apply the treatment and disposal methods of wastewater

#### UNIT- I

Introduction: water supply schemes, protected water supply, population forecast, design period, water demand, Types of demand, factors affecting, fluctuations, fire demand, sources of water, intakes, infiltration galleries, confined and unconfined aquifers, water quality parameters & testing, drinking water standards.

#### UNIT - II

Layout and general outline of water treatment units, sedimentation, uniform settling velocity, principles, design factors, surface loading, Jar test, optimum dosage of coagulant, coagulation, flocculation clarifier design, coagulants, feeding arrangements.

Filtration, theory, working of slow & rapid gravity filters, multi media filters, design of filters, troubles in operation, comparison of filters, disinfection types of disinfection, theory of chlorination, chlorine demand, other disinfection treatment methods.

#### UNIT-III

Distribution systems, types of layouts of distribution systems, design of distribution systems, Hardy cross and equivalent pipe methods, service reservoirs, Conservancy and water carriage systems, sewage and storm water estimation, time of concentration, Storm water overflows combined flow, characteristics of sewage, examination of sewage, B.O.D., C.O.D. equations. Design of sewers, shapes and materials, sewer appurtenances, manholes, inverted siphon, catch basins, flushing tanks, ejectors, pumps and pump houses, house drainage, components requirements, sanitary fittings, traps, one pipe and two pipe systems of plumbing.

#### UNIT - IV

Layout and general outline of various units in a waste water treatment plant, primary treatment design of screens, grit chambers, skimming tanks, sedimentation tanks, principles and design of biological treatment, trickling filters, standard and high rate., ASP, ASP modification, aeration.

## **UNIT -V**

Construction and design of oxidation ponds, oxidation ditches. sludge treatment Sludge digestion tanks, design of Digestion tank, factors affecting sludge digestion, Sludge disposal by drying, Elutriation of Sludge , septic tanks working principles and design, soak pits. Ultimate disposal of waste water- self-purification of rivers, sewage farming.

### **TEXT BOOKS:**

1. Environmental Engineering, I and II by BC Punmia, Std.Publications.
2. Environmental Engineering, I and II by SK Garg, KhannaPublications.

### **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, NewJersey.
6. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition2008.
7. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication

## 21CS3271: APPLICATIONS OF MACHINE LEARNING

(Professional Elective-II)

B.Tech. III Year II Sem

T P C

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### Course Objectives:

- To prepare students for career in computer science & engineering where knowledge of AI & ML techniques leading to the advancement of research and technology.
- Identify problems where artificial intelligence techniques are applicable.
- To explore the use of Genetic algorithms and Reinforcement learning.
- Judge applicability of more advanced techniques.
- Participate in the design of systems that act intelligently and learn from experience.

**Course Outcomes:** At the end of the course the students will be able

- To understand the fundamentals of Artificial Intelligence(AI)
- To understand the fundamentals of Machine Learning(ML)
- To learn different classifiers and apply them on various datasets.
- To learn and apply different unsupervised learning algorithms
- Design models to solve the problems in various domains.

### UNIT- I

**INTRODUCTION TO AI:** AI definition, categories of AI (Narrow AI, General AI, Super AI) and their applications, Intelligent Agents.

**PROBLEM-SOLVING BY SEARCH:** Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, informed (Heuristic) Search Strategies: Greedy best-first search, A\*search.

### UNIT- II

**INTRODUCTION TO MACHINE LEARNING:** A concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination

**SUPERVISED LEARNING: Regression-**Linear-Simple, Multiple, Logistic Regression

**Classification-** Naive Bayes Classifier, k-NN classifier, Support Vector Machines -Linear, Non-Linear

### UNIT- III

**Decision Trees-**ID3(Iterative Dichotomiser3), Random forest, Ensemble methods- Bagging, Boosting, Stacking--Case Study

**UNSUPERVISED LEARNING:** Measures of Distance, Clustering: K-means, Hierarchical Clustering: Agglomerative and Divisive

#### **UNIT- IV**

**Artificial Neural Networks**– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm, Remarks on the Back-Propagation algorithm.

#### **UNIT- V**

**Genetic Algorithms** – Motivation, Genetic algorithms, an illustrative example

**Reinforcement Learning** – Introduction, the learning task,  $Q$ -learning, non-deterministic, rewards and actions, temporal difference learning.

#### **TEXT BOOKS:**

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.
2. Machine Learning –Tom M. Mitchell,- Tata McGraw-Hill

#### **REFERENCE BOOKS:**

1. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt.Ltd., 2017.
2. "Reinforcement Learning Algorithms: Analysis and Applications," Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, and Jan Peters First Edition, Springer 2021.

## 21CE3272: ADVANCED STRUCTURAL DESIGN

(Professional Elective-II)

B.Tech. III Year II Sem

Pre-requisite: ASA & RCC

L	T	P	C
3	-	-	3

### Course Objectives:

- To make the student more conversant with the design principles of critical structures using limit state approach.

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

- Design cantilever type and counter fort retaining walls
- Design flatslab slabs
- Design RCC circular water tanks
- Design Gantry girder
- Design Composite Structure.

### UNIT – I

Design and Detailing of cantilever type of Retaining walls – Stability Check. Principles & Design of Counter fort Retaining walls.

### UNIT – II

**Flat slabs:** Direct design method–Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs- Check for one way and two way shears

### UNIT – III

Design of RCC Elevated Water Tanks

### UNIT – IV

Introduction to gantry girder, Gantry girder impact factor- Longitudinal forces, Design of welded Gantry girder. Introduction to Pre-engineered metal buildings.

### UNIT – V

Composite Construction: Introduction; Composite beam; Method of construction; Limit states of collapse; Limit states of serviceability – Deflection.

### TEXT BOOKS:

1. Advanced RCC by Krishna Raju, CBS Publishers & distributors, New Delhi.
2. Design of steel structures by K.S.Sai Ram, Pearson Education, 2010.
3. Structural Design and drawing (RCC and steel) by Krishnam Raju, Univ. Press, New Delhi

4. R.C.C Structures by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi. Publications, NewDelhi.

**REFERENCES:**

1. RCC Designs by Sushil Kumar, standard publishinghouse.
2. Fundamentals of RCC by N.C. Sinha and S.K. Roy, S. Chand Publications, NewDelhi.
3. N. Krishna Raju, Design of Bridges, Oxford & IBH Publishing Company Pvt. Ltd, New Delhi. Fourth edition2009.

## 21CE3273: FOUNDATION ENGINEERING

(Professional Elective-II)

B.Tech. III Year II Sem

	L	T	P	C
Pre-requisite: Soil Mechanics	3	-	-	3

### 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
- To design pile group foundation

**Course Outcomes:** At the end of the course the student will be 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
- Analyse and design the shallow foundations
- Analyse and design the deep foundations

### 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 – stability of slopes of earth dams under different conditions.

### UNIT – III

**Earth pressure theories:** Active, Passive and at rest soil pressures - Rankine's theory of earth pressure – earth pressures in layered soils – 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 – shear criteria – 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

**Well foundations:** Types – different shapes of wells – forces on wells - components of wells – sinking of wells – tilts and shifts.

### **TEXT BOOKS:**

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt Ltd, New Delhi
2. Principles 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 Interna



## 21CE3274: GEO - ENVIRONMENTAL ENGINEERING

### (Professional Elective-II)

#### B.Tech. III Year II Sem

	L	T	P	C
<b>Pre Requisites:</b> Soil Mechanics & Environmental Engineering				
<b>Course Objectives:</b> To understand	3	-	-	3

- Various sources of ground contamination
- Classify the types of wastes
- About various contaminant transport process
- About the remediation techniques
- About the various types of landfills

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

- Identify the necessity and various methods of Site Characterization.
- Apply various waste management strategies.
- Apply various types of modeling and contaminant transport process.
- Identify various Emerging Remediation Technologies.
- Design the types of landfills with necessary components.

#### UNIT – I

Sources and Site Characterization: Scope of Geo- environmental Engineering, Various Sources of Contaminations, Need for contaminated site characterization; and Characterisation methods.

#### UNIT - II

Solid and Hazardous Waste Management: Classification of waste, Characterisation solid wastes, Environmental Concerns with waste, waste management strategies.

#### UNIT - III

Contaminant Transport: Transport process, Mass-transfer process, Modeling, Bioremediation, Phytoremediation.

#### UNIT – IV

Remediation Techniques: Objectives of site remediation, various active and passive methods, remediation NAPL sites, Emerging Remediation Technologies.

#### UNIT - V

Landfills: Types of landfills, Site Selection, Waste Containment Liners, Leachate collection system, Cover system, Gas collection system.

#### TEXT BOOKS:

1 Sharma, H. D. and Reddy, K. R. - Geoenvironmental Engineering, John Wiley & Sons (2004) 2 Bedient, P.B.H.S. Refai, & C.J. Newell, - Ground Water Contamination, Prentice Hall Publications, 4th Edition, 2008.

#### REFERENCES:

1. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Handbook, Kluwer Academic, 2001.

2. Reddi, L. N. and Inyang, H. I. - Geoenvironmental Engineering: Principles and Applications, Marcel Dekker, Inc., New York (2000)
3. LaGrega, M. D., Buckingham, P. L. and Evans, J. C. - Hazardous Waste Management, New York: McGraw-Hill Publishers, 2001.

## 21CE3251: TRANSPORTATION ENGINEERING LAB

**B.Tech. III Year II Sem**

L	T	P	C
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**Pre-requisite:** CT

**Course Objectives:** To learn

- Laboratory tests and their procedures related to coarse aggregates and bitumen.
- The Evaluation of strength properties of aggregates.
- The test procedures for characterization of bituminous mixes
- The traffic volume studies
- The traffic speed studies

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

- Assess for Highway construction properties of highway materials.
- Examine the tests performed for Bitumen mixes.
- Proportion bitumen mixes
- Assess the traffic volume
- Assess the speed of vehicle

### **I. Test on Road Aggregates**

1. Aggregate Crushing Value Test
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Abrasion Test (Los Angeles)
5. Shape Test (Flakiness and elongation indices)
6. Sieve Analysis and gradation charts

### **II. Test on Bitumen and Bituminous Mixes**

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Viscosity Test
5. Flash and fire points and specific gravity
6. Marshall's Stability (sample preparation and testing for stability and flow values)

### **TEXT BOOKS:**

1. Highway Material Testing by Khanna S.K., Justo C.E.G, Nem Chand & Bros.
2. Road Material Testing and Pavement Evaluation by Dr. S. Krishna Rao and Dr. P. Sravana, Research India Publication, 2019
3. Highway Material Testing and Quality Control by Rao G. Venkatappa, Rao K. Ramachandra, Pahari Kausik, Rao and D.V. Bhavanna. I.K International Publisher.

### **IS CODES:**

1. IS 1201 -1220 (1978) "Methods for Testing Tars and Bituminous Materials"
2. IRC SP 53 -2010 "Guidelines on use of Modified Bitumen"
3. MS-2 Manual for Marshalls Mix design 2002

## 21CE3252: COMPUTER AIDED STRUCTURAL DESIGN LAB

**B.Tech. III Year II Sem**

**L T P C**

**Pre-requisite:** SOM, SA, DRCS & DSS

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### **Course Objectives:**

The objectives of the course are to

- Learn the usage of any fundamental software for design
- Create geometries using pre-processor
- Analyse and Interpret the results using post processor
- Design the structural elements

### **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
- Interpret from the Post processing results
- Design the structural elements and a system as per IS Codes

### **LIST OF EXPERIMENTS**

1. Analysis & Design 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,WL,EQL)
6. Analysis & Design of Roof Trusses
7. Design and detailing of built up steel beam
8. Detailing of RCC beam (Simply supported beam, continuous beam and Cantilever beam)
9. Detailing of RCC slab (One way slab and two way slab)
10. Detailing of Steel built up compression member

## 21HS3253: ADVANCED ENGLISH COMMUNICATION SKILLS LAB

**B.Tech. III Year II Sem.**

**L T P C**  
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### **Introduction**

A course on Advanced English Communication Skills (AECS) Lab is considered essential at the third year level of B. Tech and Pharmacy courses. At this stage, the students need to prepare themselves for their career which requires them to listen to, read, speak and write in English both for their professional and interpersonal communication. The main purpose of this course is to prepare the students of Engineering for their placements.

### **Course Objectives:**

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

1. To improve students' fluency in spoken English
2. To enable them to listen to English spoken at normal conversational speed
3. To help students develop their vocabulary
4. To read and comprehend texts in different contexts
5. To communicate their ideas relevantly and coherently in writing
6. To make students industry-ready
7. To help students acquire behavioural skills for their personal and professional life
8. To respond appropriately in different socio-cultural and professional contexts

### **Course Outcomes: Students will be able to:**

1. Acquire vocabulary and use it contextually
2. Listen and speak effectively
3. Develop proficiency in academic reading and writing
4. Increase possibilities of job prospects
5. Communicate confidently in formal and informal contexts

The following course activities will be conducted as part of the Advanced English Communication Skills (AECS) Lab:

### **UNIT-I:**

Inter-personal Communication and Building Vocabulary –Starting a Conversation–Responding Appropriately and Relevantly –Using Appropriate Body Language –Role Play in Different Situations – Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.

### **UNIT-II:**

Reading Comprehension –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, Skimming, Scanning, Inferring Meaning.

### **UNIT-III:**

Writing Skills –Structure and Presentation of Different Types of Writing –Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing.

**UNIT-IV:**

Presentation Skills –Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ emails/Assignments...etc.,

**UNIT-V:**

Group Discussion and Interview Skills –Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation-Concept and Process, Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

**REFERENCES:**

1. Kumar, Sanjay and Pushp Lata. English for Effective Communication, Oxford University Press, 2015.
2. Konar, Nira. English Language Laboratories –A Comprehensive Manual, PHI Learning Pvt. Ltd., 2011

## 21MC0007: YOGA AND INDIAN PHILOSOPHY

**B.Tech. III Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**Course Objectives:** To

**Course outcomes:**

### **Unit-1**

Bhagavad Gita, chapter 2 Sankhya Yoga slokas 54-72 about emotional intelligence(Stitaprajnata)

### **Unit-II**

Bhagavad Gita, chapters 3-7

### **Unit-III**

Bhagavad Gita, chapters 8-11

### **Unit-IV**

Bhagavad Gita, chapters 12-15

### **Unit-V**

Bhagavad Gita, chapters 16-18

10 quotes from each chapter of ref.(2)

### **References:**

- 1) Bhagavad Gita By Swami Swarupananda, R K Math Publication
- 2) Vivekananda-His Call to the Nation, R K Math Publication