ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

ANNEXURE-I

B.TECH. –CIVIL ENGINEERING

III & IV YEAR COURSE STRUCTURE & SYLLABI

B.Tech.– III Year I Semester

S.No.	Category	Course Code	Title	L	T	P	Credits
1	PC	23A0151T	Water Resources Engineering	3	0	0	3
2	PC	23A0152T	Design of Reinforced Concrete Structures	2	1	0	3
3	PC	23A0153T	Geotechnical Engineering	3	0	0	3
4	MC	23A0154T	Quantum Technology and Applications	3	0	0	3
5	PE-I	23A015AT	Design of Pre-stressed Concrete Members	3	0	0	3
6		23A015BT	Air Pollution and Control				
7		23A015CT	Environmental Impact Assessment				
8	OE-1	23A015DT 23A015ET	Green Buildings Construction Technology and Management	3	0	0	3
9	PC	23A0153L	Geotechnical Engineering Laboratory	3	0	0	3
10	PC	23A0156L	Fluid Mechanics and Hydraulic Machines Laboratory	3	0	0	3
11	MC	23A0157L	Estimation, Specifications, Costing & Valuation	0	0	3	1.5
12	SOC	23A0158L	Tinkering Laboratory	0	0	3	1.5
13	SEC	23A0159I	Evaluation of Community Service Internship	0	1	2	2
			Total	**20**	**02**	**08**	**29**

Open Elective-I

S.No.	Course Code	Title	Branch
1	23A025ET	Electrical Safety Practices and Standards	EEE
	23A025FT	Instrumentation	
2	23A035FT	Sustainable Energy Technologies	ME
3	23A045DT	Electronic Circuits	ECE
4	23A055ET	Java Programming	CSE& Allied/IT
5	23A055FT	Introduction to Artificial Intelligence	
6	23AHS51T	Mathematics for Machine Learning and AI	Mathematics
7	23AHS52T	Materials Characterization Techniques	Physics
8	23AHS53T	Chemistry of Energy Systems	Chemistry
9	23AHSM51T	Entrepreneurship and New Venture Creation	Humanities
10	23AHS54T	English for Competitive Examinations	

Note:

1. A student can register for Honours or a Minor in IV semester after declaring the results of III Semester and students are allowed to credit maximum two Courses per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be allowed to register courses as Open Electives/Minor/Honours with content substantially equivalent to the courses already pursued in the student's primary major.

3. A student is permitted to register a Minor program only if the institution offers a Major degree program in that discipline.

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B.Tech. III Year II Semester

S.No.	Category	Course Code	Title	L	T	P	Credits
1	PC	23A0161T	Design of Steel Structures	3	0	0	3
2	PC	23A0162T	Highway Engineering	3	0	0	3
3	PC	23A0163T	Environmental Engineering	3	0	0	3
4	PE-2	23A016AT 23A016BT 23A016CT	1. Design of Earthquake Resistant Structures 2. Open Channel Flow 3. Foundation Engineering	3	0	0	3
5	PE-3	23A016DT 23A016ET 23A016FT	1. Cost Effective Housing Techniques 2. Watershed Management 3. Advanced Structural Analysis	3	0	0	3
6	OE-II	23A016GT 23A016HT	Disaster Management Sustainability in Civil Engineering Practices	3	0	0	3
7	PC	23A0162L	Highway Engineering Laboratory	0	0	3	2
8	PC	23A0163L	Environmental Engineering Laboratory	0	0	3	2
9	**SOC**	23A0164L	Building Information Modelling	0	1	2	2
10	MC	23AHSM61T	Preparation of Project Reports / Technical Paper Writing & IPR	2	0	0	-
			Total	**20**	**1**	**8**	**23**
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation							

Open Elective-II

S.No.	Course Code	Title	Branch
1	23A026IT	Renewable Energy Sources	EEE
2	23A026JT	Wind and Solar Energy	EEE
3	23A036KT	Automation and Robotics	ME
4	23A0466AT	Digital Electronics	ECE
5	23A056IT	Operating Systems	CSE & Allied/IT
6	23A056JT	Machine Learning	
7	23AHS61T	Optimization Techniques	Mathematics
8	23AHS62T	Physics of Electronic Materials and Devices	Physics
9	23AHS63T	Chemistry of Polymers and Applications	Chemistry
10	23AHS64T	Academic Writing and Public Speaking	Humanities

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B.Tech IV Year-I Semester

S.No.	Category	Course Code	Title	L	T	P	Credits
1	PC	23A0171T	Finite Element Analysis	3	0	0	3
2	OE	23AHSM7AT 23AHSM7BT 23AHSM7CT	Management Course-II 1. Business Ethics and Corporate Governance 2. E-Business 3. Management Science	2	0	0	2
3	PE-4	23A017AT 23A017BT 23A017CT	1. Geo-synthetics and Reinforced Earth Structures 2. Railways, Airports, Docks and Harbour Engineering 3. Experimental Stress Analysis	3	0	0	3
4	PE-5	23A017DT 23A017ET 23A017FT	1. Ground Improvement Techniques 2. Subsurface Investigation and Instrumentation 3. Transportation Economics	3	0	0	3
5	OE-III	23A017GT 23A017HT	1.Building materials and services 2.Environmental Impact Assessment	3	0	0	3
6	OE-IV	23A017IT 23A017JT	Geo-spatial technologies Solid waste management	3	0	0	3
7	**SOC**	23A0172L	Civil Engineering softwares (STAADPRO/CAD/TEKL)	0	1	2	2
8	Audit Course		**Gender Sensitization**	2	0	0	-
9		23A0173I	Evaluation of Industry Internship	-	-	-	2
			Total	**19**	**1**	**2**	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation							

Open Elective-III

S.No.	Course Code	Title	Branch
1	23A027IT	Smart Grid Technologies	EEE
2	23A037KT	3D Printing Technologies	ME
3	23A0474AT	Microprocessors and Microcontrollers	ECE
4	23A057IT	Data Base Management Systems	CSE& Allied/IT
5	23A057JT	Cyber Security	
6	23AHS71T	Wavelet transforms and its applications	Mathematics
7	23AHS72T	Smart Materials and Devices	Physics
8	23AHS73T	Green Chemistry and Catalysis for Sustainable Environment	Chemistry
9	23AHS74T	Employability Skills	Humanities

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Open Elective-IV

S.No.	Course Code	Title	Branch
1	23A027JT	Electric Vehicles	EEE
2	23A037LT	Total Quality Management	ME
3	23A0475AT	Transducers and Sensors	ECE
4	23A057KT	Computer Networks	CSE& Allied/IT
5	23A057LT	Internet of Things	
6	23AHS75T	Financial Mathematics	Mathematics
7	23AHS76T	Sensors and Actuators for Engineering Applications	Physics
8	23AHS77T	Chemistry of Nanomaterials and Applications	Chemistry
9	23AHS78T	Literary Vibes	Humanities

IV B.Tech-II Semester

S.No.	Category	Course Code	Title	L	T	P	Credits
1.	Project	23A0182P	Internship	-	-	-	4
			Project-II	-	-	-	8
Total							12

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Department of Civil Engineering

Title of the Course: **WATER RESOURCES ENGINEERING**
Category: PC
Couse Code: 23A0151T
Branch/es: Civil Engineering
Semester: V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
The objectives of this course are to make the student to:
1. Understand the fundamental concepts of hydrology, including precipitation, evaporation, infiltration, and runoff, and their significance in water resource management.
2. Analyze hydrographs, unit hydrographs, and groundwater characteristics for estimating water availability and flood management.
3. Evaluate the necessity, importance, and methods of irrigation, along with soil-water- plant relationships and irrigation efficiencies.
4. Apply silt theories and principles of canal design to ensure efficient water conveyance and management in irrigation systems.
5. Assess the principles of diversion head works, water logging, canal lining, and the stability of hydraulic structures on permeable foundations.

Course Outcomes:
At the end of the course, the student will be able to
1. Explain the hydrologic cycle, precipitation types, and measurement techniques for rainfall, evaporation, infiltration, and runoff computation.
2. Analyze hydrographs, unit hydrographs, and groundwater flow parameters for flood estimation and water resource planning.
3. Evaluate irrigation requirements, soil-water-plant relationships, duty, delta, and irrigation efficiencies for sustainable agricultural productivity.
4. Apply silt theories and design principles of irrigation canals to ensure effective water conveyance and prevent water logging.
5. Assess the stability of diversion head works, including weirs and barrages, using

Unit 1 Introduction to Hydrology 8

Engineering Hydrology and Its Applications; Hydrologic Cycle; Precipitation- Types and forms, Rainfall Measurement, Types of Rain Gauges, Computation of Average Rainfall Over A Basin, Presentation and Interpretation of Rainfall Data. Evaporation- Factors Affecting Evaporation, Measurement of Evaporation; Infiltration- Factors Affecting Infiltration, Measurement of Infiltration, Infiltration Indices; Run off- Factors Affecting Run- off, Computation of Run-Off; Design Flood; Estimation of Maximum Rate of Run-Off; Separation of Base Flow.

Unit 2 Hydrograph Analysis 8

Hydrograph- Unit Hydrograph- Construction and Limitations of Unit Hydrograph, Application of The Unit Hydrograph to The Construction of A Flood Hydrograph Resulting From Rainfall of Unit Duration; S-Hydrograph.
Ground Water: Introduction; Aquifer; Aquiclude; Aquifuge; Aquifer Parameters Porosity, Specific Yield, Specific Retention; Divisions of Sub–Surface Water; Water Table; Types of Aquifers; Storage Coefficient- Coefficient of Permeability and Transmissibility

8

Unit 3 Irrigation & Water Requirement of Crops

Introduction, Necessity and Importance of Irrigation; Advantages and Ill Effects of Irrigation; Types of Irrigation; Methods of Application of Irrigation Water; Quality for Irrigation Water. Duty and Delta; Duty at Various Places; Relation Between Duty and Delta; Factors Affecting Duty; Methods of Improving Duty.

Types of Soils, Indian Agricultural Soils, Preparation of Land for Irrigation; Soil Fertility; Soil-Water-Plant Relationship; Vertical Distribution of Soil Moisture; Soil Moisture Tension; Soil Moisture Stress; Various Soil Moisture Constants; Limiting Soil Moisture Conditions; Depth and Frequency of Irrigation; Gross Command Area; Culturable Command Area; Culturable Cultivated and Uncultivated Area; Kor Depth and Kor Period; Crop Seasons and Crop Rotation; Irrigation Efficiencies; Determination of Irrigation Requirements of Crops; Assessment of Irrigation Water. Consumptive Use of Water-Factors Affecting Consumptive Use, Direct Measurement and Determination By Use of Equations

Unit 4 10

Channels – Silt Theories:

Classification; Canal Alignment; Inundation Canals; Cross–Section of An Irrigation Channel; Balancing Depth; Borrow Pit; Spoil Bank; Land Width; Silt Theories–Kennedy‘s Theory, Kennedy‘s Method of Channel Design; Drawbacks in Kennedy‘s Theory; Lacey‘s Regime Theory- Lacey‘s Theory Applied to Channel Design; Defects in Lacey‘s Theory; Comparison of Kennedy‘s and Lacey‘s Theory.

Water Logging and Canal Lining:

Water Logging; Effects of Water Logging; Causes of Water Logging; Remedial Measures; Saline and Alkaline Soils and their Reclamation; Losses in Canal; Lining of Irrigation Channels – Necessity, Advantages and Disadvantages; Types of Lining; Design of Lined

Unit 5 Diversion Head Works 10

Types of Diversion Head Works; Diversion and Storage Head Works; Weirs and Barrages; Layouts of Diversion Head Works; Components; Causes and Failure of Hydraulic Structures On Permeable Foundations; Bligh‘s Creep Theory; Khosla‘s Theory; Determination of Uplift Pressure, Impervious Floors Using Bligh‘s and Khosla‘s Theory; Exit Gradient.

Prescribed Textbooks:

1.Irrigation and Water Power Engineering By Punmia&Lal, Laxmi Publications Pvt.Ltd., New Delhi 17th Edition 2021

2.Engineering Hydrology By K. Subramanya, The Tata McGraw Hill Company, Delhi 5th Edition 2020

Reference Books:

1. Irrigation Engineering and Hydraulic Structures By S. K. Garg; Khanna Publishers,Delhi 36th Edition
2. Engineering Hydrology By Jayarami Reddy, Laxmi Publications Pvt. Ltd., New Delhi 3rd Edition 2016
3. Engineering Hydrology By Jayarami Reddy, Laxmi Publications Pvt. Ltd., New Delhi 3rd Edition 2016

Online Learning Resources:

https://nptel.ac.in/courses/105101214

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A0151T.1	3	2	2	1	2	-	-	-	-	2	-	2	2	2
23A0151T.2	3	3	3	3	3	-	-	-	-	2	-	2	3	2
23A0151T.3	3	3	3	3	2	-	-	-	-	2	-	2	3	3
23A0151T.4	3	3	3	3	3	3	3	3	-	2	-	2	3	3
23A0151T.5	3	3	3	3	3	2	2	2	-	2	-	2	3	3

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Department of Civil Engineering

Title of the Course: **DESIGN OF REINFORCED CONCRETE STRUCTURES**
Category: PC
Couse Code: 23A0152T
Branch/es: Civil Engineering
Semester: V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
The objectives of this course are to make the student to:
1. Understand the fundamental methods of concrete structure design, including elastic, ultimate load, and limit state methods.
2. Analyze anddesign reinforced concrete beams, slabs, staircases, columns, and footings using the Limit State Method as per IS codes.
3. Evaluate the behavior of reinforced concrete membersin terms of flexure, shear, torsion, bond, and anchorage.
4. Apply design principles to ensure serviceability and safety of concrete structures under various loading conditions.
5. Develop skills to use design aids and professional software for the analysis and design of RC structures.

Course Outcomes:
At the end of the course, the student will be able to
1. Explain the different methods of concrete structure design and their advantages.
2. Analyze and design singly and doubly reinforced beams, flanged beams, slabs, and staircases using the Limit State Method.
3. Evaluate the behavior of RC members under shear, torsion, and combined loading conditions.
4. Design short columns and footings considering axial and eccentric loading conditions
5. Utilize IS code provisions and design aids for efficient structural design.

Unit 1 Methods of Design of Concrete Structures 8

Behaviour of Plain and RC Beams under Flexure, Design Concept: Elastic Method, Ultimate Load Method and Limit State Method, – Working Stress Method as per IS Code - Design of Singly Reinforced Beam By Working Stress Method - Limit State Philosophy as Detailed in IS Code - Advantages of Limit State Method Over Other Methods - Analysis and Design of Singly and Doubly Reinforced Rectangular Beams By Limit State Method.

Unit 2 Limit State Method - Flanged Beam, Shear &Torsion 8

Analysis and Design of Flanged Beams – Use of Design Aids for Flexure - Behaviour of RC Members in Bond and Anchorage - Design Requirements as Per Current Code - Behaviour of RC Beams in Shear and torsion - Design of RC Members for Combined Bending, Shear and torsion - Serviceability.

Unit 3 Limit State Design of Slabs 8

Analysis and Design of Cantilever, One Way, Two Way and Continuous Slabs Subjected to Uniformly Distributed Load for Various Boundary Conditions- –Introduction to Flat Slab.

Unit 4 Limit State Design of Columns & Footings 10

Classification of Columns – Design of Short Rectangular and Circular Columns for Axial, Uniaxial and Biaxial Bending. Design of Wall Footing – Design of Axially and Eccentrically Loaded Rectangular Pad and Sloped Footings – Design of Combined Rectangular Footing for Two Columns Only.

Unit 5 Limit State of Serviceability and Miscellaneous 10

Deflection and Cracking, Staircases – Classification, Design of Dog-Legged Staircase

Prescribed Textbooks:

1. N. Krishnaraju, ―Structural Design and Drawing, Universities Press Pvt ltd, Hyderabad. 4th edition 2020.
2. P. C. Varghese, Limit State―Designed of Reinforced Concrete, P r e n t i c e Hall of India, New Delhi

Reference Books:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Limit State Design, Laxmi Publications Pvt. Ltd., New Delhi.
2. N.C. Sinha and S.K. Roy,― Fundamentals of Reinforced Concrete, S.ChandPublishers
3. N.Subramanian, ―Design of Reinforced Concrete Structures, Oxford University Press

Online Learning Resources:
https://archive.nptel.ac.in/courses/105/105/105105105/

Codes/Tables: IS 456-2000 and relevant sheets (Pertaining to columns) of SP 16 Code books to be permitted into the examinations Hall.

NOTE: Assignment on preparation of drawing sheets detailing various RC Elements

All the designs to be taught in Limit State
Method Following plates should be prepared by the students.

1. Reinforcement particulars of T-beams and L-beams.
2. Reinforcement detailing of continuous beams.
3. Reinforcement particulars of columns and footings.
4. Detailing of One-way, Two way and continuous slabs

Exam Pattern:

The end examination paper should consist of Part A and Part B.
Part A consists of two questions in Design and Drawing out of which one question is to be answered.
Part-B should consist of five questions on design out of which three are to be answered. Weightage for Part -A is 40% and Part-B is 60%.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**	**PSO3**
23A0152T.1	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**2**	**3**
23A0152T.2	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**	**3**
23A0152T.3	**3**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2**	**3**
23A0152T.4	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**3**	**3**
23A0152T.5	**2**	**2**	**2**	**1**	**3**	**-**	**-**	**-**	**-**	**2**	**1**	**2**	**2**	**2**	**2**

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Department of Civil Engineering

Title of the Course: **GEOTECHNICAL ENGINEERING**

Category: PC
Couse Code: 23A0153T
Branch/es: Civil Engineering
Semester: V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. Understand the classification and compaction characteristics of different soil types and their engineering significance.
2. Analyze the concepts of effective stress, permeability, and seepage in soils and their impact on soil behavior.
3. Apply stress distribution theories and settlement computations to evaluate soil response under loads.
4. Evaluate shear strength properties of soil using various testing methods and their applications in geotechnical engineering.
5. Assess the stability of slopes using different analytical methods and suggest suitable slope protection measures.

Course Outcomes:

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

1. Classify soils based on their physical and index properties as per BIS and Unified classification systems.
2. Analyze soil permeability and seepage problems using Darcy‘s law and flow net concepts.
3. Apply stress distribution theories and settlement analysis to predict soil behavior under loading
4. Evaluate shear strength of soils using experimental methods and interpret test results.
5. Assess slope stability and recommend suitable protection measures.

Unit 1 Soil Classification and Compaction 8

Formation of Soil - Soil Description – Particle – Size Shape and Colour – Composition of Gravel, Sand, Silt, Clay Particles – Particle Behavior – Soil Structure – Phase Relationship – Index Properties – Significance – BIS Classification System – Unified Classification System – Compaction of Soils Theory, Laboratory and Field Tests – Field Compaction Methods – Factors Influencing Compaction of Soils.

Unit 2 Effective Stress and Permeability 8

Soil - Water – Static Pressure in Water - Effective Stress Concepts in Soils – Capillary Phenomena– Permeability Interaction – Hydraulic Conductivity – Darcy‘s Law – Determination of Hydraulic Conductivity – Laboratory Determination (Constant Head and Falling Head Methods) and Field Measurement Pumping Out in Unconfined and Confined Aquifer – Factors Influencing Permeability of Soils – Seepage - Two Dimensional Flow – Laplace‘s Equation – Introduction to Flow Nets – Simple Problems. (Sheet Pile and Weir).

Unit 3 Stress Distribution and Settlement 8

Stress Distribution in Homogeneous and Isotropic Medium – Boussinesq Theory – (Point Land, Line Land and UDL) Use of New Marks Influence Chart –Components of Settlement – Immediate and Consolidation Settlement – Terzaghi‘s One Dimensional Consolidation Theory – Computation of Rate of Settlement. - √T and Log T Methods– E-Log P Relationship.

Unit 4 Shear Strength 10

Shear Strength of Cohesive and Cohesion Less Soils – Mohr-Coulomb Failure Theory Measurement of Shear Strength - Direct Shear, Tri-axial Compression, UCC and Vane Shear Tests – Pore Pressure Parameters – Cyclic Mobility – Liquefaction.

Unit 5 Stability of Slopes 10

Stability Analysis - Infinite Slopes and Finite Slopes – total Stress Analysis for Saturated Clay Friction Circle Method – Use of Stability Number – Method of Slices – Fellenious and Bishop's Method - Slope Protection Measures.

Prescribed Textbooks:

1. Soil Mechanics and Foundation Engg by K.R.Arora, Standard Publishers and Distributors Delhi 7th edition2009.
2. Geotechnical Engineering by C.Venkataramiah, New Age International Pvt. Ltd,(2002).

Reference Books:

1. Soil Mechanics and Foundation by B.C.Punmia, Ashok Kumar Jain andArun KumarJain, Laxmi, publications Pvt.Ltd., New Delhi17thedition 2017
2. Geotechnical Engineering by Iqbal H.Khan, PHI Pubilishers, 4th edition.
3. Basic and Applied Soil Mechanics by Gopal Ranjan& ASR Rao, New ageInternational Pvt. Ltd, New Delhi 3rdedition 2016

Online Learning Resources:

1. https://nptel.ac.in/courses/105101201
2. https://nptel.ac.in/courses/105105185

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
23A0153T.1	3	2	2	1	-	-	-	-	-	2	-	2	3	2	3
23A0153T.2	3	3	3	2	2	-	-	-	-	-	-	1	3	2	3
23A0153T.3	3	2	2	2	2	-	-	-	-	-	-	1	2	2	3
23A0153T 4	3	3	3	2	2	-	-	-	-	-	-	1	3	3	3
23A0153T.5	2	2	2	1	3	-	-	-	-	2	1	2	2	2	2

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Department of Civil Engineering

Title of the Course: **INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS**

Category: MC
Couse Code: 23A0154T
Branch/es: Civil Engineering
Semester: V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. 1Introduce fundamental quantum concepts like superposition and entanglement.
2. Understand theoretical structure of qubits and quantum information.
3. Explore conceptual challenges in building quantum computers.
4. Explain principles of quantum communication and computing.
5. Examine real-world applications and the future of quantum technologies

Course Outcomes:

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

1. Explain core quantum principles in a non-mathematical manner.
2. Compare classical and quantum information systems.
3. Identify theoretical issues in building quantum computers.
4. Discuss quantum communication and computing concepts.
5. Recognize applications, industry trends, and career paths in quantum technology

Unit 1 Introduction to Quantum Theory and Technologies 8

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison,Quantum states and measurement: nature of observation,Overview of quantum systems: electrons, photons, atoms,The concept of quantization: discrete energy levels,Why quantum? Strategic, scientific, and technological significance,A snapshot of quantum technologies: Computing, Communication, and Sensing,National and global quantum missions: India's Quantum Mission, EU, USA, China

Unit 2 Theoretical Structure of Quantum Information Systems 8

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract,The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences,Philosophical implications: randomness, determinism, and observer role

Unit 3 Building a Quantum Computer – Theoretical Challenges and Requirements 8

What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers:
Why maintaining entanglement is difficult,Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Visionvs reality: what's working and what remains elusive,The role of quantum software in managing theoretical complexities

Unit 4 Quantum Communication and Computing – Theoretical Perspective 10

Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication,The Idea of the Quantum Internet – Secure Global Networking,Introduction to Quantum Computing,Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction,Real-World Importance and Future Potential

Unit 5 Applications, Use Cases, and the Quantum Future 10

Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum,Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization,Emerging careers in quantum: roles, skillsets, and preparation pathways,Educational and research landscape – India's opportunity in the global quantum race

Prescribed Textbooks:

1. Soil Mechanics and Foundation Engg by K.R.Arora, Standard Publishers and Distributors Delhi 7th edition2009.
2. Geotechnical Engineering by C.Venkataramiah, New Age International Pvt. Ltd,(2002).

Reference Books:

1. Soil Mechanics and Foundation by B.C.Punmia, Ashok Kumar Jain andArun KumarJain, Laxmi, publications Pvt.Ltd., New Delhi17thedition 2017
2. Geotechnical Engineering by Iqbal H.Khan, PHI Pubilishers, 4th edition.
3. Basic and Applied Soil Mechanics by Gopal Ranjan& ASR Rao, New ageInternational Pvt. Ltd, New Delhi 3rdedition 2016

Online Learning Resources:

1. https://nptel.ac.in/courses/105101201
2. https://nptel.ac.in/courses/105105185

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
23A0153T.1	3	2	2	1	-	-	-	-	-	2	-	2	3	2	3
23A0153T.2	3	3	3	2	2	-	-	-	-	-	-	1	3	2	3
23A0153T.3	3	2	2	2	2	-	-	-	-	-	-	1	2	2	3
23A0153T 4	3	3	3	2	2	-	-	-	-	-	-	1	3	3	3
23A0153T.5	2	2	2	1	3	-	-	-	-	2	1	2	2	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course: **DESIGN OF PRESTRESSED CONCRETE MEMBERS**
Category: PE-1
Couse Code: 23A015AT
Branch/es: Civil Engineering
Semester: V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1.Understand the principles, methods, and materials used in prestressed concrete.
2. Analyze various losses of prestress in both pre-tensioned and post-tensioned members.
3. Design prestressed concrete beams considering flexure and shear forces.
4. Evaluate deflections in prestressed concrete structures and their controlling factors.
5. Analyze the behavior of composite beams under different loading conditions.

Course Outcomes:

At the end of the course, the student will be able to
1. Explain the principles and methods of prestressing and the need for high-strength materials.
2. Analyze the different types of prestress losses and their impact on structural performance.
3. Design prestressed concrete beams considering flexural and shear stresses.
4. Evaluate deflections in prestressed beams and suggest control measures.
5. Analyze the stress distribution and differential shrinkage in composite beams.

Unit 1 Introduction 8

Principles of Pre-Stressing – Prestressing Systems - Pre-Tensioning and Post Tensioning- Advantages and Limitations of PreStressed Concrete- Need for High Strength Materials. Methods of Pre-Stressing: Pre-Tensioning (Hoyer System) and Post-Tensioning Methods (Freyssinet System and Gifford- Udall System)

Unit 2 Losses of Pre-Stress 8

Loss of Pre-Stress in Pre-Tensioned and Post-Tensioned Members Due to Elastic Shortening, Shrinkage and Creep of Concrete, Relaxation of Stress in Steel, Anchorage Slip and Frictional Losses.

Unit 3 Flexural And Shear 8

Analysis of Beams for Flexure and Shear - Beams Pre-Stressed With Straight, Concentric, Eccentric, Bent and Parabolic Tendons- Kern Line - Cable Profile - Design of PSC Beams (Rectangular and I Sections) Using IS 1343. Analysis and Design of Rectangular and I Beams for Shear. Introduction to Transmission Length and End Block (No Design and Analytical Problems).

Unit 4 Deflections 10

Control of Deflections- Factors Influencing Deflections - Short Term Deflections of Uncracked Beams- Prediction of Long Time Deflections

Unit 5 Composite Beams 10

Different Types- Propped and Un-Propped- Stress Distribution- Differential Shrinkage- Analysis of Composite Beams.

Prescribed Textbooks:

1.Prestressed Concrete by N. Krishna Raju, Tata McGraw Hill Publications, New Delhi, 6^{tn} edition 2018

2. Design of Prestressed Concrete Structures by T.Y. Lin & Ned H. Burns, John Wiley & Sons 3rd edition 2010

Reference Books:

1.Prestressed concrete by N.Rajagopalan, Narosa Publishing House 2nd edition 2017
2.Prestressed Concrete Design by Praveen Nagrajan, Pearson publications, 2013
3. IS: 1343, BIS code on –prestressed concrete‖, to be permitted into the examination Hall

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/105/106/105106118/**
2. **https://nptel.ac.in/courses/105106117**

CO-PO Mapping:

	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A015AT.1	2	1	1	-	-	1	-	-	-	1	-	1	1	1
23A015AT.2	2	2	1	1	2	-	-	-	-	-	-	1	1	1
23A015AT.3	2	2	3	2	2	-	1	-	-	-	-	1	2	2
23A015AT.4	2	1	2	2	3	1	-	-	-	-	-	1	2	1
23A015AT.5	2	2	2	1	2	1	-	-	-	-	-	1	2	1

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course: **AIR POLLUTION AND CONTROL**
Category: PE-1
Couse Code: 23A015BT
Branch/es: Civil Engineering
Semester: V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. Understand the sources, classification, and effects of air pollution on humans and the environment.
2. Analyze meteorological factors influencing air pollution and dispersion modelling.
3. Design and evaluate control measures for particulate pollutants.
4. Apply techniques for controlling gaseous pollutants through chemical and physical processes.
5. Assess vehicular and indoor air pollution and propose control strategies

Course Outcomes:

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

1. Explain the sources, classification, and global effects of air pollution.
2. Analyze meteorological parameters affecting air pollution dispersion.
3. Design control systems for particulate matter using appropriate removal techniques.
4. Apply suitable technologies for gaseous pollutant removal through adsorption, absorption, and combustion.
5. Evaluate vehicular and indoor air pollution sources and suggest mitigation strategies

Unit 1 Introduction 8

Definition - Sources & Classification of Air Pollutants - Effects of Air Pollution on Humans, Plants and Materials- Global Effects - Air Quality and NAAQS - National Clean Air Programme- Sampling of Pollutants in Ambient Air - Stack Sampling

Unit 2 Meteorology And Air Pollution 8

Factors Influencing Air Pollution, Wind Rose, Mixing Depths, Lapse Rates and Dispersion - Atmospheric Stability, Plume Rise and Dispersion, Plume behaviour Prediction of Air Quality, Box Model - Gaussian Model - Dispersion Coefficient - Application of Tall Chimney for Pollutant Dispersion.

Unit 3 Control of Particulate Pollutants 8

Properties of Particulate Pollution - Particle Size Distribution - Control Mechanism - Dust Removal Equipment - Design and Operation of Settling Chambers, Cyclones, Wet Dust Scrubbers, Fabric Filters &ESP.

Unit 4 Control Of Gaseous Pollutants 10

Process and Equipment for The Removal by Chemical Methods - Design and Operation of Absorption and Adsorption Equipment - Combustion and Condensation Equipment.

Unit 5 Automobile And Indoor Pollution 10

Vehicular Pollution – Sources and Types of Emission – Effect of Operating Conditions- Alternate Fuels and Emissions-Emission Controls and Standards, Strategies to Control Automobile Pollution– Causes of Indoor Air Pollution-Changes in Indoor Air Quality- Control and Air Cleaning Systems-Indoor Air Quality

Prescribed Textbooks:

1. Rao, M. N. and Rao H. V. N., Air Pollution, Tata McGraw-Hill, New Delhi, 2007
2. Khare M, Sharma P, Kota, S.H, Sumanth C, Air Pollution Science Engineering and Management Fundamentals, CRC Press, 2024.

Reference Books:

1. Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford & I.B.H
2. Air Pollution Control Engineering by Nevers, , McGraw-Hill, Inc., 2000
3. Rao, C. S., Environmental Pollution Control Engineering, New Age International, New Delhi, 2006.
4. Mahajan S. P., Pollution Control in Process Industries, Tata McGraw-Hill PublishingCompany, New Delhi, 1991.

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/105/107/105107213/**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A015BT.1	2	1	-	-	-	2	3	-	-	1	-	1	1	1
23A015BT.2	2	2	-	2	2	3	3	-	-	-	-	1	2	2
23A015BT.3	2	2	3	2	2	3	3	-	-	-	-	1	2	2
23A015BT.4	2	1	2	2	3	3	3	-	-	-	-	1	2	2
23A015BT.5	2	2	2	2	2	3	3	2	-	-	-	1	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course: **ENVIRONMENTAL IMPACT ASSESSMENT**
Category: PE-1
Couse Code: 23A015CT
Branch/es: Civil Engineering
Semester: V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).
2. Analyze the impact of developmental activities on land use, soil, and water resources.
3. Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.
4. Develop environmental audit procedures and assess compliance with environmental regulations.
5. Understand and apply environmental acts, notifications, and legal frameworksin EIA studies

Course Outcomes:

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

1. Apply various methodologies for conducting Environmental Impact Assessments.
2. Analyze the impact of land-use changes on soil, water, and air quality.
3. Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.
4. Develop environmental audit reports and assess compliance with environmental policies.
5. Interpret and apply environmental acts and regulations related to EIA.

Unit 1 Concepts and Methodologies of EIA 8

Initial Environmental Examination, Elements of EIA, - Factors E-I-A Impact
Evaluation and Analysis, Preparation of Environmental Base Map, Classification of Environmental Parameters- Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis.

Unit 2 Impact of Developmental Activities and Land Use 8

Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I A in Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts on Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact.

Unit 3 Assessment of Impact on Vegetation, Wildlife and Risk Assessment 8

Introduction - Assessment of Impact of Development Activities on Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing Environmental Risk Assessment-Advantages of Environmental Risk Assessment.

Unit 4 Environmental Audit 10

Introduction - 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

Unit 5 Environmental Acts and Notifications 10

The Environmental Protection Act, The Water Preservation Act, The Air (Prevention & Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, Concept of ISO and ISO 14000.

Prescribed Textbooks:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011.
2. Environmental Impact Assessment, by Canter Larry W McGraw-Hill education Edi (1996)

Reference Books:

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi.
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/124/107/124107160/

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A015CT.1	3	2	2	2	2	3	-	-	-	-	-	1	2	2
23A015CT.2	3	3	3	2	2	3	-	-	-	-	-	1	3	2
23A015CT.3	3	3	3	2	2	3	3	-	-	-	-	1	3	3
23A015CT.4	3	3	3	3	2	3	3	-	-	-	-	1	3	3
23A015CT.5	2	2	2	2	2	3	3	3	-	-	-	1	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**ELECTRICAL SAFETY PRACTICES AND STANDARDS**
Category:	OE-I
Course Code:	23A025ET
Branch/es:	CSE/ECE/ME/Civil
Year:	III
Semester:	I

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. Explain the physiological effects of electric shock and identify various hazards of electricity including arc and blast based on safety requirements.
2. Classify conductors, insulators, and voltage types, and evaluate the use of appropriate electrical safety equipment and fire extinguishers.
3. Interpret grounding and bonding requirements, and determine safe approach distances and arc hazard categories based on earthing practices.
4. Demonstrate appropriate safety practices in handling electrical appliances and installations across various environments through real-life case studies.
5. Analyze national and international electrical safety standards (e.g., NFPA 70E, OSHA, NEC, NESC) and apply statutory compliance as per the Electricity Act and regulations.

Course Outcomes:

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

1. Analyze national and international electrical safety standards and apply statutory compliance as per the Electricity Act and regulations.
2. Classify various electrical safety components including conductors, insulators, voltage levels, and select suitable protection methods for overvoltage and static electricity.
3. Explain grounding and bonding principles, and calculate safe approach distances and arc hazard levels using earthing system standards.
4. Demonstrate appropriate electrical safety practices in domestic, industrial, and public environments, and evaluate real-world case studies for safety effectiveness.
5. Compare various electrical safety standards and interpret statutory compliance requirements from governing authorities.

Unit 1 Introduction To Electrical Safety **9**

Fundamentals of Electrical safety - Electric Shock- physiological effects of electric current - Safety requirements - Hazards of electricity - Arc - Blast - Causes for electrical failure.

Unit 2 Safety Components **9**

Introduction to conductors and insulators - voltage classification - safety against over voltages - safety against static electricity - Electrical safety equipment - Fire extinguishers for electrical safety.

Unit 3 Grounding **9**

General requirements for grounding and bonding - Definitions- System grounding - Equipment grounding - The Earth - Earthing practices - Determining safe approach distance - Determining arc hazard category.

Unit 4 Safety Practices **9**

General first aid - Safety in handling hand held electrical appliances tools - Electrical safety in train stations- swimming pools, external lighting installations, medical locations - Case studies.

Unit 5 Standards For Electrical Safety **9**

Electricity Acts - Rules & regulations - Electrical standards - NFPA 70 E-OSHA standards - IEEE standards- National Electrical Code 2005 - National Electric Safety code NESC - Statutory requirements from electrical inspectorate

Prescribed Textbooks:

1. Massimo A. G. Mitolo - Electrical Safety of Low-Voltage Systems, McGraw Hill, USA, 2009.
2. Mohamed El-Sharkawi - Electric Safety - Practice and Standards, CRC Press, USA, 2014.

Reference Books:

1. Kenneth G. Mastrullo, Ray A. Jones - The Electrical Safety Program Book‖, Jones and Bartlett Publishers, London, 2nd Edition, 2011.
2. Palmer Hickman - Electrical Safety - Related Work Practices, Jones & Bartlett Publishers, London, 2009.
3. Fordham Cooper, W. - Electrical Safety Engineering‖, Butterworth and Company, London, 1986.
4. John Cadick, Mary Capelli - Schellpfeffer, Dennis K. Neitzel - Electrical Safety Hand book, McGraw - Hill, New York, USA, 4th edition, 2012.

Web Resources:

1. https://www.youtube.com/watch?v=_s24Gn43mVs
2. https://www.youtube.com/@NOUCS-ey8iq

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A025ET.1	3	2	-	-	2	-	-	-	-	-	-	3	2
23A025ET.2	3	3	-	-	2	-	-	-	-	-	-	3	2
23A025ET.3	3	2	-	-	2	-	-	-	-	-	-	3	3
23A025ET.4	3	2	-	-	3	-	-	-	-	-	-	3	3
23A025ET.5	3	2	-	-	3	-	-	-	-	-	-	3	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course	**INSTRUMENTATION**
Category	**OE-I**
Couse Code	**23A025FT**
Branch/es	**CSE/ECE/ME/Civil**
Year	**III**
Semester	**I**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To Impart knowledge on the characteristics and classifications of signals, along with measurement systems and associated errors.
2. To Familiarize students with various methods of data transmission and telemetry systems for instrumentation.
3. To Provide insights into advanced signal analysis tools like spectrum analyzers and wave analyzers.
4. To Equip students with the knowledge to measure a wide range of non-electrical quantities using appropriate sensors and transducers.
5. To Introduce the architecture and operation of real-time control systems including PLCs, SCADA, and DCS.

Course Outcomes:

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

1. Understand characteristics of signals and measurement system errors.
2. Explain data transmission and telemetry techniques.
3. Understand signal analyzers for waveform and spectral analysis.
4. Analyze non-electrical quantities using appropriate sensors.
5. Apply PLC, SCADA, and DCS in real-time control systems.

Unit 1 Characteristics of Signals and their Representation 10

Measuring Systems, Performance Characteristics, - Static characteristics, Dynamic Characteristics; Errors in Measurement- Gross Errors, Systematic Errors, Statistical Analysis of Random Errors. Signals and their representation: Standard Test, periodic, aperiodic, modulated signal, sampled data.

Unit 2 Data Transmission and Telemetry 10

Methods of Data Transmission – General Telemetry System – Land line Telemetry System – Voltage, Current and position. Land line with feedback system. Frequency Modulation System (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Telemetry. Comparison of FM, PM, PAM and PCM.

Unit 3 Signal Analyzers 10

Wave Analysers- Frequency selective analyzers, Heterodyne, Application of Wave analyzers- Harmonic Analyzers, Total Harmonic distortion, spectrum analyzers, Basic spectrum analyzers, spectral displays, vector impedance meter, Q meter. Peak reading and RMS voltmeters.

Unit 4 Measurement of Non-Electrical Quantities 10

Measurement of strain, Displacement, Velocity, Angular Velocity (DC Tachometer generator, Photoelectric tachometer), acceleration (LVDT), Force (Strain-guage, load cells and LVDT), Torque (Magneto-Strictive), Temperature (Thermocouples and Thermistor), Pressure (Resistive, Inductive, LVDT and capacitive), Flow (electromagnetic flow meter, hot wire anemometer), Liquid level (ultrasonic level gauging, resistive and inductive methods).

Unit 5 Real Time Systems, Scada & Dcs 8

REAL TIME SYSTEMS: PLC's: Programmable logic controllers- Organisation- Hardware details- I/O- Power supply- CPU- Standards.

SACADA: Introduction, SCADA Architecture, Different Communication Protocols, Common System Components, Supervision and Control.

DCS: Introduction, DCS Architecture, Local Control (LCU) architecture, Configuration of DCS, displays, redundancy concept.

Prescribed Text Books:

1. A.K. Sawhney, *A course in Electrical and Electronic Measurements and Instrumentation*. Dhanpat Rai & Co, 2015,7th Edition
2. R.G. Jamkar, *Industrial Automation using PLC, SCADA & DCS*, Global education Ltd. Publication.,2018, 2nd edition.

Reference Books:

1. D O Doeblin, *Measurements Systems, Applications and Design*. McGraw Hill 4th Edition.
2. A.S Morris, *Principles of Measurement and Instrumentation*. Pearson /Prentice Hall of India,2001,3rd edition.
3. H.S.Kalsi, *Electronic Instrumentation*. Tata McGraw-Hill Edition, 3/e,2017.
4. A.D Helfrick and W.D.Cooper, *Modern Electronic Instrumentation and Measurement techniques*. Pearson/Prentice Hall of Indi, 3rd edition.
5. T. R. Padmanabhan, *Industrial Instrumentation – Principles and Design*. Springer,1st edition,2000.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ee112/preview
2. https://info.premierautomation.com/blog/automation-solutions-remote-monitoring-with-telemetry.
3. https://archive.nptel.ac.in/content/syllabus_pdf/108105153.pdf.
4. https://www.panelmatic.com/articles/dcs-vs-plc-vs-scada/

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and the world	Ethics	Individual and collaborative teamwork	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A025FT -1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**3**	**-**
23A025FT -2	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**3**	**-**
23A025FT -3	**3**	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**3**	**2**
23A025FT -4	**3**	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**3**	**2**
23A025FT -5	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course: **ELECTRONIC CIRCUITS**
Category: OE-I
Couse Code: 23A045DT
Branch/es: Civil/EEE/ME/CSE & Allied
Year: III
Semester: I Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
1. To comprehend semiconductor diodes, their characteristics and applications.
2. To explore the operation, configurations, and biasing of BJTs.
3. To study the operation, analysis, and coupling techniques of BJT amplifiers.
4. To learn the operation, applications and uses of feedback amplifiers and oscillators.
5. To analyze the characteristics, configurations, and applications of operational amplifiers.

Course Outcomes:
At the end of the course, the student will be able to
1. Understand semiconductor diodes, their characteristics and applications.
2. Explore the operation, configurations, and biasing of BJTs.
3. Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.
4. Learn the operation, applications and uses of feedback amplifiers and oscillators.
5. Analyze the characteristics, configurations, and applications of operational amplifiers.

Unit 1 Semiconductor Diode and Applications: 12

Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).

Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode .

Unit 2 Bipolar Junction Transistor (BJT) 10

Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.

Unit 3 12

Single stage amplifiers: Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.

Multistage amplifiers: Different Coupling Schemes used in Amplifiers - RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier (Qualitative treatment only).

Unit 4 12

Feedback amplifiers: Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).

Oscillators: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator

Unit 5 **10**

Op-amp: Classification of IC'S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

Applications of op-amp : Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.

Prescribed Textbooks:

1. Electronics Devices and Circuits, J.Millman and Christos. C. Halkias, 3rd edition, Tata McGraw Hill, 2006.
2. Electronics Devices and Circuits Theory, David A. Bell, 5th Edition, Oxford University press. 2008

Reference Books:

1. Electronics Devices and Circuits Theory, R.L.Boylestad, LousisNashelsky and K.Lal Kishore, 12th edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3rd Edition, TMH, 2012
3. Microelectronic Circuits, S.Sedra and K.C.Smith, 5th Edition, Oxford University Press

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A045DT.1	3	3	3	3	-	-	-	-	-	-	-	-	2	2
23A045DT.2	3	3	3	3	-	-	-	-	-	-	-	-	2	2
23A045DT.3	3	3	3	3	-	-	-	-	-	-	-	-	2	2
23A045DT.4	3	3	3	3	-	-	-	-	-	-	-	-	2	2
23A045DT.5	3	3	3	3	-	-	-	-	-	-	-	-	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**JAVA PROGRAMMING**
Category:	Open Elective-1
Couse Code:	23A055ET
Year:	III B. Tech
Semester:	I Semester
Branch:	CE, EEE, ME, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

This course will be able to

1. Identify Java language components and how they work together in applications
2. Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3. Learn how to extend Java classes with inheritance and dynamic binding and how to use exception
4. Understand how to design applications with threads in Java
5. Understand how to use Java apis for program development

Course Outcomes:

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

1. Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.
2. Design and implement classes to model real-world entities, with a focus on attributes, behaviours, and relationships between objects
3. Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.
4. Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.
5. Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.

Unit 1: 10

Object Oriented Programming: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style. Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators. Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break
Statement, Continue Statement.

Unit 2 9

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects

as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

Unit 3 11

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors. Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.
Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

Unit 4 10

Packages and Java Library : Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java. lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto un boxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java..Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.
Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throw able, Unchecked Exceptions, Checked Exceptions.
Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java

Unit 5 11

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer. Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter thread Communication - Suspending, Resuming, and Stopping of Threads.
Java Database Connectivity: Introduction, JDBC Architecture, Installing My SQL and My SQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface
Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Textbooks:

1. JAVA one step ahead, Anitha Seth, B.L. Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

Reference Books:

1. The complete Reference Java, 11thedition, Herbert Schildt, TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Learning Resources**:**
https://nptel.ac.in/courses/106/105/106105191/

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A045DT.1	3	3	3	3	3	-	-	-	-	-	-	-	2	2
23A045DT.2	3	3	3	3	3	-	-	-	-	-	-	-	2	2
23A045DT.3	3	3	3	3	3	-	-	-	-	-	-	-	2	2
23A045DT.4	3	3	3	3	3	-	-	-	-	-	-	-	2	2
23A045DT.5	3	3	3	3	3	-	-	-	-	-	-	-	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE**
Category:	Open Elective-1
Couse Code:	23A055FT
Year:	III B. Tech
Semester:	I Semester
Branch:	CE, EEE, ME, ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	**-**	**-**	**3**

Course Objectives:

This course will be able to

1. To learn the distinction between optimal reasoning Vs. human like reasoning.
2. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
3. To learn different knowledge representation techniques.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes:

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

1. Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities
2. Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
3. Learn different knowledge representation techniques.
4. Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
5. Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.

Unit 1 **8**

Introduction to AI - Intelligent Agents, Problem-Solving Agents, Searching for Solutions - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

Unit 2 **8**

Games – Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic- Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

Unit 3 **10**

First-Order Logic – Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution. Knowledge Representation: Ontological Engineering, Categories and Objects, Events.

Unit 4 **10**

Planning – Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

Unit 5 **8**

Probabilistic Reasoning: Acting under Uncertainty, Basic Probability Notation Bayes'Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

Text Books:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.
2. Artificial Intelligence, Shivani Goel, Pearson Education.

Reference books:

1. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A055FT.1	3	3	3	3	-	-	-	-	-	-	-	-	2	2
23A055FT.2	3	3	3	3	-	-	-	-	-	-	-	-	2	2
23A055FT.3	3	3	3	3	-	-	-	-	-	-	-	-	2	2
23A055FT.4	3	3	3	3	-	-	-	-	-	-	-	-	2	2
23A055FT.5	3	3	3	3	-	-	-	-	-	-	-	-	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**MATHEMATICS FOR MACHINE LEARNING AND AI**
Category:	OE
Couse Code:	23AHS51T
Branch/es:	Common to All Branches
Year	III year
Semester:	I Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
1. To provide a strong mathematical foundation for understanding and developing AI/ML algorithms.
2. To enhance the ability to apply linear algebra, probability, and calculus in AI/ML models.
3. To equip students with optimization techniques and graph-based methods used in AI applications.
4. To develop critical problem-solving skills for analysing mathematical formulations in AI/ML.

Course Outcomes:
At the end of the course, the student will be able to
1. Apply linear algebra concepts to ML techniques like PCA and regression.
2. Analyze probabilistic models and statistical methods for AI applications.
3. Implement optimization techniques for machine learning algorithms.
4. Utilize vector calculus and transformations in AI-based models.
5. Develop graph-based AI models using mathematical representations.

Unit 1 Linear Algebra for Machine Learning **8**
Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigenvalues, eigenvectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

Unit 2 Probability and Statistics for AI **8**
Probability distributions: Gaussian, Binomial, Poisson. Bayes‘ Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP).Entropy and Kullback-Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains.

Unit 3 Optimization Techniques for ML **8**
Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT(Karush-Kuhn-Tucker) conditions. Gradient Descent and its variants (Momentum, Adam) Newton‘s method, BFGS(Broyden-Fletcher-Goldfarb-Shanno) method.

Unit 4 Vector Calculus & Transformations **8**
Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications.

Unit 5 Graph Theory for AI **8**
Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).

Prescribed Textbooks:
1. Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.
2. Pattern Recognition and Machine Learning by Christopher Bishop, Springer.

Reference Books:
1. Gilbert Strang, Linear Algebra and Its Applications, Cengage Learning, 2016.

2. Jonathan Gross, Jay Yellen, Graph Theory and Its Applications, CRC Press, 2018.

Online Learning Resources**:**

3. MIT– Mathematics for Machine Learning https://ocw.mit.edu
4. Stanford CS229 – Machine Learning Course https://cs229.stanford.edu/
5. DeepAI – Mathematical Foundations for AI https://deepai.org

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
23AHS51T.1	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
23AHS51T.2	**3**	**3**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
23AHS51T.3	**3**	**3**	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
23AHS51T.4	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
23AHS51T.5	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**MATERIALS CHARACTERIZATION TECHNIQUES**
Category:	OE
Couse Code:	23AHS52T
Branch/es:	Common to all branches
Year	III Year
Semester:	I Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To provide exposure to different characterization techniques.
2. To explain the basic principles and analysis of different spectroscopic techniques.
3. To elucidate the working of Scanning electron microscope - Principle, limitations and applications.
4. To illustrate the working of the Transmission electron microscope (TEM) - SAED patterns and its applications.
5. To educate the uses of advanced electric and magnetic instruments for characterization.

Course Outcomes:

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

1. Analyze the crystal structure and crystallite size by various methods
2. Analyze the morphology of the sample by using a Scanning Electron Microscope
3. Analyze the morphology and crystal structure of the sample by using Transmission Electron Microscope
4. Explain the principle and experimental arrangement of various spectroscopic techniques
5. Identify the construction and working principle of various Electrical & Magnetic Characterization technique

Unit 1 Structure analysis by Powder X-Ray Diffraction **9**

Introduction, Bragg‘s law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle X- ray scattering (SAXS) (in brief).

Unit 2 Microscopy technique -1 –Scanning Electron Microscopy (SEM) **9**

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

Unit 3 Microscopy Technique -2 - Transmission Electron Microscopy (TEM) **9**

Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy

Unit 4 Spectroscopy techniques **9**

Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

Unit 5 Electrical & Magnetic Characterization techniques **9**

Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

Prescribed Textbooks:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2013.
2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008

Reference Books:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine M. McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, Prentice Hall , 2001 – Science.
3. Practical Guide to Materials Characterization: Techniques and Applications - Khalid Sultan – Wiley – 2021.
4. Materials Characterization Techniques -Sam Zhang, Lin Li, Ashok Kumar -CRC Press - 2008

Online Learning Resources**:**

1. https://nptel.ac.in/courses/115/103/115103030/
2. https://nptel.ac.in/content/syllabus_pdf/113106034.pdf
3. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/

CO-PO Mapping:

Course Outcomes	**Engineering Knowledge**	**Problem Analysis**	**Design/Development of solutions**	**Conduct investigations of complex problems**	**Modern tool usage**	**The engineer and society**	**Environment and sustainability**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-long learning**	**PSO1**	**PSO2**
23AHS52T.1	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**
23AHS52T.2	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**
23AHS52T.3	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**
23AHS52T.4	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**
23AHS52T.5	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**CHEMISTRY OF ENERGY SYSTEMS**
Category:	OE
Couse Code:	23AHS53T
Branch/es:	Common to all branches
Year	III
Semester:	I Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
2. To understand the basic concepts of processing and limitations of Fuel cells & their applications.
3. To impart knowledge to the students about fundamental concepts of photo chemical cells, reactions and applications
4. To know the necessity of harnessing alternate energy resources such as solar energy and its basic concepts.
5. To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method.

Course Outcomes:

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

1. Understand electrochemical concepts and battery technologies with their practical applications.
2. Apply the principles of fuel cell technology to explain their design, working, classification, efficiency, and applications, including PEM and SOFC types.
3. Apply the concepts of photochemical cells to understand their working, specificity, advantages in photo electrocatalytic conversions, and practical applications.
4. Analyze the principles of solar energy conversion to differentiate between photovoltaic and concentrated solar power technologies and evaluate the performance and applications of solar cells.
5. Analyze hydrogen storage and delivery methods by comparing their mechanisms, advantages, and limitations.

Unit 1 Electrochemical Systems **9**

Introduction to electrodes, concepts, electrochemical reactions, Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries – Introduction, primary battery-Zn/air, secondary battery, Lithium-ion batteries and their applications**.**

Unit 2 Fuel Cells **9**

Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells-Methanol oxygen fuel cell, fuel cell, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications.

Unit 3 Photo and Photo electrochemical Conversions **9**

Photochemical cells-Introduction and application, photochemical reactions- Electricity generation using Dye-Sensitized Solar Cells (DSSCs), specificity of photo electrochemical cell (PEC)- Water Splitting (Hydrogen Generation), advantage of photoelectron catalytic conversions and their applications.

Unit 4 Solar Energy **9**

Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells-Types, Construction, working principle of PN junction, and electricity generation through light-induced charge separation and applications**.**

Unit 5 Hydrogen Storage **9**

Introduction-Hydrogen fuel, Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel, and Organic hydrogen carriers.

Prescribed Textbooks:

1. Ira N. Levine Physical Chemistry, 6th edition, McGraw-Hill Education, 2011
2. Bahl, A., Bahl, B. S., & Tuli, G. D. Essentials of physical chemistry. New Delhi: S. Chand. 2010.

Reference Books:

1. Fuel Cell Hand Book, 7th Edition, by US Department of Energy (EG&G technical services and corporation)
2. Arvind, & Shyam. (2018). Handbook of Solar Energy: Theory, Analysis and Applications. Springer.
3. Solar energy fundamental, technology and systems by Klaus Jagar et.al. (2014) Delft University of Technology, Delft.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23AHS53T.1	**3**	**2**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
23AHS53T.2	**3**	**2**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
23AHS53T.3	**3**	**2**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
23AHS53T.4	**3**	**2**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
23AHS53T.5	**3**	**2**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**2**

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**ENGLISH FOR COMPETITIVE EXAMINATIONS**
Category:	**OE**
Couse Code:	**23AHS54T**
Branch/es:	**Common to all branches**
Year	**III B. Tech**
Semester	**I Semester**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To raise awareness of the importance of English for competitive exams
2. To understand the grammatical aspects and identify the errors
3. To enhance verbal ability and identify the errors
4. To enrich vocabulary to face competitive exams and for effective expression
5. To equip learners with the skills and confidence needed to succeed in competitive exams.

Course Outcomes:

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

1. Identify the basics of English grammar and its importance.
2. Explain the use of grammatical structures in sentences.
3. Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams
4. Analyze an unknown passage and reach conclusions about it.
5. Use correct verb forms and improve speed reading and comprehension to excel in competitive exams

Unit 1 GRAMMAR-1 **9**

Nouns-classification-errors-Pronouns-types-errors-Adjectives-types-errors-Articles-definite-indefinite -Adverbs-types- errors-Conjunctions-usage

Unit 2 GRAMMAR-2 **9**

Verbs-tenses- structure-usages- negatives- positives- time adverbs-Sequence of tenses--If Clause-Voice-active voice and passive voice- -Degrees of Comparison -reported Speech-Agreement- subject and verb-Modals-Spotting Errors-Practices.

Unit 3 VERBAL ABILITY **9**

Sentence completion-Verbal analogies-Word Groups-Instructions-Critical reasoning-Verbal deduction- Select appropriate pair-Reading Comprehension-Paragraph-Jumbles

Unit 4 READING COMPREHENSION AND VOCUBULARY **9**

Reading Comprehension Skills-Competitive Vocabulary: Word Building – Memory Techniques-Synonyms, Antonyms, Affixes-Prefix &Suffix-One-word substitutes-Compound Words-Phrasal Verbs-Idioms and Phrases-Homophones- Linking Words-Modifiers-Intensifiers

Unit 5 WRITING FOR COMPETITIVE EXAMINATIONS **9**

Punctuation- Spelling rules- Word Order-Sub Skills of Writing- Paragraph- meaning-salient features-types - Note-making, Note-taking, summarizing-precise writing- Paraphrasing-Expansion of proverbs

Prescribed Textbooks:

1. Wren & Martin, English for Competitive Examinations, S.Chand & Co, 2021
2. Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.

Reference Books:

1. Hari Mohan Prasad, Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.

2. Philip Sunil Solomon, English for Success in Competitive Exams, Oxford 2016
3. Shalini Verma, Word Power Made Handy, S Chand Publications
4. Neira, Anjana Dev & Co. Creative Writing: A Beginner's Manual. Pearson Education India, 2008.
5. Abhishek Jain, Vocabulary Learning Techniques Vol.I&II,RR Global Publishers 2013.
6. Michel Swan, Practical English Usage, Oxford,2006

Online Learning Resources**:**

1. https://www.grammar.cl/english/parts-of-speech.htm
2. https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech
3. https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active-passive-voice
4. https://languagetool.org/insights/post/verb-tenses/
5. https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council
6. https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23AHS54T-1	-	-	-		-	-	-	-	-	3	-	3	3	3
23AHS54T-2	-	-	-	-	-	-	-	-	-	3	-	3	3	3
23AHS54T-3	-	-	-	-	-	-	-	-	-	3	-	3	3	3
23AHS54T-4	-	-	-	-	-	-	-	-	-	3	-	3	3	3
23AHS54T-5	-	-	-	-	-	-	-	-	-	3	-	3	3	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**GREEN BUILDINGS**
Category:	OE-1
Couse Code:	23A015DT
Branch/es:	Civil Engineering
Semester:	V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

The objectives of this course are to make the student:

1. To understand the fundamental concepts of green buildings, their necessity, and sustainable features.
2. To analyze green building concepts, rating systems, and their benefitsin India.
3. To apply green building design principles, energy efficiency measures, and renewable energy sources.
4. To evaluate air conditioning systems, HVAC designs, and energy modeling for sustainable buildings.
5. To assess material conservation strategies, waste management, and indoor environmental qualityin green buildings.

Course Outcomes:

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

1. Understand the importance of green buildings, their necessity, and sustainable features.
2. Analyze various green building practices, rating systems, and their impact on environmental sustainability.
3. Apply principles of green building design to enhance energy efficiency and incorporate renewable energy sources.
4. Evaluate HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design.
5. Assess material conservation techniques, waste reduction strategies, and indoor air quality management in green buildings.

Unit 1 Introduction 8

– Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing A Green Building, Important Sustainable Features for Green Buildings.

Unit 2 Concepts and Practices 8

– Indian Green Building Council, Green Building Movement in India, Benefits Experiencedin Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving Approaches in Buildings, LEED India Rating System, and Energy Efficiency.

Unit 3 Building Design 8

– Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

Unit 4 Air Conditioning 10

– Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modeling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of The Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

Unit 5 Material Conservation 10

– Handling of Non-Process Waste, Waste Reduction During Construction, Materials With Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. Indoor Environment Quality and Occupational Health– Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke.

Prescribed Textbooks:

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.
2. Green Building Hand Book by tom woolley and Sam kimings, 2009.

Reference Books:

1. Complete Guide to Green Buildings by Trish riley.
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009
3. Energy Conservation Building Code –ECBC-2020, published by BEE

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/105/102/105102195/**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and	Life-long learning	**PSO1**	**PSO2**
23A015DT.1	3	-	-	-	-	2	3	-	-	-	-	-	3	3
23A015DT.2	-	3	-	-	2	-	3	-	-	-	-	2	3	3
23A015DT.3	-	-	3	3	3	-	3	-	-	-	-	-	3	3
23A015DT.4	-	-	3	3	3	-	3	-	-	-	-	-	3	3
23A015DT.5	-	-	-	-	-	3	3	3	2	-	-	-	-	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**CONSTRUCTION TECHNOLOGY AND MANAGEMENT**
Category:	OE-1
Couse Code:	23A015ET
Branch/es:	Civil Engineering
Semester:	V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To understand project management fundamentals, organizational structures, and leadership principles in construction.
2. To analyze manpower planning, equipment management, and cost estimation in civil engineering projects.
3. To apply planning, scheduling, and project management techniques such as CPM and PERT.
4. To evaluate various contract types, contract formation, and legal aspects in construction management.
5. To assess safety management practices, accident prevention strategies, and quality management systemsin construction.

Course Outcomes:

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

1. Understand project management fundamentals, organizational structures, and leadership principles in construction.
2. Analyze manpower planning, equipment management, and cost estimation in civil engineering projects.
3. Apply planning, scheduling, and project management techniques such as CPM and PERT.
4. Evaluate various contract types, contract formation, and legal aspects in construction management.
5. Assess safety management practices, accident prevention strategies, and quality management systems in construction.

Unit 1 Introduction: 8

Types of Projects, Management Objectives and Functions; Organizational Chart of a Construction Company; Manager's Duties and Responsibilities; Public Relations; Leadership and Team - Work; Ethics, Morale, Delegation and Accountability.

Unit 2 Man and Machine 8

Man-Power Planning, Training, Recruitment, Motivation, Welfare Measures and Safety Laws; Machinery for Civil Engineering., Earth Movers and Hauling Costs, Factors Affecting Purchase, Rent, and Lease of Equipment, and Cost Benefit Estimation.

Unit 3 Planning, Scheduling and Project Management 8

Planning Stages, Construction Schedules and Project Specification, Monitoring and Evaluation; Bar-Chart, CPM, PERT, Network- formulation and Time Computation.

Unit 4 Contracts **10**

Types of Contracts, formation of Contract – Contract Conditions – Contract for Labour, Material, Design, Construction – Drafting of Contract Documents Based On IBRD/ MORTH Standard Bidding Documents – Construction Contracts – Contract Problems– Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control.

Unit 5 Safety Management 10

Implementation and Application of QMS in Safety Programs, ISO9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety, Occupational Health and Ergonomics.

Prescribed Textbooks:

1. Construction Project Management, S K.Sears, G A.Sears, R H. Clough, John Wiley and Sons, 6th Edition, 2016.
2. Construction Project Scheduling and Control by Saleh Mubarak, 4th Edition, 2019

Reference Books:

1. Brien, J.O. and Plotnick, F.L., CPM in Construction Management, Mc Graw Hill, 2010.
2. Punmia, B.C., and Khandelwal, K.K., Project Planning and control with PERT and CPM, Laxmi Publications, 2002.
3. Construction Methods and Management: Pearson New International Edition 8th Edition Stephens Nunnally.
4. Rhoden, M and Cato B, Construction Management and Organisational Behaviour, Wiley-Blackwell, 2016.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/105/104/105104161/
2. https://archive.nptel.ac.in/courses/105/103/105103093/

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A015ET.1	3	-	-	-	-	2	-	2	2	-	-	-	3	3
23A015ET.2	-	3	-	-	2	-	-	-	-	-	-	2	3	3
23A015ET.3	-	-	3	3	3	-	-	-	-	2	-	-	3	3
23A015ET.4	-	-	3	3	3	-	-	2	-	-	-	-	3	3
23A015ET.5	-	-	-	-	-	3	3	3	2	-	-	-	-	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course: **GEOTECHNICAL ENGINEERING LABORATORY**
Category: PC
Couse Code: 23A0153L
Branch/es: Civil Engineering
Semester: V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamental index properties of soils and their significance ingeotechnical engineering.
2. Perform field and laboratory tests to determine in-situ density and compaction characteristics of soils.
3. Evaluate the engineering properties of soil, including permeability, shear strength, and consolidation.
4. Analyze the strength and deformation characteristics of soils through shear and compression tests.
5. Interpret test results and relate engineering properties of soils to real-world geotechnical problems and design considerations.

Course Outcomes:

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

1. Determine index properties of soil, including specific gravity, grain size distribution, and consistency limits.
2. Conduct field and laboratory compaction tests to evaluate the moisture-density relationship of soil.
3. Evaluate permeability and consolidation characteristics of soil using appropriate laboratory techniques.
4. Analyze the shear strength and compressibility of soil through direct shear, unconfined compression, and tri-axial tests.
5. Integrate test results and engineering judgment to interpret soil behavior and make informed decisionsin geotechnical engineering applications.

LIST OF EXPERIMENTS: -

I. Determination of Index Properties

1. Specific Gravity of Soil
2. Grain Size Distribution – Sieve Analysis
3. Grain Size Distribution - Hydrometer Analysis
4. Liquid Limit and Plastic Limit Tests
5. Shrinkage Limit and Differential Free Swell Tests

II. Determination of In-Situ Density and Compaction Characteristics

1. Field Density Test (Sand Replacement Method)
2. Determination o f Moisture–Density Relationship Using Standard Proctor Compaction Test.

III. Determination of Engineering Properties

1. Permeability Determination (Constant Head Method)
2. Permeability Determination (Falling Head Methods)
3. Determination of Co-Efficient of Consolidation
4. Direct Shear Test in Cohesion Less Soil
5. Unconfined Compression Test in Cohesive Soil
6. Laboratory Vane Shear Test in Cohesive Soil
7. Tri-Axial Compression Test in Cohesion Less Soil
8. California Bearing Ratio Test

Note-80% of the Experiments are to be completed mandatorily

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A0153L.1	3	2	2	2	-	-	-	-	-	2	-	2	3	2
23A0153L.2	3	3	3	2	2	-	-	-	-	-	-	1	3	2
23A0153L.3	3	3	2	2	2	-	-	-	-	-	-	1	3	3
23A0153L.4	3	3	3	2	2	-	-	-	-	-	-	1	3	3
23A0153L.5	2	2	2	1	3	-	-	-	-	2	1	2	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY**
Category:	PC
Couse Code:	23A0156L
Branch/es:	Civil Engineering
Semester:	V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the principles of fluid mechanics and validate fundamental concepts through experiments.
2. Determine discharge coefficients for various flow measurement devices and analyze flow behavior.
3. Evaluate energy lossesin pipes, open channels, and hydraulic jumps to improve flow efficiency.
4. Analyze the impact of jet forces on vanes and their applicationsin hydraulic machinery.
5. Assess the performance characteristics of hydraulic turbines and pumps under different operating conditions.

Course Outcomes:

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

1. Verify Bernoulli‘s equation and apply it to real-life fluid flow problems.
2. Determine the coefficient of discharge for orifices, notches, and flow meters.
3. Evaluate head losses due to friction and minor losses in pipe flow systems.
4. Analyze the impact of jets on vanes and its significance in hydraulic machinery.
5. Assess the performance of turbines and pumps under different conditions and recommend optimal operating parameters.

List of Experiments

1. Verification of Bernoulli’s Equation
2. Determination of Coefficient of Discharge for A Small Orifice by a Constant Head Method
3. Determination of Coefficient of Discharge through Venturimeter/ Orifice Meter
4. Determination of Coefficient of Discharge through Triangular / Rectangular/Trapezoidal Notch
5. Determination of Minor Losses in Pipe Flow
6. Determination of Friction Factor of a Pipeline
7. Determination of Energy Loss in Hydraulic Jump
8. Determination of Manning’s and Chezy‘s Constants for Open Channel Flow
9. Impact of Jet On Vanes
10. Performance Characteristics of Pelton Wheel Turbine
11. Performance Characteristics of Francis Turbine
12. Performance Characteristics of Kaplan Turbine
13. Performance Characteristics of A Single Stage / Multistage Centrifugal Pump

Note-80% of the Experiments are to be completed mandatorily

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A0156L.1	3	2	2	2	-	-	-	-	-	2	-	2	3	2
23A0156L.2	3	3	3	2	2	-	-	-	-	-	-	1	3	2
23A0156L.3	3	3	2	2	2	-	-	-	-	-	-	1	3	3
23A0156L.4	3	3	3	2	2	-	-	-	-	-	-	1	3	3
23A0156L.5	2	2	2	1	3	-	-	-	-	2	1	2	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**ESTIMATION, SPECIFICATIONS, COSTING AND VALUATION**
Category:	SC
Couse Code:	23A0157L
Branch/es:	Civil Engineering
Semester:	V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the various methods and types of estimates used in civil engineering projects.
2. Develop detailed estimates for single and multi-storey buildings using standard estimation methods.
3. Analyze rate analysis, abstract estimation, and bill preparation as per standard procedures.
4. Prepare detailed specifications and tender documents for construction works.
5. Evaluate the valuation, cost escalation, and value analysis of buildings.

Course Outcomes:

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

1. Apply estimation techniques to prepare detailed estimates for various construction projects.
2. Develop abstract estimates and rate analysis for different civil engineering works.
3. Analyze the preparation of measurement books and bill preparation as per AP State Government procedures.
4. Create detailed specifications and tender documents for construction projects.
5. Assess building valuation, cost escalation, and value analysis techniques.

List of Experiments

1. Activity Based on Learning Methods and Types of Estimates
2. Preparation of Detailed Estimate for A Single-Storied Residential Building Using Wall to Wall Method
3. Preparation of Detailed Estimate for A Single Storied Residential Building Using Centre Line Method for Earthwork, Foundations, Super Structure, Fittings Including Sanitary and Electrical Fittings &Paintings.
4. Preparation of Detailed Estimate for A Two Storied Residential Building Using Centre Line Method for Earthwork, Foundations, Super Structure, Fittings Including Sanitary and Electrical Fittings &Paintings.
5. Activity Based Learning of Estimate Data and Rate Analysis
6. Preparation of Abstract Estimate for The Detailed Estimate in Exercise No.3
7. Preparation of Abstract Estimate for The Detailed Estimate in Exercise No.4
8. Writing of Measurement Book and Bill Preparation as Per AP State Govt Procedure for Detailed Estimate in No. 3 and Abstract Estimate of No. 6
9. Writing of Detailed Specifications for Various Items of Estimate and Preparing A Model Tender Document for The Work Listed in No. 3 and 6
10. Activity Based Learning for Valuation of Buildings, Cost Escalation Procedures and Value Analysis for Any One Work

Note-80% of the Experiments are to be completed mandatorily

TEXT BOOKS:
1. B.N. Dutta - Estimating and Costing in Civil Engineering, CBS Publishers & Distributors, 28th Revised Edition (2020). 2. M. Chakraborti - Estimating, Costing, Specification &Valuationin Civil Engineering, 29th Edition (2021).
REFRENCE BOOKS:
1. Rangwala - Estimating, Costing and Valuation, Charotar Publishing House, 2023. 2. Gurcharan Singh - Estimating, Costing and Valuation, Standard Publishers, 2018. 3. V.N. Vazirani& S.P. Chandola - Civil Engineering Estimating & Costing, Khanna Publishers, 4th Edition (2001). 4. D.D. Kohli& R.C. Kohli - A Textbook of Estimating and Costing (Civil), S. Chand Publishing, 2011.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A0157L.1	3	2	2	2	-	-	-	-	-	2	-	2	3	2
23A0158L .2	3	3	3	2	2	-	-	-	-	-	-	1	3	2
23A0158L.3	3	3	2	2	2	-	-	-	-	-	-	1	3	3
23A0158L.4	3	3	3	2	2	-	-	-	-	-	-	1	3	3
23A0158L.5	2	2	2	1	3	-	-	-	-	2	1	2	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**TINKERING LABORATORY**
Category:	SC
Couse Code:	23A0158L
Branch/es:	Civil Engineering
Semester:	V

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course objectives:

1. Encourage Innovation and Creativity
2. Provide Hands-on Learning and Impart Skill Development
3. Foster Collaboration and Teamwork
4. Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship
5. Impart Problem-Solving mind-set

Course Outcomes:

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

1. Construct basic electronic circuits on a breadboard to demonstrate practical applications involving series and parallel connections.
2. Develop and simulate embedded system projects using Arduino and ESP32 platforms for sensor-based automation.
3. Interface sensors and actuators with microcontrollers to implement real-time monitoring and control applications.
4. Design and fabricate simple electromechanical prototypes using 3D modeling and printing tools.
5. Apply design thinking methodology to creatively redesign existing products with a user-centered approach.

List of Experiments

1) Make your own parallel and series circuits using breadboard for any application of your choice.
2) Demonstrate a traffic light circuit using breadboard.
3) Build and demonstrate automatic Street Light using LDR.
4) Simulate the Arduino LED blinking activity in Tinkercad.
5) Build and demonstrate an Arduino LED blinking activity using Arduino IDE.
6) Interfacing IR Sensor and Servo Motor with Arduino.
7) Blink LED using ESP32.
8) LDR Interfacing with ESP32.
9) Control an LED using Mobile App.
10) Design and 3D print a Walking Robot
11) Design and 3D Print a Rocket.
12) Build a live soil moisture monitoring project, and monitor soil moisture levels of a remote plan in your computer dashboard.
13) Demonstrate all the steps in design thinking to redesign a motor bike.

Note-80% of the Experiments are to be completed mandatorily

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A0158L.1	3	2	2	2	-	-	-	-	-	2	-	2	3	2
23A0158L.2	3	3	3	2	2	-	-	-	-	-	-	1	3	2
23A0158L.3	3	3	2	2	2	-	-	-	-	-	-	1	3	3
23A0158L.4	3	3	3	2	2	-	-	-	-	-	-	1	3	3
23A0158L.5	2	2	2	1	3	-	-	-	-	2	1	2	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course: **Design of Steel Structures**
Category: PC
Couse Code: 23A0161T
Branch/es: Civil Engineering
Semester: VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
The objectives of this course are to make the student to:
1. Understand the properties, types, and applications of structural steelin construction.
2. Analyze the behavior and design of bolted and welded connections for steel structures.
3. Design tension and compression members, including built-up members and column bases.
4. Develop steel structural elements such as beams, plate girders, roof trusses, and gantry girders.
5.Apply plastic analysis concepts to the design of continuous beams and portal frames.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Explain the properties of structural steel, types of sections, and the concept of limit state design.
2. Analyze and design bolted and welded connections for structural steel members.
3. Design tension and compression members, including built-up sections and column bases.
4. Develop design solutions for beams, plate girders, roof trusses, and gantry girders.
5. Perform plastic analysis and design of continuous beams and portal frames.

Unit 1 Introduction 8
General-Types of Steel, Section Classifications, Properties of Structural Steel - I.S. Rolled Sections - Concept of Limit State Design - Design of Simple and Eccentric Bolted and Welded Connections - Types of Failure and Efficiency of Joint – Prying Action - Introduction to HSFG bolts

Unit 2 Design of Tension and Compression Members 8
Behaviour and Design of Simple and Built-Up Members Subjected to Tension - Shear Lag Effect Design of Lug Angles - Tension Splice - Behaviour of Short and Long Columns - Euler's Column Theory Design of Simple and Built-Up Compression Members (Lacings and Battens) - Design of Column Bases - Slab Base and Gusseted Base

Unit 3 Design of Beams 8
Design of Laterally Supported and Unsupported Beams - Design of Built-Up Beams – Design of Plate Girders

Unit 4 Design of Industrial Structures 10
Loads on R oof Trusses, Purlins (Angle and Channel Sections) – Truss Design, Design of Joints and End Bearings–Design of Gantry Girder(Demo) - Introduction to Pre-Engineered Buildings(Demo)

Unit 5 Plastic Analysis and Design 10
Theory of Plastic Analysis - Design of Continuous Beams and Portal Frames.

Prescribed Textbooks:
1. Duggal S.K., Design of Steel Structures, Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 2010
2. Bhavikatti S.S, Design of Steel Structures, Ik International Publishing House, New Delhi, 2017.

Reference Books:
1. Gambhir M L, Fundamentals of Structural Steel Design, McGraw Hill Education India Pvt Limited, 2013
2. Jack C. McCormac& Stephen F. C sernak - Structural Steel Design, Pearson, 7th Edition, 2023.

3. William T. Segui & Farid Soleimani - Steel Design, Cengage, 7th Edition, 2023.
4. Sarwar Alam Raz, Structural Design in Steel, New Age International Publishers, 2014

Online Learning Resources:
1.https://nptel.ac.in/courses/105105162

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A0161T.1	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**-**	**1**	**-**	**2**	**2**	**2**	**2**
23A0161T.2	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**-**	**1**	**-**	**2**	**2**	**1**	**1**
23A0161T.3	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**2**	**2**	**2**	**1**
23A0161T.4	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**2**	**2**	**1**	**1**
23A0161T.5	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**2**	**2**	**2**	**2**

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course: **HIGHWAY ENGINEERING**
Category: PC
Couse Code: 23A0162T
Branch/es: Civil Engineering
Semester: VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
The objectives of this course are to make the student to:
1. Understand the history, importance, and planning aspects of highway development in India.
2. Apply geometric design principles for highway alignment, sight distance, and curves.
3. Analyze traffic characteristics, capacity, level of service, and road safety measures.
4. Design flexible and rigid pavements using IRC guidelines.
5. Evaluate highway construction materials, testing methods, and maintenance techniques.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Explain the significance, planning, and alignment of highways.
2. Design geometric elements of highways, including curves, gradients, and sight distances.
3. Analyze traffic flow, capacity, level of service, and implement road safety measures.
4. Design flexible and rigid pavements as per IRC guidelines.
5. Assess construction practices, highway materials, and pavement maintenance techniques.

Unit 1 PLANNED HIGHWAY DEVELOPMENT IN INDIA 8
Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

Unit 2 GEOMETRIC DESIGN of HIGHWAYS 8
Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical Alignment-Gradients- Vertical curves

Unit 3 TRAFFIC CHARACTERISTICS 8
Basic Parameters of Traffic-Volume, Speed and Density – Definitions and their inter relation
– Highway capacity and level of service concept – factors affecting capacity and level of service - Traffic Volume Studies- Data Collection and Presentation-Speed studies- Data Collection and Presentation- - Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams

Unit 4 INTERSECTION DESIGN 10
Conflicts at Intersections- Channelization: Objectives –Traffic Islands and Design Criteria-Types of At-Grade Intersections – Types of Grade-Separated Intersections- R o t a r y Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersections.

Unit 5 PAVEMENT DESIGN 10
Types of Pavements – Difference Between Flexible and Rigid Pavements – Pavement Components – Sub Grade, Sub Base, Base and Wearing Course – Functions of Pavement Components – Design Factors – Flexible Pavement Design Methods – G.I Method, CBR Method, (As Per IRC 37-2002) –Design of Rigid Pavements – Critical Load Positions - Westergaard_S Stress Equations – Computing Radius of Relative Stiffness and Equivalent Radius of Resisting Section – Stresses in Rigid Pavements – Design of Expansion and Contraction Joints in CC Pavements. Design ofDowel Bars and Tie Bars.

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Prescribed Textbooks:

1. Highway Engineering – S.K.Khanna & C.E.G.Justo, Nemchand & Bros., 9th edition(2011).
2. Transportation Engineering, Volume I, C Venkatramaiah, Universities Press, 2015

Reference Books:

1. Principles of Highway Engineering by L.R.Kadiyali, Khanna Publishers.
2. Traffic Engineering and Transportation Planning by L.R.Kadiyali andLal- Khanna Publications 9th edition
3. Highway Engineering – Dr. S.K.Sharma, S.Chand Publishers 2014 edition

Online Learning Resources:

1. https://nptel.ac.in/courses/105101087

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A0162T.1	3	2	2	1	-	-	-	-	-	1	-	2	3	2
23A0162T.2	3	3	3	2	2	-	-	-	-	-	-	1	3	3
23A0162T.3	3	3	3	2	2	-	2	1	-	-	-	1	3	3
23A0162T.4	3	3	3	2	2	-	2	1	-	-	-	1	3	3
23A0162T.5	2	2	2	1	3	-	3	1	-	1	1	2	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**ENVIRONMENTAL ENGINEERING**
Category:	PC
Couse Code:	23A0163T
	Civil Engineering
Branch/es:	
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
The objectives of this course are to make the student to:
1. Understand the sources, demand estimation, and quality parameters of water.
2. Apply water treatment processes for purification and supply.
3. Analyze storage, distribution, and operation of water supply systems.
4. Design sewerage systems, stormwater drainage, and plumbing networks.
5. Evaluate sewage treatment, sludge management, and water reuse methods.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Explain water sources, quality standards, and waterborne diseases.
2. Design unit processes of water treatment plants.
3. Analyze water distribution networks and pumping stations.
4. Design sewerage systems, including stormwater and sanitary sewers.
5. Assess sewage treatment methods and advanced wastewater management techniques

Unit 1 WATER SUPPLY 8
Estimation of Surface and Subsurface Water Resources - Predicting Demand for Water-Impurities of Water and Their Significance - Physical, Chemical and Bacteriological Analysis- Waterborne Diseases - Standards for Potable Water. Intake of Water: Pumping and Gravity Schemes.

Unit 2 WATER TREATMENT 8
Objectives - Unit Operations and Processes - Principles, Functions, and Design of Water Treatment Plant Units, Aerators of Flash Mixers, Coagulation and Flocculation – Clarifloccuator- Plate and Tube Settlers - Pulsator Clarifier - Sand Filters - Disinfection - Softening, Removal of Iron and Manganese - Defluoridation- Softening - Desalination Process - Residue Management - Construction, Operation and Maintenance Aspects

Unit 3 WATER STORAGE AND DISTRIBUTION 8
Storage and Balancing Reservoirs - Types, Location and Capacity. Distribution System: Layout, Hydraulics of Pipe Lines, Pipe Fittings, Valves Including Check and Pressure Reducing Valves, Meters, Analysis of Distribution Systems, Leak Detection, Maintenance of Distribution Systems, Pumping Stations and Their Operations - House Service Connections

Unit 4 SEWERAGE SYSTEM 10
Characteristics and Composition of Sewage - Population Equivalent - Sanitary Sewage FlowEstimation - Sewer Materials - Hydraulics of Flow in Sanitary Sewers - Sewer Design - Storm Drainage-Storm Runoff Estimation - Sewer Appurtenances - Corrosion in Sewers - Prevention and Control – Sewage Pumping-Drainage in Buildings - Plumbing Systems for Drainage- Basics of Underground Drainage System.

Unit 5 SEWAGE TREATMENT AND DISPOSAL 10
Objectives - Selection of Treatment Methods - Principles, Functions, - Activated Sludge Process and Extended Aeration Systems - Trickling Filters - Sequencing Batch Reactor(SBR)- UASB - Waste Stabilization Ponds - Other Treatment Methods - Reclamation and Reuse of Sewage - Recent Advances in

Sewage Treatment - Construction, Operation and Maintenance Aspects. - Discharge Standards-Sludge Treatment -Disposal of Sludge

Prescribed Textbooks:

1. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014
2. Environmental Engineering, I and II by BC Punmia, Std. Publications.

Reference Books:

1. Environmental Engineering, I and II by SK Garg, Khanna Publications.
2. Environmental Pollution and Control Engineering CS Rao,Wiley Publications
3. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
4. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.
5. Water and Waste Water Technology by Mark J Hammar and Mark HammarJr.Wiley, 2007.

Online Learning Resources:

1. https://nptel.ac.in/courses/103107084

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A0163T.1	3	2	2	1	-	3	3	1	-	1	-	2	3	3
23A0163T.2	3	3	3	2	2	2	2	1	-	-	-	1	3	3
23A0163T.3	3	3	3	2	2	2	3	1	-	-	-	1	3	3
23A0163T.4	3	3	3	2	2	2	3	1	-	-	-	1	3	3
23A0163T.5	2	2	2	1	3	3	3	1	-	1	1	2	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**DESIGN OF EARTHQUAKE RESISTANT STRUCTURES**
Category:	**PE – II**
Couse Code:	23A016AT
Branch/es:	Civil Engineering
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
The objectives of this course are to make the student to:

1. **Understand** the fundamental concepts of engineering seismology, including
2. earthquake phenomena, seismic waves, and measuring instruments.
3. **Analyze** the principles of structural vibrations, degrees of freedom, and dynamic response of structures to earthquake ground motions.
4. **Evaluate** conceptual design strategies, seismic design principles, and methods for improving earthquake resistancein structures.
5. **Apply** earthquake-resistant design principles to reinforced concrete and masonry buildings using IS codes and lateral force methods.
6. **Assess** the role of structural walls, non-structural elements, and ductility considerationsin enhancing earthquake resistance.

Course Outcomes:
After successful completion of this course, students will be able to:

1. **Explain** earthquake mechanisms, seismic waves, and seismic zones, including measuring techniques and instruments.
2. **Analyze** vibratory systems, single-degree-of-freedom (SDOF) models, damping effects, and earthquake-induced dynamic forces.
3. **Evaluate** conceptual design strategies, ductility factors, and seismic design methods for ensuring structural resilience.
4. **Apply** IS code provisions and lateral force methods for seismic design of reinforced concrete and masonry buildings.
5. **Assess** the significance of structural walls, non-structural elements, and ductile detailingin enhancing earthquake resistance.

Unit 1 Engineering Seismology: 8

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 Seismogram - Seismoscope, Seismograph, - Strong Ground Motions- Seismic Zones of India.

Theory of Vibrations: Elements of A Vibratory System- Degrees of Freedom-Continuous System- Lumped Mass Idealization-Oscillatory Motion-Simple Harmonic Motion-Free Vibration of Single Degree of Freedom (SDOF) System- Undamped and Damped-Critical Damping-Logarithmic Decrement-Forced Vibrations-Harmonic Excitation-Dynamic Magnification Factor-Excitation By Rigid Based Translation for SDOF System-Earthquake Ground Motion.

Unit 2 Conceptual Design 8

Introduction-Functional Planning-Continuous Load Path-Overall form- Simplicity and Symmetry-Elongated Shapes-Stiffness and Strength-Horizontal and Vertical Members-Twisting of Buildings-Ductility-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 3 Reinforced Concrete Buildings 8

Principles of Earthquake Resistant Deign of RC Members- Structural Models for Frame Buildings - Seismic Methods of Analysis- Is Code Based Methods for Seismic Design - Vertical Irregularities - Plan Configuration Problems- Lateral Load Resisting Systems- Determination of Design Lateral forces as Per Is 1893 (Part-1):2016- Equivalent Lateral force Procedure- Lateral Distribution of Base Shear.

Unit 4 Masonry Buildings 10

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 5 Structural Walls and Non-Structural Elements 10

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 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 13920-2016 - Behaviour of Beams, Columns and Joints in RC Buildings During Earthquakes

Prescribed Textbooks:

1 Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press.

2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, PrenticeHall of India Pvt. Ltd.

Reference Books:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly,John Wiley & Sons.
2. Eartquake Resistant Design of Buidling 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 –AnandS.Arya, Nemchand & Bros
5. Earthquake Tips – Learning Earthquake Design and Construction, C.V.R. Murthy
6. BIS Codes: 1. IS 1893(Part-1):2016 or Latest codes;. 2. IS 13920:2016. 3. IS 4326. IS 456:2000 or latest.

Online Learning Resources:

1. https://nptel.ac.in/courses/105107204

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A016AT.1	3	2	-	-	1	-	3	1	-	2	-	2	2	2
23A016AT.2	3	-	-	-	2	-	3	1	-	2	-	-	-	2
23A016AT.3	3	-	-	3	-	-	3	2	-	2	-	-	-	3
23A016AT.4	3	2	-	3	-	-	3	2	-	2	2	2	3	3
23A016AT.5	3	3	-	3	-	-	3	2	-	2	2	2	3	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**OPEN CHANNEL FLOW**
Category:	PE – II
Couse Code:	23A016BT
Branch/es:	Civil Engineering
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

The objectives of this course are to make the student to:

1. Explain the principles governing fluid flowin pipelines and networks, including steady and unsteady flow conditions.
2. Apply fundamental concepts of uniform and varied flowin open channels for analyzing hydraulic structures and networks.
3. Analyze the behavior of unsteady flowsin open channels, including wave motion and dam break scenarios.
4. Evaluate sediment transport mechanisms and their impact on hydraulic structures, reservoirs, and river morphology.
5. Design and assess hydraulic models, flow measurement devices, and physical models for hydraulic applications.

Course Outcomes:

After successful completion of this course, students will be able to:

1. Describe the fundamental principles of fluid flow in pipelines and networks under steady and unsteady conditions.
2. Solve problems related to uniform and varied flow in open channels using theoretical and computational approaches.
3. Analyze the impact of unsteady flow phenomena such as surges and dam breaksin open channels.
4. Evaluate sediment transport processes and their influence on river morphology and hydraulic structures.
5. Develop and validate hydraulic models for flow measurement and physical modeling applicationsin fluid mechanics.

Unit 1 Hydraulics of Pipelines and Pipe Networks 8

Review of Fluid Mechanics. Reynolds Transport Theorem and Applications. Steady Flow Analysis of Pipe Network Systems. Unsteady Flows - Basic Equations of Water Hammer, Solution by Method of Characteristics. Network Analysis

Unit 2 Steady and Varied Flows In Open Channels 8

Basic Concepts of Uniform Flow. Specific Energy and Specific force Concepts. Dynamic Equation for Spatially Varied Flows. Flow Profile Computations. Introduction to Hec-Ras. Spatially Varied Flows and Rapidly Varied Flows – Applications.

Unit 3 Unsteady Flows in Open Channels 8

Equations of Motion. Uniformly Progressive Wave. Rapidly Varied Unsteady Flow – Positive and Negative Surges. Dam Break Problem

Unit 4 Sediment Transport 10

Sediment Properties – Inception of Sediment Motion – Bed forms. Bed Load Suspended Load– total Sediment Transport. Design of Stable Channels and Regime Channels. Reservoir Sedimentation and Trap Efficiency.

Unit 5 Flow Measurements and Hydraulic Modeling 10

Sharp-Crested Weirs, Broad-Crested Weirs, Critical Depth Flumes. Recent Advancement in Open Channel Flow Measurements. Physical Modeling in Hydraulics. Dimensional Analysis. Modeling Closed Flows and Free Surface Flows. Distorted Models. Design of Physical Models

Prescribed Textbooks:

1. Open Channel Hydraulics, Chow, V.T., McGraw Hill Inc.NYork,1979
2. Flow in Open Channels, Subramanya K., Tata McGraw Hill Pub., N Delhi2015
3. Flow through Open Channels, Rajesh Srivastava, Oxford Univ. Press. N Delhi, 2011

Reference Books:

1. Open Channel Hydraulics, French, R.H., McGraw Hill PubCo.NYork,1986
2. Open Channel Hydraulics, Terry Sturm, Tata McGraw Hill Pub. N Delhi,2011

Online Learning Resources:

1. https://nptel.ac.in/courses/105/106/105106114/

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A016BT.1	3	2	-	-	-	-	-	-	-	-	-	-	2	-
23A016BT.2	3	2	2	1	2	-	-	-	-	-	-	-	2	1
23A016BT.3	2	3	2	2	2	-	-	-	-	-	-	-	3	2
23A016BT.4	2	3	3	3	2	-	-	-	-	-	-	-	3	3
23A016BT.5	2	2	3	3	3	2	-	-	-	-	-	-	3	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course: **FOUNDATION ENGINEERING**
Category: **PE – II**
Couse Code: 23A016CT
Branch/es: Civil Engineering
Semester: VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
The objectives of this course are to make the student to:
1. Understand the need for soil exploration and various methods used in site investigations.
2. Analyze the stability of slopes under different conditions using various stability methods.
3. Apply earth pressure theories to analyze retaining walls and soil pressures.
4. Evaluate the bearing capacity and settlement characteristics of shallow foundations.
5. Assess the load-carrying capacity and settlement of deep foundations, including pile and well foundations.

Course Outcomes:
After successful completion of this course, students will be able to:
1. Explain the principles of soil exploration, field testing, and soil investigation reporting
2. Analyze slope stability using different failure theories and numerical methods.
3. Apply earth pressure theories to determine the stability of retaining walls.
4. Evaluate the bearing capacity and settlement of shallow foundations using theoretical and field methods.
5. Analyze deep foundations, including pile and well foundations, for their load-carrying capacity and settlement.

Unit 1 Soil Exploration 8
Need – Methods of Soil Exploration – Boring and Sampling Methods – Field Tests – Penetration Tests – Plate Load Test – Pressure Meter – Planning of Programme and Preparation of Soil Investigation Report.

Unit 2 Shallow Foundations and Allowable Bearing Pressure 8
Types – Choice of Foundation – Location of Depth – Safe Bearing Capacity – Terzaghi`s, Meyerhoff‘s and Skempton`s Methods
Safe Bearing Pressure Based On N- Value – Allowable Bearing Pressure; Safe Bearing Capacity and Settlement From Plate Load Test – Allowable Settlements of Structures – Settlement Analysis.

Unit 3 Pile Foundation and Well Foundations 10
Types of Piles – Load Carrying Capacity of Piles Based On Static Pile formulae – Dynamic Pile formulae – Pile Load Tests – Load Carrying Capacity of Pile Groups in Sands and Clays – Settlement of Pile Groups
Types – Different Shapes of Wells – Components of Wells –Functions and Design Criteria – Sinking of Wells – Tilts and Shifts

Unit 4 Stability of Slopes 10
Infinite and Finite Earth Slopes – Types of Failures – Factor of Safety of Infinite Slopes – Stability Analysis By Swedish Arc Method, Standard Method of Slices, Bishop‘s Simplified Method – Taylor‘s Stability Number- Stability of Slopes of Earth Dams Under Different Conditions- Seepage-Horizontal and Vertical Filters.

Unit 5 Earth Pressure Theories 10
Rankine‘s Theory of Earth Pressure – Earth Pressures in Layered Soils – Coulomb‘s Earth Pressure Theory – Rebhann‘s and Cullman‘s Graphical Method
RETAINING WALLS: Types of Retaining Walls – Stability of Retaining Walls

Prescribed Textbooks:

1 Geotechnical Engineering by C.Venkataramaiah, New Age Pubilications(2002). Soil Mechanics and Foundation Engineering by Arora, Standard Publishers and Distributors, Delhi 7th edition 2009

3. Soil Mechanics and Foundations by B.C.Punmia, Ashok Kumar Jain andArun Kumar Jain, Laxmi publications Pvt. Ltd., New Delhi 17th edition 2017.

Reference Books:

1. Soil Mechanics and Foundation Engineering by Purushtoma Raj, Pearson Pubilications 2nd edition 2013
2. Principles of Foundation Engineering by Das, B.M., - (1999)–6th edition (Indian edition) Thomson Engineering.
3. Foundation Engineering by V.N.S.Murthy, CRC Press, New Delhi.

Online Learning Resources:

1. https://nptel.ac.in/courses/105/106/105106114/

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A016CT.1	2	1	1	-	-	1	-	-	-	1	-	1	1	1
23A016CT.2	2	2	1	1	2	-	-	-	-	-	-	1	1	1
23A016CT.3	2	2	3	2	2	-	1	-	-	-	-	1	2	2
23A016CT.4	2	1	2	2	3	1	-	-	-	-	-	1	2	1
23A016CT.5	2	2	2	1	2	1	-	-	-	-	-	1	2	1

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**COST EFFECTIVE HOUSING TECHNIQUES**
Category:	**PE – III**
Couse Code:	23A016DT
Branch/es:	Civil Engineering
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
The objectives of this course are to make the student to:
1. Analyze the housing scenario in urban and rural areas, including challenges in housing finance and urban planning.
2. Explore and evaluate innovative low-cost housing technologies for sustainable construction.
3. Investigate alternative building materials and infrastructure services for cost-effective housing solutions.
4. Assess rural housing techniques, including traditional mud housing, soil stabilization, and fire treatment for roofing.
5. Develop strategies for housing in disaster-prone areas, with a focus one earthquake, cyclone, and flood-resistant construction.

Course Outcomes:
After successful completion of this course, students will be able to:
1. Examine the current status of urban and rural housing and analyze the role of finance and planning in housing development.
2. Evaluate and recommend cost-effective construction techniques, including prefabrication and innovative roofing/flooring systems.
3. Assess the feasibility of alternative building materials and infrastructure solutions for low-cost housing.
4. Analyze traditional rural housing methods and propose modern techniques for improving rural housing quality.
5. Design housing solutions for disaster-prone areas by incorporating earthquake, cyclone, and flood-resistant strategies

Unit 1 Housing 8

a**) Current Scenario** :Introducing - Status of Urban Housing - Status of Rural Housing

b**) Finance**: Introducing - Existing Finance System in India – Government Role as Facilitator - Status At Rural Housing Finance – Impedimently In Housing
Finance and Related Issues

c) **Land Use and Physical Planning:** Introduction - Planning of Urban Land - Urban Land Ceiling and Regulation Act - Efficiency of Building Bye Lass - Residential Densities

d**) Housing for Urban Poor**: Introduction - Living Conditions in Slums - Approaches and Strategies for Housing Urban Poor.

Unit 2 Low-Cost Resilient Housing Technology 8

Introduction - Adoption of Innovative Cost Effective Construction Techniques - Adoption of Precast Elements in Partial Prefabrication- Adopting of total Prefabrication of Mass Housing in India- General Remarks On Pre Cast Rooting/Flooring Systems -Economical Wall System - Single Brick Thick Loading Bearing Wall - 19cm Thick Load Bearing Masonry Walls - Half Brick Thick Load Bearing Wall – Fly-Ash Gypsum Thick for Masonry- Stone Block Masonry - Adoption of Precast R.C. Plank and Join System for Roof/Floor inThe Building

U**nit 3 Materials for Low Cost Housing** 10

Alternative Building Materials for Low Cost Housing

Introduction - Substitute for Scarce Materials – Ferro-Cement - Gypsum Boards – Timber Substitutions - Industrial Wastes - Agricultural Wastes - Alternative Building Maintenance

Low Cost Infrastructure Services: Introduction - Present Status - Technological Options - Low Cost Sanitation- Domestic Wall - Water Supply, Energy

Unit 4 Rural Housing: 10

Introduction Traditional Practice of Rural Housing Continuous - Mud Housing Technology Mud Roofs - Characteristics of Mud - Fire Treatment for Thatch Roof - Soil Stabilization - Rural Housing Program

Unit 5 Housing for Disaster Prone Areas: 10

Introduction – Earthquake - Damages to Houses - Traditional Prone Areas - Type of Damages and Railways of Non-Engineered Buildings - Repair and Restore Action of Earthquake Damaged Non-Engineered Buildings Recommendations for Future Constructions. Requirement'sOf Structural Safety of Thin Precast Roofing Units Against Earthquake forces Status of R&D in Earthquake Strengthening Measures - Floods, Cyclone, Future Safety

Prescribed Textbooks:

1. Building materials for low – income houses – International council for building research studies and documentation. Hand book of low cost housing by A.K.Lal – Newage international publishers.
2. Low cost Housing – G.C. Mathur by South Asia Books

Reference Books:

1. Properties of concrete – Neville A.m. Pitman Publishing Limited, London.
2. Light weight concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.
3. Modern trends in housing in developing countries – A.G. Madhava Rao, D.S. Rama chandra Murthy & G.Annamalai. E. & F. N. Spon Publishers.

Online Learning Resources:

1. https://nptel.ac.in/courses/124107001

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A016DT.1	3	2	1	2	-	2	2	-	-	1	-	1	2	2
23A016DT.2	3	3	2	3	2	-	3	-	-	-	-	2	3	2
23A016DT.3	3	2	3	3	2	-	3	-	-	-	-	2	3	3
23A016DT.4	2	3	3	3	2	2	2	-	-	-	-	2	3	3
23A016DT.5	2	3	3	3	3	3	3	-	-	-	-	2	3	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**WATERSHED MANAGEMENT**
Category:	**PE – III**
Couse Code:	23A016ET
Branch/es:	Civil Engineering
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the concept of watershed management, stakeholder roles, pollution sources, and environmental guidelines for water quality.
2. Analyze soil erosion processes, sediment yield, and wetland hydrology, including the role ofwaterin wetland ecosystems.
3. Evaluate surface water and groundwater interactions, wetland water quality, and hydrological models for effective watershed planning.
4. Apply principles of wetland hydrologic assessment, water harvesting, and watershed treatment system design to real-world scenarios.
5. Assess irrigation planning, participatory water management, and water footprint concepts to ensure sustainable water resource utilization.

Course Outcomes:

After successful completion of this course, students will be able to:

1. Explain watershed management concepts, pollution control strategies, and environmental policies related to water quality.
2. Analyze erosion processes, wetland water budgets, and sediment transport models to assess land degradation and conservation needs.
3. Evaluate surface and groundwater interactions, wetland treatment efficiency, and hydrological models for integrated water resource management.
4. Apply water harvesting techniques, hydrologic modeling, and wetland design methods for sustainable watershed management.
5. Assess irrigation water management strategies, drought mitigation policies, and the role of water foot print in agricultural sustainability.

Unit 1 Watershed Management 8

Introduction and Concepts of Watershed Management, Different Stakeholders and Their Relative Importance, Watershed Management Policies and Decision Making, Watershed Management Practices in Arid and Semiarid Regions, Short Term and Long Term Strategic Planning, Types and Sources of Pollution, Environmental Guidelines for Water Quality, Perspective On Recycle and Reuse

Unit 2 Morphometry 8

Soil Erosion - Erosion - Factors Affecting Erosion, Effects of Erosion On Land Fertility and Land Capability, Soil Erosion Modelling, Erosivity and Erodibility - Sediment Yield and Sedimentation- Wetland Definitions and The Role of Water in Wetland Structure and Function, Introduction to Wetland Water Budgets and Hydro-Period Components of The Water Budget: Inflows, Outflows, and Storage, Precipitation and Runoff, Evapotranspiration;

Unit 3 Surface Water Flow **10**

Structures and Channels, Groundwater-Surface Water Exchange in Wetlands, Surface Water Flows Iines and Wetland Hydrology Case Studies, Flow and Mixing in Wetlands Wetland Water Quality Information: Nutrients, Organic/Inorganic Contaminants, Sediments and Colloids, Wetland Transport Models I: Plug Flow, Cstrs and Cstrs in Series; Intro to Method of Moments.

Unit 4 Wet land Hydrology **10**

Physical and Biological Processes, Anthropogenic and Climate Change Impacts On Wetland Hydrology, Modeling Wetland Hydrology, Hydraulics, and Hydrodynamics, Introduction to Wetland Treatment Systems Design - Water Harvesting: Rainwater Harvesting, Catchment Harvesting, Harvesting Structures - Model Watershed – Government and Ngo Projects.

Unit 5 Rain Water Management **10**

Planning and Operation of Irrigation Systems. Conjunctive Use of Water. Participatory Irrigation Management and Integrated Water Resources Management (IWRM), Water Management Policy During Droughts, Effect of Water Shortage on Crops, Introduction to Water Footprint of Crops and Its Applications. Blue, Green and Grey Water Foot Print.

Prescribed Textbooks:

1. T. O. Randhir, Watershed Management: Issues and Approaches, IWA Publishing, 2006
2. J. V. S. Murty, Watershed Management, New Age International, 2013

Reference Books:

1. D. K. Majumdar, Irrigation Water Management, Prentice Hall, 2014
2. K. N. Brooks, P. F. Folliott, J. A. Magner, Hydrology and the Management of Watersheds, Wiley-Blackwell, Fourth edition, 2012
3. E. M. Tideman, Watershed Management: Guidelines for Indian Conditions, Omega Scientific Publishers, 1996
4. R. Rajora, Integrated Watershed Management: Field Manual for Equitable, Productive and Sustainable Development, Rawat Publications, 2019

Online Learning Resources:

1. https://nptel.ac.in/courses/105101010
2. https://nptel.ac.in/courses/126105334

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A016ET.1	3	2	2	2	1	2	3	1	-	2	-	2	2	2
23A016ET.2	3	3	2	3	2	2	3	1	-	2	-	2	2	2
23A016ET.3	3	3	3	3	3	2	3	2	-	2	-	2	3	3
23A016ET.4	3	2	3	3	3	3	3	2	-	2	2	2	3	3
23A016ET.5	3	3	3	3	3	3	3	2	-	2	2	2	3	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**ADVANCED STRUCTURAL ANALYSIS**
Category:	**PE – III**
Couse Code:	23A016FT
Branch/es:	Civil Engineering
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamental concepts of arches, including three-hinged and two-hinged arches, and analyze the effects of horizontal thrust, bending moment, normal thrust, and radial shear.
2. Apply the moment distribution method to analyze single-bay, single-story portal frames with and without side sway.
3. Analyze continuous beams and portal frames using Kani‘s Method, including cases with and without settlement of supports.
4. Solve structural problems using the flexibility method for continuous beams and single-bay portal frames, considering support settlements and side sway effects.
5. Evaluate the stiffness method for analyzing continuous beams and single-bay portal frames with and without side sway, ensuring structural stability and performance.

Course Outcomes:

After successful completion of this course, students will be able to:

1. Explain the behavior of three-hinged and two-hinged arches and analyze the effects of horizontal thrust, bending moment, normal thrust, and radial shear.
2. Apply the moment distribution method to analyze single-bay, single-story portal frames with and without side sway.
3. Analyze continuous beams and portal frames using Kani‘s Method, including cases with and without settlement of supports.
4. Solve structural problems using the flexibility method for continuous beams and single-bay portal frames, considering support settlements and side sway effects.
5. Evaluate the stiffness method for analyzing continuous beams and single-bay portal frames with and without side sway, ensuring structural stability and performance

Unit 1 Analysis of ARCHES: 8

Three Hinged and Two Hinged Arches, Elastic Theory of Arches– Eddy’S Theorem –Determination of Horizontal Thrust, Bending Moment, Normal Thrust and Radial Shear–Effect of Temperature-Determination of Horizontal Thrust Bending Moment, Normal Thrust and Radial Shear–Rib Shortening and Temperature Stresses.

Unit 2 Analysis of Frames by MOMENT DISTRIBUTION METHOD- 8

Single Bay Single Storey Portal Frame Including Sides Way–Substitute Frame Analysis By Two Cycle Method.

Unit 3 Analysis of Frames by KANIs Method: 10

Continuous Beams with and Without Settlement of Supports-Single Bay Single Storey Portal Frames With and Without Side Sway.

Unit 4 Flexibility Methods 10

Flexibility Methods- Introduction-Application to Continuous Beams Including Support Settlements—Analysis of Single Bay Single Storey Portal Frames Without and With Side Sway.

Unit 5 Stiffness Methods 10

Stiffness Methods – Introduction – Application to Continuous Beams Including Support Settlements – Analysis of Single Bay Single Storey Portal Frames Without and With Side Sway.

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Department of Civil Engineering

Prescribed Textbooks:

1. Theory of Structures by Gupta SP, G S Pundit and R Gupta, Vol II, Tata McGraw Hill Publications Company Ltd.
2. Analysis of structures by Vazrani & Ratwani– Khanna Publications.

Reference Books:

1. Theory of structures by Ramamuratam, jain book depot , New Delhi.
2. Structural analysis by R.S. Khurmi, S. Chand Publications, New Delhi.
3. Basic Structural Analysis by K .U. Muthu I.K. International Publishing House Pvt. Ltd.
4. D. S. PrakashRao,–StructuralAnalysis:AUnifiedApproach‖,UniversitiesPress.

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/105/106/105106050/**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A016FT.1	3	2	2	2	1	-	-	-	-	2	-	1	2	2
23A016FT.2	3	3	2	2	2	-	-	-	-	2	-	2	2	2
23A016FT.3	3	3	3	2	2	-	-	-	-	2	-	2	3	2
23A016FT.4	3	2	3	3	3	-	-	-	-	2	1	2	3	3
23A016FT.5	3	3	3	3	3	-	-	-	-	2	1	2	3	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**RENEWABLE ENERGY SOURCES**
Category:	OE
Couse Code:	23A026IT
Branch/es:	CSE/ECE/ME/Civil
Year:	III
Semester:	II

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	--	--	3

Course Objectives:
1. Analyze the working of flat plate and concentrating collectors.
2. Describe the electrical characteristics of solar PV cells/modules and their design considerations.
3. Illustrate the components and types of Wind Energy Conversion Systems (WECS).
4. Examine Emerging Renewable Technologies and their applications.

Course Outcomes:
At the end of the course, the student will be able to…
1. Understand principle operation of various renewable energy sources
2. Identify site selection of various renewable energy sources.
3. Analyze various factors affecting on solar energy measurements, wind energy conversion
4. Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems.
5. Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power.

Unit 1 Solar Energy: 8

Solar radiation - beam and diffuse radiation, solar constant, measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. Flat plate collectors (Liquid, air), Concentrating collectors - Compound Parabolic Concentrator, Parabolic Dish Collector, **Central Receiver System.** Solar water heater, solar industrial heating system.

Unit 2 PV Energy Systems: 10

Advantages and Disadvantages of solar PV system, Electrical characteristics of solar PV cells and modules, Solar cell design considerations, Solar cell, module and array construction, Solar PV cell in series and parallel, Simple numerical problems, Solar power distributed system – off-line, grid connected and hybrid PV systems.

Unit 3 Wind Energy: 8

Factors affecting the distribution of Wind Energy on the Surface of Earth, Nature of winds, Basic block diagram of wind energy conversion systems (WECS), Wind mill components, various types WECS and their constructional features, Site selection considerations, Estimation of wind energy at a place, advantages and disadvantages of wind energy.

Unit 4 Geothermal Energy: 8

Advantages, disadvantages and application of Geothermal Energy, Origin and distribution of Geothermal sources, Geothermal resources - Hydrothermal, Hot dry rock, Magma, Estimation of heat content in the Hot dry rock resource.

Unit 5 Miscellaneous Energy Technologies: 10

Ocean Energy: Ocean Tidal Energy conversion schemes, advantages and limitations.
Wave Energy: Principle of working, energy and power from waves, advantages and limitations.
Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages.
Fuel cell: Principle of working of various types of fuel cells and their working, fuel cell power plant.
Hydrogen Energy: Principle of working of Hydrogen energy and benefits of Hydrogen energy.

Prescribed Text books:

1. G. D. Rai, ―Non-Conventional Energy Sources‖, 4th Edition, Khanna Publishers, 2004.
2. B H Khan , ― Non-Conventional Energy Resources‖, 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.

Reference Books:

1. G. N. Tiwari and M.K.Ghosal, ―Renewable Energy Resource: Basic Principles and Applications‖, Narosa Publishing House, 2004.
2. Stephen Peake, ―Renewable Energy Power for a Sustainable Future‖, Oxford International Edition, 2018.

Online Learning Resources:

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A026IT.1	3	1	-	-	1	1	-	-	-	-	2	1	3
23A026IT.2	3	2	1	1	1	2	-	-	-	1	1	2	3
23A026IT.3	2	3	1	2	2	1	-	-	-	-	1	2	3
23A026IT.4	2	2	3	1	3	-	-	-	1	2	-	3	3
23A026IT.5	1	2	2	1	1	1	2	-	2	-	-	1	3

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Department of Civil Engineering

Title of the Course:	**WIND AND SOLAR ENERGY**
Category:	OE
Couse Code:	23A026JT
Branch/es:	CSE/ECE/ME/Civil
Year:	III
Semester:	II

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	**0**	**0**	**3**

Course Objectives:
1. To provide a survey of the wind energy and solar energy generation technologies
2. To explain the harnessing of these resources
3. To describe the control of generated power based on power electronics.

Course Outcomes:
At the end of the course, the student will be able to…
1. Understand basic physics of wind and solar power generation.
2. Analyze power electronic interfaces for wind and solar generation.
3. Understand energy scenario and the consequent growth of the power.
4. Generation from renewable energy sources.
5. Analyze grid integration of solar and wind energy systems.

Unit 1 Physics of Wind Power: 10
History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics probability distributions, Wind speed and power-cumulative distribution functions, numerical problems

Unit 2 Wind generator topologies: 10
Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent- Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.

Unit 3 The Solar Resource and Solar thermal power generation: 10
The Solar Resource: Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability. Numerical problems on solar geometry. Solar thermal power generation: Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis

Unit 4 Solar photovoltaic: 10
Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms, Converter Control

Unit 5 Network Integration Issues: 10
Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality Challenges in Renewable Integration. Hybrid and isolated operations of solar PV and wind systems

Prescribed Textbooks:

1. G.D. Rai. Non-Conventional Energy Sources. Khanna Publishers, 6th edition, Khanna Publishers, Delhi, 2018.
2. 2. B. H. Khan., Non-Conventional Energy Resources, 3rd edition ,McGraw-Hill Education India,2017

Reference Books:

1. Twidell & Wier, Renewable Energy Resources, CRC Press, Taylor & Francis. 2008
2. T. Ackermann, Wind Power in Power Systems, John Wiley and Sons Ltd., 2005
3. S. P. Sukhatme, Solar Energy: Principles of Thermal Collection and Storage, McGraw Hill, 1984

Online Learning Resources:

1. https://www.youtube.com/watch?v=wIvUiF1gdEE

2.https://www.youtube.com/watch?v=roxuawcqzCA&list=PL9fGaCid4G_a2aSHjm_uVNsYhiQdYMvq

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
1	3	3	2	3	3	-	3	1	-	3	-	3	2	-
2	3	-	1	-	3	2	3	-	-	3	-	3	2	-
3	3	3	3	3	3	2	3	2	1	3	1	3	2	1
4	3	-	3	-	3	-	3	-	-	3	-	3	2	-

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Department of Civil Engineering

Title of the Course:	**AUTOMATION AND ROBOTICS**
Category:	OE
Couse Code:	23A036KT
Branch/es:	MECHANICAL ENGINEERING
Year & Semester:	IV-I

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. To acquire basic knowledge on automation and hardware components of automation.
2. To learn about the automated flow lines, line balancing methods and automated assembly systems.
3. To learn about the robotics and fundamentals of robots with their needs in present trend and the sensors, actuators.
4. To understand robot kinematics, dynamics and to acquire knowledge on importance of trajectory planning in robots.
5. To learn about the robot programming methods and applications of industrial robots.

Course Outcomes:

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

1. Summarize the concepts of an automation and hardware components of automation
2. Analyze the line balancing methods and automated assembly systems, automated flow lines.
3. Summarize the fundamentals of Robots, sensors and actuators.
4. Analyze the Robot kinematics, dynamics and trajectory planning
5. Summarize the concept of robot programming methods and robot applications

Unit 1 Introduction to Automation 12 Hrs

Introduction to Automation, Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation, Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

Unit 2 Automated Flow Lines and Assembly line balancing 12 Hrs

Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

Unit 3 Introduction to Industrial Robotics, actuators and Feedback components 12 Hrs

Introduction to Industrial Robotics: Introduction to Industrial Robotics, Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers.

Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.

Unit 4 Manipulator Kinematics, Manipulator Dynamics and Trajectory Planning 12 Hrs

Manipulator Kinematics: Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics.

Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formations.

Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint

integrated motion - straight line motion.

Unit 5 Robot Programming and Robot Application in Manufacturing 10 Hrs

Robot Programming: Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages.

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and In

Prescribed Textbooks:

1. Automation, Production systems and CIM, M.P.Groover, Pearson Edu 2004. ISBN-10: 9789332572492, ISBN-13: 978-9332572492
2. Introduction to Robotics: Analysis, systems, Applications, Niku Saeed B., PHI New Delhi. ISBN-10: 0130613096

Reference Books:

1. Robotics. Fu KS, McGraw Hill. 2014. ISBN: 9780071822282
2. Introduction to Robtics, Saha, S.K., Second Edition McGraw Hill New Edition 2014. ISBN: 9789332902800.
3. Industrial Robotics, M.P. Groover, TMH 2003. ISBN-10: 007024989X
4. Introduction to Robotics. John J. Craig, Pearson Edu 2017. ISBN: 0133489795

Online Learning Resources:

1. https://youtu.be/oxMdDsud5vg
2. https://www.youtube.com/watch?v=xrwz9IxpMJg&t=1311

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of	Conduct investigations of	Modern tool usage	The engineer and society	Environment and	Ethics	Individual and team work	Communication	Project management	Life-long learning	PSO1	PSO2
23A036KT.1	3	2	1	1	-	-	-	-	-	-	-	3	1	1
23A036KT.2	3	3	2	2	-	-	-	-	-	-	-	3	2	2
23A036KT.3	3	2	1	1	-	-	-	-	-	-	-	3	1	1
23A036KT.4	3	3	2	2	-	-	-	-	-	-	-	3	2	2
23A036KT.5	3	2	1	1	-	-	-	-	-	-	-	3	1	1

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**DIGITAL ELECTRONICS**
Category:	OE II
Couse Code:	23A046GT
Branch/es:	Civil/EEE/ME/CSE & Allied
Year:	III
Semester:	II Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. To analyze combinational circuits like adders, subtractors, and code converters.
3. To explore combinational logic circuits and their applications in digital design.
4. To comprehend sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. To gain knowledge about programmable logic devices and digital IC‘s.

Course Outcomes:

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

1. To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. To analyze combinational circuits like adders, subtractors, and code converters.
3. To explore combinational logic circuits and their applications in digital design.
4. To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. To gain knowledge about programmable logic devices and digital IC‘s.

Unit 1 Logic Simplification and Combinational Logic Design: 10

Review of Boolean Algebra and De Morgan‘s Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

Unit 2 Introduction to Combinational Design 1 15

Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

Unit 3 Combinational Logic Design 2 15

Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

Unit 4 Sequential Logic Design 12

Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

Unit 5 Programmable Logic Devices & Digital IC’s 10

ROM, Programmable Logic Devices (PLA and PAL).
Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de- multiplexer (74x155), comparator (74x85).

Prescribed Textbooks:

1. Digital Design, M.Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999
2. Switching theory and Finite Automata Theory, ZviKohavi and NirahK.Jha, 2nd Edition, Tata McGraw Hill, 2005.

Reference Books:

1. Fundamentals of Logic Design, Charles H Roth,Jr., 5th Edition, Brooks/cole Cengage Learning, 2004.

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CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of	Conduct investigations	Modern tool usage	The engineer and society	Ethics	Individual and team work	Communication	Project management	Life-long learning	**PSO1**	**PSO2**
23A046GT. 1	3	-	3	3	-	-	-	-	-	-	-	2	-
23A046GT. 2	3	2	3	3	-	-	-	-	-	-	-	2	-
23A046GT. 3	3	2	3	3	-	-	-	-	-	-	-	2	-
23A046GT. 4	3	-	3	3	-	-	-	-	-	-	-	2	-
23A046GT. 5	3	2	3	3	-	-	-	-	-	-	-	2	-

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Department of Civil Engineering

Title of the Course:	**OPERATING SYSTEMS**
Category:	OE
Couse Code:	23A056IT
Year:	III B. Tech
Semester:	II Semester
Branch:	CE,EEE,ME,ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1.Understand the fundamental principles of operating systems and their role in managing hardware and software resources.

2.Explore process management techniques, including scheduling algorithms, multithreading, and inter process communication mechanisms.

3.Analyze memory management strategies such as paging, segmentation, and virtual memory to optimize system performance.

4.Evaluate deadlock conditions and file system structures, including resource allocation, disk scheduling, and RAID technologies.

5.Implement security and protection mechanisms to safeguard computer systems from threats and unauthorized access.

Course Outcomes:

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

1.Explain core operating system functions such as process, memory, file, and device management.

2.Analyze scheduling algorithms and IPC mechanisms to enhance process efficiency.

3.Apply memory management techniques to improve system performance.

4.Assess deadlock conditions and propose solutions for resource management.

5.Able to design and implement file systems, focusing on file access methods, directory structure, free space management, and also explore various protection mechanisms,

Unit 1 Operating Systems Overview, System Structures 8

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.

Unit 2 Process Concept, Multithreaded Programming, Process Scheduling, Inter-process Communication 10

Programming: Multithreading models, Thread libraries, Threading issues, Examples. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. Multithreaded algorithms, Multiple processor scheduling, Thread scheduling, Examples. Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem

Unit 3 Memory-Management Strategies, Virtual Memory Management 10

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples. Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples

Unit 4 Deadlocks, File Systems 10

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention. File Systems: Files, Directories, File system implementation, management and optimization. Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation

Unit 5 System Protection, System Security 10

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification. Case Studies: Linux, Microsoft Windows.

Prescribed Textbooks:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Inter-process Communication and File systems.)

Reference Books:

1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition,PHI, 2006.
2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004

Online Learning Resources:

1. *https://nptel.ac.in/courses/106/106/106106144/ http://peterindia.net/OperatingSystems.html*

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of	Conduct investigations	Modern tool usage	The engineer and society	Ethics	Individual and team work	Communication	Project management	Life-long learning	**PSO1**	**PSO2**
23A056IT. 1	3	-	3	3	-	-	-	-	-	-	-	2	-
23A056IT. 2	3	2	3	3	-	-	-	-	-	-	-	2	-
23A056IT. 3	3	2	3	3	-	-	-	-	-	-	-	2	-
23A056IT. 4	3	-	3	3	-	-	-	-	-	-	-	2	-
23A056IT. 5	3	2	3	3	-	-	-	-	-	-	-	2	-

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Department of Civil Engineering

Title of the Course:	**MACHINE LEARNING**		
Category:	**OE**		
Couse Code:	23A056JT		
Year:	III B. Tech		
Semester:	II Semester		
Branch:	CE, EEE, ME, ECE		
Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

This course will be able to

1.Understand the fundamental concepts of machine learning, its types, applications, and data preprocessing techniques.

2.Learn to select, train, evaluate, and improve machine learning models while applying feature engineering techniques.

3.Explore Bayesian methods for concept learning and understand various classification algorithms.

4.Understand regression techniques for predictive modelling and methods to enhance model accuracy.

5.Learn unsupervised learning techniques such as clustering and association rule mining for pattern discovery.

Course Outcomes:

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

1. Explain the significance of machine learning types, applications, and data quality in model building
2. Apply featureengineering methods to improve model performance and interpretability. Implement classification models such as k-NN, Decision Trees, and Random Forest for predictive tasks
3. Implement classification algorithms such as k-NN, Decision Trees, and Random Forests.
4. Analyze regression algorithms and improve model accuracy using optimization techniques.
5. Design clustering models using partitioning and density-based techniques for pattern recognition.

Unit 1 Introduction to Machine Learning & Preparing to Model **8**

Introduction: What is Human Learning? Types of Human Learning, what is Machine Learning? Types of Machine Learning, Problems Not to Be Solved Using Machine Learning,
Applications of Machine Learning, State-of-The-Art Languages/Tools in Machine Learning, Issues in Machine Learning Preparing to Model: Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre- Processing

Unit 2 Modeling and Evaluation &Basics of Feature Engineering 10

Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection

Unit 3 Bayesian Concept Learning & Supervised Learning: Classification **10**

Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network. Supervised Learning: Classification: Introduction**,** Example of Supervised Learning**,** Classification Model**,** Classification Learning Steps**,** Common Classification Algorithms-*k*- Nearest Neighbour (*k*NN), Decision tree, Random forest model, Support vector machines

Unit 4 Supervised Learning: Regression 10

Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving

Accuracy of the Linear Regression Model, Polynomial, Regression Model, Logistic Regression, Maximum Likelihood Estimation.

Unit 5 Unsupervised Learning 10

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning, Clustering – Clustering as a machine learning task, Different types of clustering techniques, Partitioning methods, *K*-Medoids: a representative object-based technique, Hierarchical clustering, Density-based methods-DBSCAN Finding Pattern using Association Rule- Definition of common terms, Association rule, Theapriori algorithm for association rule
learning, Build the a priori principle rules.

Textbooks:

1. Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Reference Books:

1. EthernAlpaydin, ―Introduction to Machine Learning‖, MIT Press, 2004. Stephen Marsland, ―Machine Learning -An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.
2. Andreas C. Müller and Sarah Guido ―Introduction to Machine Learning with
3. Python: A Guide for Data Scientists‖, Oreilly.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of	Conduct investigations	Modern tool usage	The engineer and society	Ethics	Individual and team work	Communication	Project management	Life-long learning	**PSO1**	**PSO2**
23A056JT. 1	3	-	3	3	-	-	-	-	-	-	-	2	-
23A056JT. 2	3	2	3	3	-	-	-	-	-	-	-	2	-
23A056JT. 3	3	2	3	3	-	-	-	-	-	-	-	2	-
23A056JT. 4	3	-	3	3	-	-	-	-	-	-	-	2	-
23A056JT. 5	3	2	3	3	-	-	-	-	-	-	-	2	-

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**OPTIMIZATION TECHNIQUES**
Category:	OE
Couse Code:	23AHS61T
Branch/es:	Common to All Branches
Year	III Year
Semester:	II Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
1. To formulate and solve optimization problems using various techniques.
2. To apply optimization algorithms to real-world problems.
3. To analyze and interpret the results of optimization models.
4. To use optimization software tools to solve problems.

Course Outcomes:
At the end of the course, the student will be able to
1. Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.
2. Interpret the transportation models' solutions and infer solutions to the real-world problems.
3. Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.
4. Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives
5. Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.

Unit 1 Linear programming I **8**

Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Graphical Method for Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method, Big-M method.

Unit 2 Linear programming II: Duality in Linear Programming **8**

Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem

Unit 3 Non-linear programming: Unconstrained optimization techniques **8**

Introduction: Methods of Unconstrained minimization,
Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method

Unit 4 Non-linear programming: Constrained optimization techniques **8**

Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.

Unit 5 Geometric Programming **8**

Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.

Constrained minimization Problems: Solution of a constrained geometric programming problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.

Prescribed Textbooks:

1. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.
2. J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi.

Reference Books:

1. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc24_ee122/preview
2. https://archive.nptel.ac.in/courses/111/105/111105039/
3. https://onlinecourses.nptel.ac.in/noc21_ce60/preview

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23AHS61T.1	3	3	2	2	-	-	-	-	-	-	-	1	-	-
23AHS61T.2	3	2	2	2	-	-	-	-	-	-	-	1	-	-
23AHS61T.3	3	2	2	1	-	-	-	-	-	-	-	1	-	-
23AHS61T.4	2	2	2	1	-	-	-	-	-	-	-	1	-	-
23AHS61T.5	3	3	2	1	-	-	-	-	-	-	-	1	-	-

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**PHYSICS OF ELECTRONIC MATERIALS AND DEVICES**
Category:	OE
Couse Code:	23AHS62T
Branch/es:	Common to all branches
Year	III Year
Semester:	II Semester

Lecture Hours	**Tutorial Hours**	**Practice Hours**	**Credits**
3	-	-	3

Course Objectives:

1. To make the students to understand the concept of crystal growth, defects in crystals and thin films.
2. To provide insight into various semiconducting materials and their properties.
3. To develop a strong foundation in semiconductor physics and device engineering.
4. To elucidate excitonic and luminescent processes in solid-state materials.
5. To understand the principles, technologies, and applications of modern display systems.

Course Outcomes:

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

1. Understand crystal growth and thin film preparation
2. Summarize the basic concepts of semiconductors
3. Illustrate the working of various semiconductor devices
4. Analyze various luminescent phenomena and the devices based on these concepts
5. Explain the working of different display devices

Unit 1 Fundamentals of Materials Science 9

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).

Unit 2 Semiconductors 9

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

Unit 3 Physics of Semiconductor Devices 9

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Heterojunctions, Transistors, MOSFETs.

Unit 4 Excitons and Luminescence 9

Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter- band luminescence, Direct and indirect gap materials.
Photoluminescence: General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot.Electro-luminescence: General Principles of electroluminescence, light emitting diode, diode laser.

Unit 5 Display devices 9

LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays.

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Department of Civil Engineering

Prescribed Textbooks:

1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd.,4thedition, 2021.
2. Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012.

Reference Books:

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition
2. Electronic Materials Science- Eugene A. Irene, Wiley, 2005
3. Electronic Components and Materials, Grover and Jamwal, DhanpatRai and Co., New Delhi., 2012.

NPTEL course links:

1. https://nptel.ac.in/courses/113/106/113106062/
2. https://onlinecourses.nptel.ac.in/noc20_ph24/preview

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23AHS62T.1	3	3	2	2	1	-	-	-	-	-	-	-	2	2
23AHS62T.2	3	3	2	1	1	-	-	-	-	-	-	-	2	2
23AHS62T.3	3	3	2	1	1	-	-	-	-	-	-	-	2	2
23AHS62T.4	3	2	1	1	-	-	-	-	-	-	-	-	2	2
23AHS62T.5	3	3	1	1	-	-	-	-	-	-	-	-	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**CHEMISTRY OF POLYMERS AND APPLICATIONS**
Category:	OE
Couse Code:	23AHS63T
Branch/es:	Common to all branches
Year	III
Semester:	II Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
1. To understand the basic principles of polymers
2. To understand natural polymers and their applications.
3. To impart knowledge to the students about synthetic polymers, their preparation and importance.
4. To enumerate the applications of hydogel polymers
5. To enumerate applications of conducting and degradable polymers in engineering.

Course Outcomes:
At the end of the course, the student will be able to
1. Explain polymerization mechanism and measurement of molecular weight of polymer
2. Describe the physical, chemical properties and applications of natural polymers and modified cellulosics.
3. Explain types of polymerizations, types of polymers and applications.
4. Understand polymer networks, hydrogels, and their applications.
5. Explain classification and mechanism of conducting and degradable polymers.

Unit 1 Polymers-Basics and Characterization 9

Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, copolymerization and coordination polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

Unit 2 Natural Polymers & Modified Cellulosics 9

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.

Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

Unit 3 Synthetic Polymers 9

Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers (PE, PVC), Butadiene polymers (BUNA-S, BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins.

Unit 4 Hydrogels of Polymer Networks 9

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

Unit 5 Conducting and Degradable Polymers 9

Conducting polymers: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping, Applications.

Degradable polymers: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, PHB (Polyhydroxybutyrate) Nylon-6, Polyesters, applications.

Prescribed Textbooks:

1. Fred W. Billmeyer, Jr. is: Billmeyer F. W. A Textbook of Polymer Science, Textbook of Polymer Science (3rd ed.). Wiley-Interscience,1984.
2. Introduction to polymer chemistry, G.S. Mishra, Wiley Eastern Ltd., New Delhi. Newage publishers.

Reference Books:

1. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
2. Advanced Organic Chemistry, B.Miller, Prentice Hall
3. Polymer Science and Technology by Premamoy Ghosh, 3rd edition, McGraw-Hill, 2010

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23AHS63T.1	3	3	2	2	-	-	2	-	-	-	-	1	2	2
23AHS63T.2	2	2	1	1	-	-	2	-	-	-	-	1	2	2
23AHS63T.3	2	2	1	1	-	-	2	-	-	-	-	1	2	2
23AHS63T.4	2	2	1	1	-	-	2	-	-	-	-	1	2	2
23AHS63T.5	2	2	1	1	-	-	2	-	-	-	-	1	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**ACADEMIC WRITING AND PUBLIC SPEAKING**
Category:	OE
Couse Code:	23AHS64T
Branch/es:	Common to all branches
Year:	III B.Tech
Semester	II Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
1. To encourage all-round development of the students by focusing on writing skills
2. To make the students aware of non-verbal skills
3. To enhance analytical skills in academic writing for deeper knowledge enhancement
4. To cultivate proficiency in delivering clear and engaging public speeches

Course Outcomes:
At the end of the course, the student will be able to
1. Understand various elements of Academic Writing
2. Identify sources and avoid plagiarism
3. Demonstrate the knowledge in writing a Research paper
4. Analyze different types of essays
5. Assess the strengths of other speakers and build confidence in delivering impactful presentations to an audience.

Unit 1 Introduction to Academic Writing **9**

Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing.

Unit 2 Academic Journal Article **9**

Art of condensation- summarizing and paraphrasing – Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing – Editing, Proof Reading – Plagiarism.

Unit 3 Essay & Writing Reviews **9**

Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- Sop

Unit 4 Public Speaking **9**

Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation– Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events

Unit 5 Public Speaking and Non-Verbal Delivery **9**

Body Language – Facial Expressions-Kinesics – Proxemics – Haptics – Chronemics -Paralanguage – Signs

Prescribed Textbooks:
1. Critical Thinking, Academic Writing and Presentation Skills: MG University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)
2. Pease, Allan & Barbara. The Definitive Book of Body Language, RHUS Publishers, 2016

Reference Books:
1. Alice Savage, Masoud Shafiei Effective Academic Writing,2Ed.,2014 Oxford University Press.
2. Shalini Verma, Body Language, S Chand Publications 2011.
3. Sanjay Kumar and Pushpalata, Communication Skills 2E 2015, Oxford.

4. Sharon Gerson, Steven Gerson, Technical Communication Process and Product, Pearson, New Delhi, 2014

Online Learning Resources:

1 https://youtu.be/NNhTIT81nH8
2 https://www.youtube.com/watch?v=478ccrWKY-A
3 https://www.youtube.com/watch?v=nzGo5ZC1gMw
4 https://www.youtube.com/watch?v=Qve0ZBmJMh4
5 https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbal-aspects-of-delivery/

CO-PO Mapping:

Course Outcomes	**Engineering Knowledge**	**Problem Analysis**	**Design/Development of solutions**	**Conduct investigations of complex problems**	**Modern tool usage**	**The engineer and society**	**Environment and sustainability**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-long learning**	**PSO1**	**PSO2**
23AHS64T-1	-	-	-		-	-	-	-	-	3	-	3	1	1
23AHS64T-2	-	-	-	-	-	-	-	-	-	3	-	3	1	1
23AHS64T-3	-	-	-	-	-	-	-	-	-	3	-	3	1	1
23AHS64T-4	-	-	-	-	-	-	-	-	-	3	-	3	1	1
23AHS64T-5	-	-	-	-	-	-	-	-	-	3	-	3	1	1

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Department of Civil Engineering

Title of the Course:	**DISASTER MANAGEMENT**
Category:	**OE – II**
Couse Code:	23A016GT
Branch/es:	Civil Engineering
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

The objectives of this course are to make the student :

1. To understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
2. To analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
3. To apply wind engineering principles and computational techniques in designing wind-resistant structures.
4. To evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
5. To assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

Course Outcomes:

After successful completion of this course, students will be able to:

1. Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
2. Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
3. Apply wind engineering principles and computational techniques in designing wind- resistant structures.
4. Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
5. Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

Unit 1 Natural Disasters 8

SENDAI Frame Work, Types of Natural Disasters, Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) (World and India), Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socio-economic Consequences).

Unit 2 Cyclones 8

Cyclones and Their Impact– Climate Change and Its Impact on Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structures in Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters.

Unit 3 Wind Effects 10

Structural Response and Wind Loads– Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Demo on Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects On Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas.

Unit 4 Seismic Risk Assessment 10

Seismology and Earthquake Effects– Causes of Earthquakes, Plate Tectonics, Faults, Seismic Waves; Magnitude, Intensity, Epicenter, Energy Release, and Ground Motions. Earthquake Effects– On Ground, Soil

Rupture, Liquefaction, Landslides. Performance of Ground and Buildings in Past Earthquakes– Behavior of Various Types of Buildings and Structures,
Collapse Patterns; Behavior of Non-Structural Elements Such as Services, Fixtures, and Mountings – Case Studies. Seismic Retrofitting– Weakness in Existing Buildings, Aging, Concepts in Repair, Restoration, and Seismic Strengthening

Unit 5 Seismic Safety 10

General Planning and Design Considerations; Building forms, Horizontal and Vertical Eccentricities, Mass and Stiffness Distribution, Soft Storey Effects, Seismic Effect of Building Configuration. Plan and Vertical Irregularities, Redundancy, and Setbacks. Construction Detailing of Various members, Innovative Construction Materials and Techniques. Local Practices– Traditional Regional Responses.

Prescribed Textbooks:

1. RS Agarwal, Disaster Mnagement in Technology and Culture, Arise Publishers, 2007.
2. Edward A. Keller and Duane E. DeVecchio, Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes, 5th Edition, Routledge, 2019.

Reference Books:

1. Ben Wisner, J.C. Gaillard, and Ilan Kelman (Editors), Handbook of Hazards and Disaster Risk Reduction and Management, 2nd Edition, Routledge, 2012.
2. Damon P. Coppola, Introduction to International Disaster Management, 4th Edition, Butterworth-Heinemann, 2020.
3. Bimal Kanti Paul, Environmental Hazards and Disasters: Contexts, Perspectives and Management, 2nd Edition, Wiley-Blackwell, 2020.

Online Learning Resources:

1. https://nptel.ac.in/courses/124107010 2.
2. https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A016GT.1	3	-	-	-	-	2	-	2	2	-	-	-	3	3
23A016GT.2	-	3	-	-	2	-	-	-	-	-	-	2	3	-
23A016GT.3	3	-	-	3	-	-	3	-	-	2	-	-	-	3
23A016GT.4	-	-	3	-	3	-	-	2	-	-	-	-	3	-
23A016GT.5	-	-	-	3	-	3	3	3	2	-	-	-	-	3

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Department of Civil Engineering

Title of the Course:	**SUSTAINABILITY IN CIVIL ENGINEERING PRACTICES**
Category:	**OE – II**
Couse Code:	23A016HT
Branch/es:	Civil Engineering
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
2. To analyze sustainable construction materials, their durability, and life cycle assessment.
3. To apply energy calculations in construction materials and assess their embodied energy.
4. To evaluate green building standards, energy codes, and performance ratings.
5. To assess the environmental effects of energy use, climate change, and global warming.

Course Outcomes:

Course Outcomes:

After successful completion of this course, students will be able to:

1. Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
2. Analyze sustainable construction materials, their durability, and life cycle assessment.
3. Apply energy calculations in construction materials and assess their embodied energy.
4. Evaluate green building standards, energy codes, and performance ratings.
5. Assess the environmental effects of energy use, climate change, and global warming.

Unit 1 Introduction 8

Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - CO_2 Contribution From Cement and Other Construction Materials.

Unit 2 Materials for Sustainable Construction 8

Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.

Unit 3 Energy Estimate 10

Components of Embodied Energy - Calculation of Embodied Energy for Construction Materials - Energy Concept and Primary Energy - Embodied Energy Via-A-Vis Operational Energy in Conditioned Building - Life Cycle Energy Use

Unit 4 Green Building Regulations 10

Control of Energy Use in Building - ECBC Code, Codes in Neighboring Tropical Countries - OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings – Roel of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building.

Unit 5 Environmental Impact 10

Non-Renewable Sources of Energy and Environmental Impact– Energy Norm, Coal, Oil, Natural Gas - Nuclear Energy - Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change.

Prescribed Textbooks:

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition , Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.

Reference Books:

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practicesin the Built Environment, Butterworth Heinemann Publishers, 2011.
2. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd, 2012.

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/105/105/105105157/**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A016HT.1	3	-	-	-	-	2	3	2	-	-	-	-	3	3
23A016HT.2	-	3	-	-	2	-	3	-	-	-	-	2	3	3
23A016HT.3	-	-	3	3	3	-	2	-	-	2	-	-	3	3
23A016HT.4	-	-	3	3	3	-	3	2	-	-	-	-	3	3
23A016HT.5	-	-	-	-	-	3	3	3	-	-	-	-	-	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**HIGHWAY ENGINEERING LABORATORY**
Category:	PC
Couse Code:	23A0162L
Branch/es:	Civil Engineering
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
The objectives of this course are to make the student to:
1. Understand the properties and behavior of aggregates and bitumen usedin highway construction
2. Perform standard laboratory tests on aggregates and bitumen to evaluate their suitability for road construction.
3. Analyze the strength, durability, and performance characteristics of pavement materials.
4. Assess the quality and compliance of highway materials with standard specifications.
5. Develop hands-on skills for material testing and interpretation of test results.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Determine the physical properties of coarse aggregates, such as specific gravity, water absorption, and shape characteristics.
2. Evaluate the mechanical properties of aggregates, including abrasion resistance, impact strength, and crushing value.
3. Analyze the physical and chemical properties of bituminous materials through standard tests.
4. Perform Marshall stability tests and assess the optimum binder content for bituminous mixes.
5. Interpret test results to assess the suitability of aggregates and bitumen for pavement construction.

List of Experiments: -

I. TEST ON AGGREGATES

1. Specific Gravity Determination of the Coarse Aggregate Sample
2. Determination of Abrasion Value of the Coarse Aggregate Sample.
3. Determination of Impact Value of Coarse Aggregate
4. Determination of Elongation Index of Coarse Aggregate
5. Determination of Flakiness Index of Coarse Aggregate
6. Determination of Aggregate Crushing Value of Coarse Aggregate
7. Determination of Water Absorption Capacity of the Coarse Aggregate Sample.

II. TEST ON BITUMEN

1. Specific Gravity Determination of the Bitumen/Asphalt Sample.
2. Penetration Test on Bitumen.
3. Viscosity Determination of Bituminous Binder .
4. Determination of Softening Point of The Asphalt/Bitumen Sample
5. Determination of Ductility Value of The Bitumen Sample
6. Estimation of Loss of Bitumen On Heating
7. Bitumen Extraction Test

Note- 80% of the experiments are to be conducted mandatorily

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Department of Civil Engineering

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modem tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A0162L.1	3	2	2	2	1	3	3	1	-	1	-	2	3	3
23A0162L.2	3	3	3	2	2	2	2	1	-	-	-	1	3	3
23A0162L.3	3	3	3	2	2	2	3	1	-	-	-	1	3	3
23A0162L.4	3	3	3	2	2	2	3	1	-	-	-	1	3	3
23A0162L.5	2	2	2	1	3	3	3	1	-	1	1	2	2	2

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Department of Civil Engineering

Title of the Course:	**ENVIRONMENTAL ENGINEERING LABORATORY**
Category:	PC
Couse Code:	23A0163L
Branch/es:	Civil Engineering
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
The objectives of this course are to make the student to:
1. Understand the principles and methods of water and wastewater sampling and preservation.
2. Perform standard laboratory tests to determine water quality parameters.
3. Analyze wastewater characteristics and assess pollution levels.
4. Evaluate the effectiveness of treatment processes using chemical and biological tests.
5. Develop hands-on skills in advanced laboratory techniques for environmental monitoring.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Apply appropriate sampling and preservation techniques for water and wastewater.
2. Measure physical and chemical parameters such as turbidity, conductivity, and chlorine content.
3. Analyze key water and wastewater quality indicators like BOD, COD, and TKN.
4. Assess the efficiency of water treatment processes through laboratory tests.
5. Perform microbiological analysis for coli form detection and sludge characterization.

LIST OF EXPERIEMENTS: -
I. ANALYSIS of WATER SAMPLE

1. Sampling and preservation methods for water and wastewater (Demonstration only)
2. Measurement of Electrical conductivity and turbidity
3. Determination of fluoride in water by spectrophotometric method /ISE
4. Determination of iron in water (Demo)
5. Determination of Sulphate in water
6. Determination of Optimum Coagulant Dosage by Jar test apparatus.
7. Determination of available Chlorine in Bleaching powder and residual chlorine in water.
8. Determination of acidity in water
9. Determination of alkalinity in water
10. Determination of Hardness in water

II. ANALYSIS of WASTEWATER SAMPLE

1. Estimation of suspended, volatile and fixed solids
2. Determination of Sludge Volume Index in waste water
3. Determination of Dissolved Oxygen
4. Estimation of B.O.D.
5. Estimation of C.O.D.
6. Determination of TKN and Ammonia Nitrogen in wastewater
7. Determination of total and faecal coliform (Demonstration only)

Note: 80% of the experiments should be covered mandatorily.

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Department of Civil Engineering

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A0163L.1	3	2	2	2	1	3	3	1	-	1	-	2	3	3
23A0163L.2	3	3	3	2	2	2	2	1	-	-	-	1	3	3
23A0163L.3	3	3	3	2	2	2	3	1	-	-	-	1	3	3
23A0163L.4	3	3	3	2	2	2	3	1	-	-	-	1	3	3
23A0163L.5	2	2	2	1	3	3	3	1	-	1	1	2	2	2

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Department of Civil Engineering

Title of the Course:	**BUILDING INFORMATION MODELING**
Category:	SC
Couse Code:	23A0164L
Branch/es:	Civil Engineering
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives: Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamentals of Building Information Modeling (BIM) andAutodesk Revit.
2. Develop proficiency in Revit's basic drawing and editing tools for structural and architectural modeling.
3. Create 3D models of buildings, including walls, floors, ceilings, roofs, stairs, and railings.
4. Analyze different components such as curtain walls, doors, windows, and structural elements.
5. Apply various visualization and detailing techniques to generate callouts, elevations, and sections.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Explain the fundamentals of BIM and Autodesk Revit's interface and workflow.
2. Use basic drawing, editing, and modification tools in Revit for creating and modifying models.
3. Model various architectural elements such as walls, doors, windows, floors, ceilings, and roofs.
4. Construct structural elements including grids, columns, stairs, railings, and ramps.
5. Generate 3D views, sections, and elevations for visualization and detailing purposes.

List of Experiments: -

1. INTRODUCTION to BIM & AUTODESK REVIT - About Autodesk and Autocad, Work flow and BIM, Revit Terms, Overview of The Interface, Starting Projects, Viewing Commands.
2. BASIC DRAWING and EDITING to OLS - Using General Drawing tools, Editing Elements, Working With Modification tools.
3. SETTING UP LEVELS and GRIDS - Setting up Levels and Grids, Creating Structural Grids, Adding Columns, Linking and Importing CAD files.
4. MODELING WALLS modelling walls, Modifying Walls, Model Exterior Shell, Add Interior Walls.
5. WORKING WITH DOORS and WINDOWS Inserting Doors and Windows, Loading Door and Window Types From Library, Creating Additional Door and Window Sizes.
6. WORKING WITH CURTAIN WALLS Creating Curtain Walls, Adding Curtain Grids, Working With Curtain Wall Panels, Attaching Mullions to Curtain Grids.
7. WORKING WITH VIEWS Setting The View Display, Duplicating Views, Adding Callout Views, Elevations and Sections.
8. ADDING COMPONENTS Adding Component, Modifying Component, Working With Elements.
9. MODELING FLOORS Modelling& Modifying Floors, Joining Geometry, Creating Shaft Openings, Creating Sloped Floors.
10. MODELING CEILINGS & ROOFS modelling ceilings, Adding Ceiling Fixtures, Creating Ceiling Soffits, Modelling Roofs
11. MODELING STAIRS and RAILING Creating Component Stairs, Modifying Component Stairs, Working With Railings, Sketching Custom Stairs, Creating Ramps.

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CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A0164L.1	3	2	2	2	3	1	-	-	-	1	-	2	3	3
23A0164L.2	3	3	3	3	3	2	-	-	-	-	-	2	3	3
23A0164L.3	3	3	3	3	3	3	1	-	-	-	-	2	3	3
23A0164L.4	3	3	3	3	3	3	1	-	-	-	-	2	3	3
23A0164L.5	2	2	2	2	3	3	1	-	-	1	1	2	2	2

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Department of Civil Engineering

Title of the Course:	**PREPARATION OF PROJECT REPORTS / TECHNICAL PAPER WRITING AND INTELLECTUAL PROPERTY RIGHTS**
Category:	MC
Couse Code:	
Branch/es:	Civil Engineering
Semester:	VI

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives

1. To enable the students to practice the basic skills of research paper writing
2. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
3. To practice the basic skills of performing quality literature review
4. To help them in knowing the significance of real life practice and procedure of Patents.
5. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

Course Outcomes

1. Identify key secondary literature related to their proposed technical paper writing
2. Explain various principles and styles in technical writing
3. Use the acquired knowledge in writing a research/technical paper
4. Analyses rights and responsibilities of holder of Patent, Copyright, trademarks, International Trademark etc.
5. Evaluate different forms of IPR available at national & international level and develop skill of making search of various forms of IPR by using modern tools and techniques

Unit 1 General 8

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language - highlighting your findings-discussing your limitations -hedging and criticizing -plagiarism and paraphrasing

Unit 2 Sections 8

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problem sand Framing Research Questions- Synopsis

Unit 3 Methods of Paper Publishing 10

publication mechanism: types of Publishing Sources(Journals, Proceedings of Seminars, Conferences and Symphosia (indexed) - proof reading –plagiarism; paper writing; Methodology-discussion-results- citation rules

Unit 4 Intellectual property 10

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, NCIES and treaties, importance of intellectual property rights.

Trade Mark: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting evaluating trade mark, trade mark registration processes.

Unit 5 Law of copy rights 10

Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.Patent law, intellectual property audits.

Prescribed Textbooks:

1. Deborah. E. Bouchoux, intellectual property rights, engage learning india, 2013.
2. Meenakshi raman, sangeeta sharma. Technical communication: principles and practices, oxford.

Reference Books:

1. R.Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli,Intellectual Property Rights Tata Mcgraw Hill, 2001
3. P.Naryan,Intellectual Property Law, 3rd Ed ,Eastern Law House, 2007.
4. Adrian Wallwork. English for Writing Research PapersSecond Edition. Springer Cham Heidelberg New York ,2016.
5. Dan Jones, Sam Dragga, Technical Writing Style.

Online Learning Resources:

1. **https://theconceptwriters.com.pk/principles-of-technical-writing/**
2. **https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriti ng.html**
3. **https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriti ng.html**
4. **https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper- journal/**
5. **https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf**

CO – PO Articulation Matrix:-

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23AHSM61T.1	3	2	2	2	3	1	-	-	-	1	-	2	3	3
23AHSM61T.2	3	3	3	3	3	2	-	-	-	-	-	2	3	3
23AHSM61T.3	3	3	3	3	3	3	1	-	-	-	-	2	3	3
23AHSM61T.4	3	3	3	3	3	3	1	-	-	-	-	2	3	3
23AHSM61T.5	2	2	2	2	3	3	1	-	-	1	1	2	2	2

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Department of Civil Engineering

Title of the Course: **FINITE ELEMENT ANALYSIS**
Category: PC
Couse Code: 23A0171T
Branch/es: Civil Engineering
Semester: **VII**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
1. Understand the fundamental principles of the Finite Element Method (FEM) and its applications in structural analysis.
2. Apply the concepts of elasticity, stress-strain relationships, and displacement functions in FEM.
3. Develop finite element formulations for1D, 2D, and 3D elements.
4. Analyze bar, beam, and plane stress/strain problems using shape functions and stiffness matrices.
5. Implement solution techniques such as numerical integration, static condensation, and element assembly.

Course Outcomes:
At the end of the course, the student will be able to
1. Explain the basic principles, advantages, and limitations of FEMin engineering applications.
2. Derive shape functions and stiffness matrices for 1D bar and beam elements.
3. Analyze continuous beams and plane stress/strain problems using FEM.
4. Develop iso parametric formulation for 2D elements such as CST and LST.
5. Implement solution techniques for assembling elements and solving

Unit 1 **Introduction to Finite Element Method** 8
Equations in Elasticity, Weak form and Strong Form, Stress – Strain Relationships Plane Stress – Plane Strain, Element Shapes – Nodes – Nodal Degree of Freedom, Displacement Function – Natural Coordinates – compatibility Equations.

Unit 2 **Types of Finite Elements** 8
Lagrangian– Serendipity Elements – Hermite Polynomials – Regular, Irregular 2D & 3D Elements – Shape Functions limited Quadratic formulation – One Dimensional Problems – Bar Element – Shape Functions Stiffness Matrix – Stress – Strain Relation

Unit 3 **Beam Stiffness Matrix** 8
Beam Element – Stiffness Matrix - Shape Function– Analysis of Continuous Beams.

Unit 4 **Two-Dimensional FEA** 10
Two-Dimensional Problem – CST – LST Element – Shape Function – Stress – Strain Relations. Isoparametric formulation – Concepts of Isoperimetric Elements for 2D Analysis - Formulation of CST Element.

Unit 5 **Solution Techniques** 10
Numerical Integration, Static Condensation, Assembly of Elements and Solution Techniques for Static Loads.

Prescribed Textbooks:

1. Introduction to finite Elements in Engineering by Tirupathi R. Chandrupatla, and Ashok D. Belegundu, Prentice Hall of India.
2. A first course in Finite Element Method by Daryl L. Logan, 5th Edition, Cengage Learning India Pvt. Ltd.

Reference Books:

1. Finite Element Analysis by P. Seshu, PHI Learning Private Limited
2. Concepts and applications of Finite Element Analysis by Robert D. Cook et al., Wiley India Pvt. Ltd.
3. Applied Finite Element Analysis by G. Ramamurthy, I.K. International Publishing House Pvt. Ltd.

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/105/105/105105041/#**
2. **https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-me43/**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A0171T.1	3	2	2	2	2	-	-	-	-	-	-	2	3	3
23A0171T.2	3	3	3	3	3	-	-	-	-	-	-	2	3	3
23A0171T.3	3	3	3	3	3	-	-	-	-	-	-	2	3	3
23A0171T.4	3	3	3	3	3	-	-	-	-	-	-	2	3	3
23A0171T.5	2	2	2	2	3	-	-	-	-	1	-	2	2	2

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Department of Civil Engineering

Title of the Course:	**BUSINESS ETHICS AND CORPORATE GOVERNANCE**
Category:	OE
Couse Code:	23AHSM7AT
Branches:	Civil Engineering
Semester:	**VII**

Lecture Hours	**Tutorial Hours**	**Practice Hours**	**Credits**
3	-	-	3

Course Objectives:

1. To make the student understand the principles of business ethics
2. To enable them in knowing about the ethics in management
3. To facilitate the student 'role in corporate culture
4. To impart knowledge about the fair-trade practices
5. To encourage the student in knowing about the corporate governance

Course Outcomes:

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

1. Understand the Ethics and different types of ethics.
2. Understand business ethics and ethical practices in management
3. Understand the role of ethics in management
4. Apply the knowledge of professional ethics & technical ethics
5. Analyze corporate law, ethics, codes & principles

Unit 1 Ethics 8

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior, Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management-Corporate Social Responsibility – Issues of Management – Crisis Management.

Unit 2 Ethics In Management 8

Introduction-Ethics in production, finance, Human resource management and Marketing Management - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics.

Unit 3 Corporate Culture 8

Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

Unit 4 Legal Frame Work 10

Law and Ethics -Agencies enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

Unit 5 Corporate Governance 10

Introduction - Meaning – Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams - Committees in India and abroad, corporate social responsibility. BoDs composition, Cadbury Committee - Various committees - Reports - Benefits and Limitations.

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Prescribed Textbooks:

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017
2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010

Reference Books:

1. Dr. K. Nirmala, KarunakaraReaddy. *Business Ethics and Corporate Governance*, HPH
2. H.R.Machiraju: *Corporate Governance*, HPH, 2013
3. K. Venkataramana, *Corporate Governance*, SHBP.
4. N.M.Khandelwal. *Indian Ethos and Values for Managers*

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc21_mg46/
2. https://archive.nptel.ac.in/courses/110/105/110105138/
3. https://onlinecourses.nptel.ac.in/noc21_mg54/
4. https://onlinecourses.nptel.ac.in/noc22_mg54/
5. https://archive.nptel.ac.in/courses/109/106/109106117

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23AHSM7AT.1	1	1		1		2			1	1		2		2
23AHSM7AT.2	1	1		1		2			1	1		2		2
23AHSM7AT.3	1	1		1		2			1	1		2		2
23AHSM7AT.4	1	2		1		2			1	2		2		2
23AHSM7AT.5	1	-		1		2			1	1		2		2

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Department of Civil Engineering

Title of the Course:	**E-Business**
Category:	OE
Couse Code:	23AHSM7BT
Branch/es:	Civil Engineering
Semester:	**VII**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To provide knowledge on emerging concept on E-Business related aspect.
2. To understand various electronic markets & business models.
3. To impart the information about electronic payment systems & banking.
4. To create awareness on security risks and challenges in E-commerce.
5. To the students aware on different e-marketing channels & strategies.

Course Outcomes:

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

1. Remember E-Business & its nature, scope and functions.
2. Understand E-market-Models which are practicing by the organizations
3. Apply the concepts of E-Commerce in the present globalized world.
4. Analyze the various E-payment systems & importance of net banking.
5. Evaluate market research strategies & E-advertisements.

Unit I Electronic Business 8

Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)-Advantages & Disadvantages of E-Commerce – E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries.

Unit 2 Electronic Markets and Business Models 8

Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions-B2B Portals in India

Unit 3 Electronic Payment Systems: 8

Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e-wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage -Electronic Fund Transfer (EFT): Role in business transactions -Infrastructure requirements and regulatory aspects of e-payment

Unit 4 E-Security 10

Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) - Firewalls in securing e-business platforms.

Unit 5 E-Marketing: 10

Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– – E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM)

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Prescribed Textbooks:

1. Arati Oturkar&Sunil Khilari. *E-Business*. Everest Publishing House, 2022
2. P.T.S Joseph. *E-Commerce*, Fourth Edition, Prentice Hall of India, 2011

Reference Books:

1. Debjani, Kamalesh K Bajaj. *E-Commerce*, Second Edition Tata McGraw-Hill's, 2005
2. Dave Chaffey.E-Commerce E-Management, Second Edition, Pearson, 2012.
3. Henry Chan. E-Commerce Fundamentals and Application, Raymond Leatham Wiley India 2007
4. S. Jaiswal. E-Commerce Galgotia Publication Pvt Ltd., 2003.

Online Learning Resources:
https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771
https://www.slideshare.net/VikramNani/e-commerce-business-models

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23AHSM7BT.1	2	-	-	-	2	-	-	-	-	-	2	-	2	2
23AHSM7BT.2	2	-	-	-	2	-	-	-	-	-	-	-	2	2
23AHSM7BT.3	-	3	3	-	2	-	-	-	-	-	-	-	2	2
23AHSM7BT.4	-	-	-	-	2	3	2	-	-	-	-	2	2	2
23AHSM7BT.5	2	-	-	-	2	-	-	-	-	-	3	-	2	2

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Department of Civil Engineering

Title of the Course:	MANAGEMENT SCIENCE
Category:	OE
Couse Code:	23AHSM7CT
Branch/es:	Civil Engineering
Semester:	**VII Semester**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To provide fundamental knowledge on Management, Administration, Organization & its concepts.
2. To make the students understand the role of management in Production.
3. To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts
4. To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
5. To make the students aware of the contemporary issues in modern management.

Course Outcomes:

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

1. Remember the concepts & principles of management and designs of organization in a practical world
2. Understand the knowledge of Work-study principles & Quality Control techniques in industry
3. Apply the process of Recruitment & Selection in organization.
4. Analyze the concepts of HRM & different training methods.
5. Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project.

Unit 1 INTRODUCTION TO MANAGEMENT 8

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor ‘s Scientific Theory-Henry Fayol ‘s principles - Elton Mayo ‘s Human relations - **Organizational Designs** - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

Unit 2 OPERATIONS MANAGEMENT 8

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- **Material Management -** Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - **Marketing Management -** Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle. principles in real life industry.

Unit 3 HUMAN RESOURCES MANAGEMENT (HRM) 8

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process - Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

Unit 4 STRATEGIC & PROJECT MANAGEMENT 10

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis.

Project Management - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

Unit 5 CONTEMPORARY ISSUES IN MANAGEMENT 10

Customer Relations Management (CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management (SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re-engineering and Bench Marking - Knowledge Management – change management –sustainability and corporate social responsibility.

Prescribed Textbooks:

1. Frederick S. Hillier, Mark S. Hillier. ***Introduction to Management Science*****,** October 26, 2023

2. A.R Aryasri, *Management Science*, TMH, 2019

Reference Books:

1. Stoner, Freeman, Gilbert.*Management*, Pearson Education, New Delhi, 2019.
2. Koontz & Weihrich, *Essentials of Management*, 6/e, TMH, 2005.
3. Thomas N.Duening & John M.Ivancevich, *Management Principles and Guidelines*, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Samuel C.Certo, *Modern Management*, 9/e, PHI, 2005

Online Learning Resources:

1. https://www.slideshare.net/slideshow/introduction-to-management-and-organization-231308043/231308043
2. https://nptel.ac.in/courses/112107238

CO-PO Mapping:

Course Outcomes	**Engineering Knowledge**	**Problem Analysis**	**Design/Development of solutions**	**Conduct investigations of complex problems**	**Modern tool usage**	**The engineer and society**	**Environment and sustainability**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-long learning**	**PSO1**	**PSO2**
23AHSM7CT.1	2	1	2	-	1	-	-	-	-	-	-	-	1	2
23AHSM7CT.2	2	2	2	1	1	1	1	1	1	1	1	1	2	
23AHSM7CT.3	1	1	-	1	-	-	1		2	1	1		1	1
23AHSM7CT.4	2	2	2	1	1	1	-	-	-	-	-	-	1	1
23AHSM7CT.5	2	2	2	1	1		2		1	-	-	-	1	1

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**GEO SYNTHETICS AND REINFORCED EARTH STRUCTURES**
Category:	**PE**
Couse Code:	23A017AT
Branch/es:	Civil Engineering
Semester:	**VII**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. Understand the concept and applications of reinforced earth, including frictioncoefficient determination.
2. Analyze the classification, functions, and durability aspects of geosynthetics and their advantages over conventional materials.
3. Design reinforced earth retaining walls considering stability mechanisms and material selection.
4. Evaluate the performance of reinforced embankments and their foundation mattresses for settlement and stability control.
5. Develop reinforced soil beds and analyze reinforced pavements using standard design approaches.

Course Outcomes:

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

1. Explain the fundamentals of reinforced earth and analyze the effects of reinforcement on soil properties.
2. Compare different types of geosynthetics, their functions, and durability aspects in geotechnical applications.
3. Design reinforced earth retaining walls considering stability mechanisms and reinforcement layouts.
4. Evaluate reinforced embankments and foundation mattresses with respect to settlement and load-bearing capacity.
5. Design and analyze reinforced pavements and soil beds using standard methodologies.

Unit 1 Reinforced Earth: 8

Concept, Effects of Reinforcement on Soils – Equal Confining and Psuedo Cohesion Concepts, Materials, Friction Coefficient – Definition, Laboratory Determination, Factors Affecting Fiction Coefficient; Application of Reinforced Earth

Unit 2 Geosynthetics 8

- Advantages Over Conventional Materials - Classification Based on Material, Type and Function - Types of Geosynthetics - Functions of Geosynthetics - Tests On Geosynthetics - Durability Aspects of Geosynthetics - Applications of Geosynthetics

Unit 3 Reinforced Earth Retaining Walls 8

Introduction, Stability Mechanisms, Design of Reinforced Earth Retaining Wall - Selection of Materials - Geotechnical Analysis - Reinforcement Layout and Spacing - Stability Analysis - Advantages Over Conventional Retaining

Unit 4 Reinforced Embankments 10

Introduction, Design of Reinforced Embankment, Foundation Mattress Below the Embankment - Purpose and Function of Foundation Mattresses - Components of Reinforced Mattress - Design of Reinforced Mattress - Design Calculations for Settlement Control, Bearing Capacity, and Long-Term Performance. Field Implementation and Monitoring Techniques

Unit 5 Reinforced Soil Beds 10

Introduction, Factors Affecting The Behaviour of Reinforced Soil Beds, Analysis and Design Reinforced Pavements: Benefits of Placing Reinforcementin Flexible Pavement Layers, Design of Reinforced Pavements By Giroud andNoiray Approach and Modified CBR Method.

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Department of Civil Engineering

Prescribed Textbooks:

1. An Introduction to Soil Reinforcement and Geosynthetics‖ By G.L. Siva Kumar Babu, University Press
2. Fundamentals of Geosynthetics Engineering, Sanjay Kumar Shukla andJian-Hua Yin, CRC Press, 2017, 1st edition.

Reference Books:

1. Designing with Geosynthetics by Robert M Koerner, R.M. Pearson Education Inc., 2012, 6th edition
2. Advances in Geosynthetics by G. Venkatappa rao, Sai Master Geo environmental Services Pvt. Ltd. Publications
3. Designing with Geosynthetics, Koerner, R.M., Pearson Education Inc., 2012, 6th edition
4. IS:13162-1992; IS:14293& 94-1995; IS:14324-1995; IS:14714-1999, Geotextiles –Methods of Tests
5. IRC: SP:102-2014: Guidelines for design and construction of reinforced soil walls

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/105/106/105106052/**
2. **https://onlinecourses.nptel.ac.in/noc20_ce06/preview**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A017AT	2	1	1	1	-	1	1	-	-	1	-	1	1	1
23A017AT	2	1	2	1	1	-	1	-	-	-	-	1	1	1
23A017AT	2	1	2	1	1	-	1	-	-	-	-	1	1	1
23A017AT	2	1	2	1	1	1	1	-	-	-	-	1	1	1
23A017AT	2	1	2	1	1	1	2	-	-	-	-	1	2	1

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**RAILWAYS, AIRPORTS, DOCKS AND HARBOR ENGINEERING**
Category:	**(PE – IV)**
Couse Code:	23A017BT
Branch/es:	Civil Engineering
Semester:	**VII**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. Understand the components and geometric design principles of railway tracks.
2. Analyze the principles of railway track design, signaling, and interlocking.
3. Evaluate airport site selection, runway orientation, and terminal area planning.
4. Design runways and taxiways based on aircraft characteristics and geometric elements.
5. Assess the requirements and classification of ports, harbors, docks, and navigation aids.

Course Outcomes:

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

1. Explain railway track components, functions, and requirements.
2. Apply geometric design principles to railway track layout and interlocking systems.
3. Evaluate airport planning aspects, including site selection, runway design, and terminal planning.
4. Design runways and taxiways based on geometric standards and safety regulations.
5. Analyze ports and harbor structures, including docks, breakwaters, and navigation aids.

Unit 1 Railway Engineering 8

Introduction – Permanent Way Components – Cross Section of Permanent Way – Functions and Requirements of Rails, Sleepers and Ballast – Types of Gauges – Creep of Rails – Theories Related to Creep – Coning of Wheels – Adzing of Sleepers – Rail Fastenings-

Unit 2 Geometric Design of Railway Track 8

Gradients – Grade Compensation – Can't and Negative Super Elevation – Can't Deficiency –Degree of Curves – Safe Speed on Railway Track – Points and Crossings – Layout and Functioning of Left Hand Turn Out and Right-Hand Turn Outs – Station Yards – Signalling and Interlocking, Introduction to tunnelling.

Unit 3 Airport Engineering 8

Airport Site Selection – Factors Affecting Site Selection and Surveys- Runway Orientation –Wind Rose Diagram – Basic Runway Length – Correction for Runway Length – TerminalArea – Layout and Functions – Concepts of Terminal Building – Simple Building, Linear Concept, Pier Concept and Satellite Concept – Typical Layouts

Unit 4 Geometric Design of Runways and Taxiways 10

Aircraft Characteristics – Influence of Characteristics on Airport Planning and Design –Geometric Design Elements of Runway – Standards and Specifications - Functions of Taxiways – Taxiway Geometric Design – Geometric Elements and Standard Specifications – Runway and Taxiway Lighting.

Unit 5 PORTS AND HARBORS 10

Harbours - Requirements of Ports and Harbors – Types of Ports – Classification of Harbors – Docks and Types of Docks – Dry Docks, Wharves and Jetties – Breakwaters: Layouts of Different Types of Harbors and Docks – Dredging Operations – Navigation Aids

Prescribed Textbooks:

1. A Text Book of Railway Engineering-S.C.Saxena andS.Arora, Dhanpatrai and Sons, New Delhi 2010.
2. Highway, railway, Airport andHarbour Engineering – K.P. Subramanian, Scitech Publishers.

Reference Books:

1. Harbour, Dock and Tunnel Engineering – R. Srinivasan, Charotar Publishing House Pvt. Limited, 2009.
2. Railway Track Engineering by J.S.MundreyMcGraw Hill Education 5th edition 2017.
3. A Text book of Transportation Engineering – S.P.Chandola – S.Chand& Co. Ltd.2001.

Online Learning Resources:

1.https://nptel.ac.in/courses/105107123
2.https://archive.nptel.ac.in/courses/114/106/114106025/
3.https://www.mkube.co.in/product-detail/railways-airports-docks-and-harbour- engineering

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A017BT.1	3	1	1	-	-	1	-	-	-	1	-	1	1	1
23A017BT.2	3	2	2	1	2	-	-	-	-	-	-	1	2	1
23A017BT.3	3	2	3	2	2	-	1	-	-	-	-	1	2	2
23A017BT.4	3	1	2	2	3	1	-	-	-	-	-	1	2	2
23A017BT.5	3	2	2	1	2	1	-	-	-	-	-	1	2	1

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**EXPERIMENTAL STRESS ANALYSIS**
Category:	**PE**
Couse Code:	23A017CT
Branch/es:	Civil Engineering
Semester:	VII

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
1. Understand the principles and advantages of experimental stress analysis.
2. Explain strain measurement techniques using strain gauges and their applications.
3. Analyze strain rosettes and apply non-destructive testing methods for concrete.
4. Understand the fundamental principles of photoelasticity and its applications.
5. Apply two-dimensional photoelasticity methods for stress analysis in materials

Course Outcomes:
At the end of the course, the student will be able to
1. Explain the principles and merits of experimental stress analysis.
2. Demonstrate strain measurement using various strain gauge techniques.
3. Analyze strain rosette data and evaluate concrete structures using NDT methods.
4. Apply the theory of photoelasticity to determine stress distributions in materials.
5. Utilize two-dimensional photoelasticity techniques for experimental stress analysis.

Unit 1 Introduction 8

Merits of Experimental Analysis Introduction, Uses of Experimental Stress Analysis, Advantages of Experimental Stress Analysis, Different Methods –Simplification of Problems

Unit 2 Strain Measurement 8

Definition of Strain and Its Relation of Experimental Determinations Properties of Strain- Gauge Systems- Types of Strain Gauges –Mechanical, Acoustic and Optical Strain Gauges, Electrical Strain Gauges - Inductance Strain Gauges – LVDT – Resistance Strain Gauges – Various Types –Gauge Factor – Materials of Adhesion Base, Correction to Temperature effects.

Unit 3 Strain Rossettes 8

Introduction – Three Elements Rosette - Rosette Corrections for Transverse Strain Gauge, Mounting Methods of Strain Gauges, Ultrasonic Pulse Velocity Method –Application to Concrete. Hammer Test – Application to Concrete.

Unit 4 Photo Elasticity 10

Introduction –Temporary Double Refraction – The Stress Optic Law –Effects of Stressed Model in A Polar Scope for Various Arrangements – Fringe Sharpening. Brewster ‘s Stress Optic Law

Unit 5 Two-Dimensional Analysis 10

Introduction – Isocratic Fringe Patterns- Isoclinic Fringe Patterns Passage of Light Through Plane Polariscope and Circular Polariscope - Isoclinic Fringe Patterns – Compensation Techniques – Calibration Methods – Separation Methods – Scaling Model to Prototype Stresses – Materials for Photo – Elasticity Properties of Photo elastic Materials.

Prescribed Textbooks:
1. Experimental stress analysis by J.W. Dally and W. F. Riley, College House Enterprises 2005
2. Experimental stress analysis by Dr. Sadhu Singh Khanna Publishers 4^{th} edition

Reference Books:

1. Experimental Stress analysis by U.C. Jindal, Pearson Publications 2012 edition
2. Experimental Stress Analysis by L.S. Srinath, MC. Graw Hill Company Publishers

Online Learning Resources:

1.**https://archive.nptel.ac.in/courses/112/106/112106068/#**
2.**https://archive.nptel.ac.in/courses/112/106/112106198/#**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A017CT.1	3	2	-	-	-	2	-	-	-	1	-	1	1	1
23A017CT.2	3	2	2	2	2	3	-	-	-	-	-	1	2	2
23A017CT.3	2	2	3	2	2	3	2	-	-	-	-	1	2	2
23A017CT.4	3	2	2	2	2	3	2	-	-	-	-	1	2	2
23A017CT.5	2	2	2	2	2	3	2	-	-	-	-	1	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**GROUND IMPROVEMENT TECHNIQUES**
Category:	**PE**
Couse Code:	23A017DT
Branch/es:	Civil Engineering
Semester:	**VII**

Lecture Hours	**Tutorial Hours**	**Practice Hours**	**Credits**
3	-	-	3

Course Objectives:

1. Understand various dewatering methods, including sumps, well points, and electro- osmosis, for effective groundwater control.
2. Analyze the properties and applications of grouts, grouting techniques, and post- grouting tests for soil and rock stabilization.
3. Evaluate different densification techniques for granular and cohesive soils, such as vibro-compaction, preloading, and thermal methods.
4. Apply stabilization techniques, including mechanical, chemical, and bituminous stabilization, to improve soil properties.
5. Assess the design principles of reinforced earth walls and the role of geosynthetics in soil improvement and slope stability.

Course Outcomes:

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

1. Explain the methods of dewatering and grouting and their importance in foundation engineering.
2. Analyze densification techniques for granular and cohesive soils to enhance soil strength.
3. Evaluate the effectiveness of soil stabilization methods for different ground conditions.
4. Apply reinforced earth principles and geosynthetics for soil retention and foundation stability.
5. Assess expansive soil problems, their identification methods, and suitable foundation techniques like under-reamed piles.

Unit 1 Expansive Soils 8

Problems of Expansive Soils – Tests for Identification – Methods of Determination of Swell Pressure. Improvement of Expansive Soils – Foundation Techniquesin Expansive Soils – Under Reamed Piles.

Unit 2 Dewatering & Grouting 8

Methods of De-Watering- Sumps and Interceptor Ditches- Single, Multi Stage Well Points - Vacuum Well Points- Horizontal Wells-Foundation Drains-Blanket Drains- Criteria for Selection of Fill Material Around Drains –Electro-Osmosis.

Objectives of Grouting- Grouts and Their Properties- Grouting Methods- Ascending, Descending and Stage Grouting- Hydraulic Fracturing in S o i l s and Rocks- Post Grout Test

Unit 3 Densification Methods In Granular and Cohesive Soils 8

In – Situ Densification Methods in Granular Soils: – Vibration at The Ground Surface, Impact At The Ground Surface, Vibration at Depth, Impact at Depth.

In – Situ Densification Methods in Cohesive Soils: – Preloading or Dewatering, Vertical Drains – Sand Drains, Sand Wick Giordanis – Stone and Lime Columns – Thermal

Unit 4 Stabilisation 10

Methods of Stabilization-Mechanical-Cement- Lime-Bituminous- Chemical Stabilization with Calcium Chloride, Sodium Silicate and Gypsum

Unit 5 Reinforced Earth 10

Principles – Components of Reinforced Earth – Factors Governing Design of Reinforced Earth Walls – Design Principles of Reinforced Earth Walls. **GEOSYNTHETICS:** Geotextiles- Types, Functions and Applications – Geogrids and Geo Membranes – Functions and Applications

Prescribed Textbooks:

1. Engineering Principles of Ground Modification, Haussmann M.R., McGraw-Hill International Edition (1990).
2. Ground Improvement Techniques, Dr.P. Purushotham Raj. Laxmi Publications, New Delhi University science press, New Delhi 2nd edition 2016

Reference Books:

1. Ground Improvement, Moseley M.P. Blackie Academic and Professional, Boca Taton, Florida, USA (1993).
2. Ground Improvement Techniques, Nihar Ranajan Patra Vikas Publications, New Delhi
3. Ground Control and Improvement, Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) John Wiley and Sons, New York, USA.

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/105/108/105108075/**
2. **https://archive.nptel.ac.in/courses/105/105/105105210/**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A017DT	3	2	2	2	1	-	-	-	-	2	-	1	2	2
23A017DT	3	3	2	2	2	-	-	-	-	2	-	2	2	2
23A017DT	3	3	3	2	2	-	-	-	-	2	-	2	3	2
23A017DT	3	2	3	3	3	-	-	-	-	2	1	2	3	3
23A017DT	3	3	3	3	3	-	-	-	-	2	1	2	3	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**SUBSURFACE INVESTIGATION AND INSTRUMENTATION**
Category:	**(PE – V)**
Couse Code:	23A017ET
Branch/es:	Civil Engineering
Semester:	**VII**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. Understand the fundamental concepts of soil formation, classification, and stratification processes.
2. Analyze various soil exploration methods, including boring, drilling, and sampling techniques.
3. Evaluate borehole logging methods and groundwater observations for site investigation.
4. Apply field testing techniques such as SPT, PLT, PMT, CPT, and geophysical methods to assess soil properties.
5. Assess soil exploration report preparation, including instrumentation and data interpretation.

Course Outcomes:

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

1. Explain soil formation processes, classification methods, and stratification phenomena.
2. Analyze soil exploration methods and sampling techniques for various geotechnical applications.
3. Evaluate borehole logging, groundwater observations, and their influence on soil properties.
4. Apply field testing procedures, including penetration tests and geophysical methods, to assess subsurface conditions.
5. Assess soil exploration report writing and field instrumentation techniques for site investigations.

Unit 1 Introduction 8

Soil formation, Types of Soils, Physical and Chemical Weathering, Soil Transport, Deposition and Stratification Phenomena and Soil Classification

Unit 2 Methods of Soil Exploration 8

Methods of Boring, Auguring and Drilling. Machinery Used for

Drilling, Types of Augers and Their Usage for Various Projects. Soil Sampling: Sampling Methods, Types of Samples, Storage of Samples and Their Transport. Sample Preparation, Sample Sizes, Types of Sampler‘s Specifications for Testing.

Unit 3 Borehole Logging 8

Logging of Boreholes - Logging Methods - Groundwater Observations – Water Table Fluctuations and Effects - Preparation of Soil Profiles and Exploration

Unit 4 Field Testing of Soils 10

: Methods and Specifications – Visual Identification Tests, Standard Penetration Test (SPT), Plate Load Test (PLT), Pressure Meter Test (PMT) Dilatometer Test (DMT) Vane Shear Test (VST), Cone Penetration Test (CPT), Becker Penetration Test (BPT), Analysis of Test Results. Geophysical Methods of Soil Exploration-Seismic Refraction, Electrical Resistivity, Cross Hole Test.

Unit 5 Preparation of Soil Investigation Report. 10

Soil Exploration Reports- Identification, Calculations and Preparation. Field Instrumentation: Strain Gauges, Piezometer, Pressure Cells, Inclinometers, Proving Ring, Load Cells, Displacement Gauges

Prescribed Textbooks:

1. Site Investigation, Clayton C. R., Matthews M. C and Simons N. E., Blackwell Science. 2005
2. Geotechnical Instrumentation for Monitoring Field Performance, John Dunn cliff, Wiley Inter science, 2008

Reference Books:

1. Basic and Applied Soil Mechanics- A.S. Rao and Gopal Ranjan, New AgeInternational.
2. IS:1892-Code of Practice for subsurface investigation for foundation, 1979
3. IS: SP36 Part 1-Compendium of India Standards on Soil Engineering-Laboratory Testing of Soils for Civil Engineering Purposes, 1987.
4. IS: SP36 Part 2-Compendium of India Standards on Soil Engineering-Field Testing of Soils for Civil Engineering Purposes, 1988.

Online Learning Resources:

1.https://archive.nptel.ac.in/courses/105/103/105103182/
2.https://onlinecourses.nptel.ac.in/noc25_ce27/preview
3.https://onlinecourses.nptel.ac.in/noc22_ce81/preview

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A017ET.1	3	2	1	2	1	2	2	1	-	2	-	2	2	2
23A017ET.2	3	3	2	3	2	2	3	1	-	2	-	2	2	2
23A017ET.3	3	3	3	3	3	2	3	2	-	2	-	2	3	3
23A017ET.4	3	2	3	3	3	3	3	2	-	2	2	2	3	3
23A017ET.5	3	3	3	3	3	3	3	2	-	2	2	2	3	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**TRANSPORTATION ECONOMICS**
Category:	**PE**
Couse Code:	23A017FT
Branch/es:	Civil Engineering
Semester:	**VII**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
1. Understand the fundamentals of transportation project development and decision- making.
2. Analyze transportation costs, including agency and user costs.
3. Evaluate vehicle operating costs and traffic congestion economics.
4. Apply economic evaluation methods for transportation projects.
5. Assess financing methods and risk analysis in transportation projects

Course Outcomes:
At the end of the course, the student will be able to
1. Describe the overall process of transportation project development and financial planning.
2. Analyze transportation cost structures, including demand and supply elasticity.
3. Evaluate vehicle operating costs and traffic congestion pricing strategies.
4. Apply economic analysis techniques to assess the feasibility of transportation projects.
5. Assess financial models, PPP strategies, and risk analysis for road projects

Unit 1 Preliminaries of Transportation 8

Concepts, Overall Transportation Project Development, Budgeting, Financial Planning, The Process of Transportation Project Development, Models Associated with Transportation Impact Evaluation Professional Ethics.

Unit 2 Transportation Finance 8

Classification of Transportation Costs, Transportation Agency Costs, Transportation User Costs, General Structure and Behavior of Cost Functions and Road Pricing. Estimating Transportation Demand and Supply - Supply Equilibration, Dynamics of Transportation Demand and Supply, Elasticity of Travel Demand and Supply, Classification of Elasticity

Unit 3 Vehicle Operating Costs 8

: Fuel Costs - Maintenance and Spares, Depreciation - Crew Costs - Value of Travel Time Savings - Accident Costs. Economics of Traffic Congestion - Pricing Policy

Unit 4 Economic Analysis of Projects 10

- Methods of Evaluation - Cost-Benefit Ratio, First Year Rate of Return, Net Present Value, and Internal-Rate of Return Methods; Indirect Costs and Benefits of Transport Projects

Unit 5 Financing of Road Projects 10

- Methods – Private Public Partnership (PPP) - toll Collection - Economic Viability of Design-Build-Operate-Transfer Schemes – Risk Analysis – Value for Money Analysis - Case Studies.

Prescribed Textbooks:
1. Winfrey, Economic analysis for Highways, International Textbook Company,Pennsylvania, 1969.
2. Sarkar, P. K., and Maitri, V., Economics in Highway and Transportation Planning, Standard Publisher, New Delhi, 2010.

Reference Books:

1. IRC, Manual on Economic Evaluation of Highway Projects in India, SP30, 2007
2. David, H., and Brewer, A., Transport: An Economics and Management Perspective. Oxford University Press, UK, 2000.
3. Quinet, E., and Vickerman, R., Principles of Transport Economics, Edward Elgar Pub, 2005

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/105/104/105104098/**
2. **https://archive.nptel.ac.in/content/storage2/courses/105101087/01-Ltexhtml/p2/p.html**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A017FT.1	3	2	2	1	2	-	-	-	-	2	-	2	2	2
23A017FT.2	3	3	3	3	3	-	-	-	-	2	-	2	3	2
23A017FT.3	3	3	3	3	2	-	-	-	-	2	-	2	3	3
23A017FT.4	3	3	3	3	2	-	-	-	-	2	-	2	3	3
23A017FT.5	3	3	3	3	3	3	3	3	-	2	-	2	3	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**SMART GRID TECHNOLOGIES**
Category:	OE-III
Couse Code:	23A027IT
Branch/es:	CSE/ECE/ME/Civil
Semester:	VII

Lecture Hours	**Tutorial Hours**	**Practice Hours**	**Credits**
3	0	0	3

Course Objectives:

1. To Impart knowledge in smart grid concepts and smart grid architecture
2. To provide knowledge on Wide Area Monitoring System and smart meters
3. To understand different communication systems.
4. To know Smart Grid Applications and Cyber Security

Course Outcomes:

At the end of the course, the student will be able to….

1. Understanding the Concept and Evolution of Smart Grid
2. Analyzing Wide Area Monitoring System and Synchro phasor Technology
3. Applying Smart Metering and Advanced Metering Infrastructure (AMI) Concepts
4. Evaluating Information and Communication Technology (ICT) Systems in Smart Grids.
5. Designing Smart Grid Applications and Cyber security Measures.

Unit 1 Introduction to Smart Grid 10

Evolution of Electric Grid – Need for Smart Grid – Difference between conventional & smart grid – Overview of enabling technologies – International experience in Smart Grid deployment efforts – Smart Grid road map for India – Smart Grid Architecture.

Unit 2 Wide Area Monitoring System 10

Fundamentals of Synchro phasor Technology – concept and benefits of Wide Area Monitoring System – Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC) – Road Map for Synchro phasor applications (NAPSI) – Operational experience and Blackout analysis using PMU - Case study on PMU.

Unit 3 Smart Meters: 10

Features and functions of Smart Meters – Functional specification – category of Smart Meters – Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) drivers and benefits – AMI protocol – Demand Side Integration: Peak load, Outage and Power Quality management.

Unit 4 Information and Communication Technology 10

Overview of Smart Grid Communication system – Modulation and Demodulation Techniques: Radio Communication – Mobile Communication – Power Line Communication – Optical Fiber Communication – Communication Protocol for Smart Grid.

Unit 5 Smart Grid Applications and Cyber Security: Applications: 10

Overview and concept of Renewable Integration – Introduction to distributed generation - Role of Protective Relaying in Smart Grid – House Area Network – Advanced Energy Storage Technology: Flow battery – Fuel cell – SMES – Super capacitors – Plug – in Hybrid electric Vehicles - Cyber Security: Security issues in DG, Distribution Automation, AMI, Electric Vehicle Management Systems – Approach to assessment of smart grid cyber security risks – Methodologies. Cyber Security requirements – Smart Grid Information Mode

Prescribed Textbooks:

1. James Momoh, "SMART GRID: Fundamentals of Design and Analysis", John Wiley and Sons, New York, 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & Sons, New Jersey, 2012.

Reference Books:

1. Stuart Borlase, "Smart Grids: Infrastructure, Technology and Solutions", 1st Edition, CRC Press Publication, England, 2013.
2. Phadke A G, Thorp J S, "Synchronized Phasor Measurements and Their Applications", 1st Edition, Springer, Newyork, 2012.
3. Fereidoon.P.Sioshansi, "Smart Grid – Integrating Renewable, Distributed and Efficient Energy", 1st Edition, Academic Press, USA, 2011..
4. Power Grid Corporation of India Limited, "Smart Grid Primer", 1st Edition, Power Grid Corporation of India Limited, Bangalore, India, 2013.

Online Learning Resources:

1. https://www.nsgm.gov.in/en/smart-grid
2. **https://www.iea.org/energy-system/electricity/smart-grids**
3. **https://onlinecourses.nptel.ac.in/noc23_ee60/preview**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A027IT-1	3	3	2	2	-	-	-	1	-	3	3	3	2	3
23A027IT-2	2	3	3	3	2	1	2	1	1	2	3	3	2	3
23A027IT-3	3	3	3	3	-	2	-	-	-	2	3	3	3	2
23A027IT-4	2	3	3	2	2	1	2	1	1	2	2	3	2	2
23A027IT-5	2	2	3	3	-	-	-	-	-	3	2	3	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**3D PRINTING TECHNOLOGIES**
Category:	**OE**
Couse Code:	23A037KT
Branch/es:	ME
Semester:	VII

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. Understand the fundamental concepts of prototyping and distinguish between traditional and rapid prototyping methods.
2. Demonstrate the working principles, materials, and applications of solid-, liquid-, and powder-based RP systems.
3. Define the processes and classifications of rapid tooling and reverse engineering techniques.
4. Identify common errors in 3D printing and evaluate pre-processing, processing, and post-processing issues.
5. Familiarize RP-related software and its role in applications such as design, manufacturing, and medical fields.

Course Outcomes:

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

1. Define and explain the evolution and need for rapid prototyping in modern product development.
2. Compare and contrast various 3D printing technologies based on working principles, materials, and limitations.
3. Apply knowledge of rapid tooling and reverse engineering techniques for industrial and design applications.
4. Diagnose and interpret different types of errors encountered in 3D printing processes and recommend solutions.
5. Use RP-specific software tools to manipulate STL files and prepare models for printing in real-world scenarios.

Unit 1 Introduction to 3D Printing **9**

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

Unit 2 Solid and Liquid Based RP Systems **9**

Working Principle, Materials, Advantages, Limitations and Applications of Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

Unit 3 Powder Based & Other RP Systems **9**

Powder Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM). Other RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

Unit 4 Rapid Tooling & Reverse Engineering **9**

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods. Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development

Unit 5 Errors in 3D Printing and Applications: 9

Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc. Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP. Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Prescribed Textbooks:

1. Chee Kai Chua and Kah Fai Leong, ―3D Printing and Additive Manufacturing Principles and Applications‖ 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, ―Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing‖, Springer, 2/e, 2010.

Reference Books:

1. Frank W.Liou, ―Rapid Prototyping & Engineering Applications‖, CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, ―Rapid Prototyping: Principles and Applications in Manufacturing‖, John Wiley&Sons, 2006.

Online Learning Resources:

1. NPTEL Course on Rapid Manufacturing.
2. https://nptel.ac.in/courses/112/104/112104265/
3. https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A037KT.1	3	2	3	3	2	2	1	2	-	2	3	3	3	3
23A037KT.2	3	2	3	3	3	2	1	2	-	2	2	3	3	3
23A037KT.3	3	2	3	3	3	2	1	2	-	2	2	3	3	3
23A037KT.4	3	2	3	3	3	2	1	2	-	2	2	3	3	3
23A037KT.5	3	2	3	3	3	2	1	2	-	2	2	3	3	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**MICROPROCESSORS AND MICROCONTROLLERS**
Category:	OE 3
Couse Code:	23A047GT
Branch/es:	Civil/EEE/ME/CSE & Allied
Semester:	VII Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1 To learn the fundamental architectural concepts of Microprocessors.
2 To gain knowledge about assembly language programming concepts.
3 To get familiar with the 8086 interfacing.
4 To understand the fundamentals of the 8051Microcontroller.
5 To learn interfacing with the 8051 Microcontroller.

Course Outcomes:

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

1 Learn the fundamental architectural concepts of microprocessors.(L2)
2 Write the assembly language programs.(L6).
3 Interface various sensors, display devices and other ICs with 8086 and also comprehend the concepts of MSP 430 (L3).
4 Comprehend the fundamentals of the 8051 Microcontroller.(L2).
5 Interface input and output devices with 8051 Microcontroller.(L6).

Unit 1 8086 Architecture 10

Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

Unit 2 8086 Programming 13

Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

Unit 3 8086 Interfacing 14

Semiconductor memories (RAM, ROM) - Intel 8255 Programmable Peripheral Interface, interfacing switches and LEDs, Seven segment displays, Stepper motor - A/D and D/A converter - Intel 8251 USART architecture and interfacing - Need of DMA.

Features and architecture of MSP 430 (Mixed Signal Processor).

Unit 4 Microcontroller 10

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

Unit 5 Interfacing Microcontroller 12

Programming 8051 Timers - Serial Port Programming - Interrupts – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors.

Prescribed Textbooks:

1 K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017
2. Kenneth J. Ayala, The 8051Microcontroller, 3rdedition, Cengage Learning,2004.

Reference Books:

1 Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. RajKamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.
3. Microprocessors and Interfacing–Programming and Hardware by Douglas V Hall SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition,1994.

Online Learning Resources:

1. https://nptel.ac.in/courses/108/105/108105102/
2. https://www.classcentral.com/course/swayam-microprocessors-and-microcontrollers-9894

CO-PO Mapping:

Course Outcomes	**Engineering Knowledge**	**Problem Analysis**	**Design/Development of solutions**	**Conduct investigations of complex problems**	**Modern tool usage**	**The engineer and society**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-long learning**	**PSO1**	**PSO2**
23A0474AT. 1	2	1	1	1	-	-	1	-	-	-	1	-	2
23A0474AT. 2	3	3	3	3	3	-	1	2	2	-	3	3	2
23A0474AT. 3	3	2	1	1	-	-	1	-	-	-	1	-	2
23A0474AT. 4	2	1	1	1	-	-	1	-	-	-	1	-	2
23A0474AT. 5	3	3	3	3	3	-	1	2	2	-	3	3	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course: **DATABASE MANAGEMENT SYSTEMS**
Category: OE
Couse Code: 23A057IT
Semester: VII Semester
Branch: CE,EEE,ME.ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
This course will be able to
1. To introduce the fundamental concepts of database systems and data modeling.
2. To provide knowledge on relational databases and SQL for data retrieval and manipulation.
3. To understand database design principles using normalization and ER modeling.
4. To study transaction management, concurrency control, and database recovery.
5. To explore emerging database technologies and architectures including NoSQL.

Course Outcomes:

At the end of the course, the student will be able to
1. Understand the basic concepts of database systems and their architecture.
2. Apply ER modeling and relational algebra for database design.
3. Analyze and implement normalization techniques for schema refinement.
4. Evaluate transaction management techniques, concurrency control, and recovery.
5. Explore non-relational databases and recent trends in database systems.

Unit 1 Introduction to Databases **8**

Database System Applications and Purpose, View of Data: Data Abstraction and Data Independence, Database Users and Administrators, DBMS Architecture and Data Models, ER Model: Entities, Attributes, Relationships, ER Diagrams, Reduction of ER Model to Tables

Unit 2 Relational Model and Algebra **8**

Structure of Relational Databases, Relational Model Concepts and Integrity Constraints, Relational Algebra: Selection, Projection, Set Operations, Joins, Tuple Relational Calculus, Introduction to SQL: DDL, DML, DCL, Advanced SQL: Sub queries, Joins, Views, Indexes

Unit 3 Database Design and Normalization **10**

Schema Design and Logical Database Design, Functional Dependencies, Normal Forms: 1NF, 2NF, 3NF, BCNF, Decomposition and Lossless Join, Dependency Preservation, Multi-Valued and Join Dependencies.

Unit 4 Transaction Management and Concurrency Control **10**

Concept of a Transaction, ACID Properties, Serializability and Schedules, Concurrency Control: Lock-Based, Timestamp-Based Protocols, Deadlock Handling, Recovery Techniques: Log-Based, Shadow Paging

Unit 5 Advanced Topics and NoSQL Databases **10**

Distributed Databases and Parallel Databases, Introduction to NoSQL: Types – Document, Columnar, Key-Value, Graph, CAP Theorem, MongoDB: Basics and CRUD Operations, Big Data and New SQL Overview, Case Studies on Real- World Databases

Prescribed Textbooks:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan – Database System Concepts, 7th Edition, McGraw Hill
2. Ramez Elmasri, Shamkant B. Navathe – Fundamentals of Database Systems, 7th Edition, Pearson Education

Reference Books:

1. C.J. Date – An Introduction to Database Systems, 8th Edition, Addison-Wesley

2. Raghu Ramakrishnan, Johannes Gehrke – Database Management Systems, 3rd Edition, McGraw Hill

Online Resources & Courses:

1. NPTEL – Database Management Systems by IIT Madras
2. Coursera – Databases by Stanford University
3. Khan Academy – Intro to SQL

CO-PO Mapping:

Course Outcomes	**Engineering Knowledge**	**Problem Analysis**	**Design/Development of solutions**	**Conduct investigations of complex problems**	**Modern tool usage**	**The engineer and society**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-long learning**	**PSO1**	**PSO2**
23A057IT.1	2	2	1	-	-	-	1	-	-	-	1	-	2
23A057IT.2	3	3	3	-	3	-	1	-	-	-	3	3	2
23A057IT.3	3	2	1	-	-	-	1	-	-	-	1	-	2
23A057IT.4	3	2	1	-	-	-	1	-	-	-	1	-	2
23A057IT.5	3	3	3	-	3	-	1	-	-	-	3	3	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**CYBER SECURITY**
Category:	OE
Couse Code:	23A057JT
Semester:	VII Semester
Branch:	CE,EEE,ME.ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1.To introduce the concept of cybercrime and its impact on information security, and provide an overview of cybercriminal behavior and various classifications of cybercrimes.

2.To explore the methodologies used by cybercriminals to plan and execute attacks, including techniques like social engineering, botnets, and cloud-related threats.

3.To understand the security risks associated with mobile and wireless devices, and examine countermeasures for securing mobile computing in organizational environments.

4.To familiarize students with the tools and techniques used in committing cybercrimes, such as phishing, malware, DoS/DDoS attacks, and code-based exploits.

4.To analyze the implications of cybercrime for organizations, including the cost of cyberattacks, intellectual property issues, and challenges posed by social computing and web-based threats.

Course Outcomes:

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

1. Understand the fundamentals of cybercrime and information security, and explain the legal and global perspectives, especially with reference to Indian IT Act 2000.

2. Analyze how cybercriminals plan and execute cyber offenses using techniques like social engineering, cyber stalking, and botnets, including threats posed by cloud computing.

3. Evaluate the security challenges of mobile and wireless devices and formulate measures to secure mobile environments within an organization.

4. Identify and explain various cyber attack tools and methods such as phishing, keyloggers, Trojans, and SQL injection used in committing cybercrimes.

5.Assess the organizational implications of cybercrimes, including IPR issues, social media risks, and formulate strategies to mitigate security and privacy challenges.

Unit 1 Introduction to Cybercrime **10**

Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Unit 2 Cyber Offenses How Criminals Plan Them **10**

Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing

Unit 3 Cybercrime: Mobile and Wireless Devices 10

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, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones.
Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

Unit 4 Tools and Methods Used in Cybercrime 10

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Unit 5 Cyber Security: Organizational Implications 10

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Prescribed Textbooks:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

Reference Books:

1.Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press
2. Introduction to Cyber Security , Chwan –Hwa (john) Wu ,J. DavidIrwin.CRC Press T&F Group

Online Learning Resources:

1. http://nptel.ac.in/courses/106105031/40
2. http://nptel.ac.in/courses/106105031/39
3. http://nptel.ac.in/courses/106105031/38

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A057JT.1	2	2	1	-	-	-	1	-	-	-	1	-	2
23A057JT.2	3	3	3	-	3	-	1	-	-	-	3	3	2
23A057JT.3	3	2	1	-	-	-	1	-	-	-	1	-	2
23A057JT.4	3	2	1	-	-	-	1	-	-	-	1	-	2
23A057JT.5	3	3	3	-	3	-	1	-	-	-	3	3	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**WAVELET TRANSFORMS AND ITS APPLICATIONS**
Category:	OE
Couse Code:	23AHS71T
Branch/es:	Common to All Branches
Semester:	VII Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To Apply wavelet transforms to analyze signals and images.
2. To Use wavelet analysis for denoising, compression, and feature extraction.
3. To Identify suitable applications of wavelet transforms in various fields.
4. To Implement wavelet transforms using software tools.

Course Outcomes:

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

1. Understand wavelets and wavelet basis and characterize continuous and discrete wavelet Transforms.
2. Illustrate the multi resolution analysis ad scaling functions.
3. Implement discrete wavelet transforms with multi rate digital filters.
4. Understand multi resolution analysis and identify various wavelets and evaluate their time- frequency resolution properties.
5. Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields.

Unit 1 Wavelets **8**

Introduction to Wavelets - Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets - effectiveness of Wavelet Analysis -The Discrete Wavelet Transform- The Discrete-Time and Continuous Wavelet Transforms.

Unit 2 A Multiresolution Formulation of Wavelet Systems **8**

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

Unit 3 Filter Banks and the Discrete Wavelet Transform **8**

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - Different Points of View.

Unit 4 Time-Frequency and Complexity **8**

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms - The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

Unit 5 Bases and Matrix Examples **8**

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

Prescribed Textbooks:

1. C. Sidney Burrus, Ramesh A. Gopinath, ―Introduction to Wavelets and Wavelets Transforms‖, Prentice Hall, (1997).
2. James S. Walker, ―A Primer on Wavelets and their Scientific Applications‖, CRC Press, (1999)..

Reference Books:

1. RaghuveerRao, ―Wavelet Transforms‖, Pearson Education, Asia
2. C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.

Online Learning Resources:

1. **http://users.rowan.edu/~polikar/WAVELETS/WTtutorial.html**
2. **http://www.wavelet.org/ .**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23AHS71T.1	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
23AHS71T.2	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
23AHS71T.3	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
23AHS71T.4	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
23AHS71T.5	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**SMART MATERIALS AND DEVICES**
Category:	OE
Couse Code:	23AHS72T
Branch/es:	Common to all branches
Semester:	VII Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To provide exposure to smart materials and their engineering applications.
2. To impart knowledge on the basics and phenomenon behind the working of smart materials
3. To explain the properties exhibited by smart materials
4. To educate various techniques used to synthesize and characterize smart materials
5. To identify the required smart material for distinct applications/devices

Course Outcomes:

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

1. Identify key discoveries that led to modern applications of shape memory materials, describe the two phases in shape memory alloys.
2. Describe how different external stimuli (light, electricity, heat, stress, and magnetism) influence smart material properties.
3. Summarize various types of synthesis of smart materials
4. Analyze various characterization techniques used for smart materials
5. Interpret the importance of smart materials in various devices

Unit 1 Introduction to Smart Materials **9**

Historical account of the discovery and development of smart materials, Shape memory materials, chromoactive materials, magnetorheological materials, photoactive materials, Polymers and polymer composites (Basics).

Unit 2 Properties of Smart Materials **9**

Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

Unit 3 Synthesis of Smart Materials **9**

Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis.

Unit 4 Characterization Techniques **9**

Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM).

Unit 5 Smart Materials based Devices **9**

Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices.

Prescribed Textbooks:

1. YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2017
2. E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

Reference Books:

1. Gauenzi,P.,Smart Structures, Wiley, 2009.
2. MahmoodAliofkhazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 2014
3. Handbook of Smart Materials, Technologies, and Devices: Applications of Industry,4.0,Chaudhery MustansarHussain, Paolo Di Sia, Springer,2022.
4. Fundamentals of Smart Materials,Mohsen Shahinpoor, Royal Society of Chemistry, 2020

Online Learning Resources**:**

1. **https://onlinecourses.nptel.ac.in/noc22_me17/preview**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23AHS72T.1	3	3	2	2	1	-	-	-	-	-	-	-	2	2
23AHS72T.2	3	3	2	1	1	-	-	-	-	-	-	-	2	2
23AHS72T.3	3	3	1	1	1	-	-	-	-	-	-	-	2	2
23AHS72T.4	3	2	1	1	1	-	-	-	-	-	-	-	2	2
23AHS72T.5	3	3	1	1	-	-	-	-	-	-	-	-	2	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	Green chemistry and Catalysis for sustainable Environment
Category:	OE
Couse Code:	23AHS73T
Branch/es:	Common to all branches
Semester:	VII Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To understand principle and concepts of green chemistry.
2. To understand the types of catalysis and industrial applications.
3. To apply green solvents in chemical synthesis.
4. To enumerate different sourced of green energy.
5. To apply alternative greener methods foe chemical reactions

Course Outcomes:

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

1. Apply green chemistry principles in daily life and synthesis, including sustainable development, economic reactions, and polymer recycling.
2. Explain types of catalysis and their applications, including heterogeneous, homogeneous, biophoto, transition metal, and phase transfer catalysis.
3. Demonstrate the use and importance of green solvents, including supercritical CO_2 and water, and their recycling methods
4. Apply green chemistry for sustainable development by utilizing biomass, solar power, sonochemistry, renewable resources, and mechanochemical synthesis.
5. discuss alternative green methods such as photoredox catalysis, SET, photochemical, microwave-assisted, and sonochemical reactions with examples and applications.

Unit 1 Principles and Concepts of Green Chemistry 9

Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic Reactions: Rearrangement and addition reactions and atom un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling.

Unit 2 Catalysis and Green Chemistry 9

Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio-catalysis and Photo-catalysis with examples.

Unit 3 Green Solvents in Chemical Synthesis 9

Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Super critical carbondioxide, super critical water, Polyethylene glycol (PEG), Ionic liquids, Recycling of green solvents.

Unit 4 Emerging Greener Technologies 9

Biomass as renewable resource, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstock 's, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Mechanochemical synthesis.

Unit 5 Alternative Greener Methods 9

Photochemical Reactions - Examples, Advantages and Challenges, Photoredox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.

Prescribed Textbooks:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA

Reference Books:

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and AckmezMudhoo, CRC Press, 2010.
2. Hand Book of Green chemistry, edited by Alvise Perosa and Maurizio Selva, Volume 8:AGreen Nanoscience, wiley-VCH, 2013.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning
23AHS73T.1	3	3	2	2	-	-	3	-	-	-	-	1
23AHS73T.2	3	2	2	1	-	-	3	-	-	-	-	1
23AHS73T.3	3	2	2	1	-	-	3	-	-	-	-	1
23AHS73T.4	3	2	2	1	-	-	3	-	-	-	-	1
23AHS73T.5	3	2	2	1	-	-	3	-	-	-	-	1

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**EMPLOYABILITY SKILLS**
Category:	OE
Couse Code:	23AHS74T
Branch/es:	Common to all branches
Semester:	VII Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To strengthen writing skills Intune with the needs of academic and Industry domains.
2. To strengthen communication skills through effective public speaking.
3. To lend exposure to different types of writing skills, relevant to research and academia.
4. To help them develop organizational skills through group activities.
5. To function effectively with heterogeneous teams.

Course Outcomes:

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

1. Understand the importance of goals and try to achieve them.
2. Explain the significance of self-management.
3. Apply the knowledge of writing skills in preparing eye-catchy resumes
4. Analyse various forms of Presentation skills
5. Evaluate group behavior effectively and develop essential skills for employability

Unit 1 Goal Setting and Self-Management 9

Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOC Analysis

Unit 2 Writing Skills 9

Definition, significance, types of writing skills – Resume writing Vs CV Writing - E-Mail writing, Cover Letters - E-Mail Etiquette -SoP (Statement of Purpose)

Unit 3 Technical Presentation Skills 9

Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics – Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation.

Unit 4 Group Presentation Skills 9

Body Language – Group Behavior - Team Dynamics – Leadership Skills – Personality Manifestation- Group Discussion-Debate –Corporate Etiquette

Unit 5 Interview Skills 9

Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews

Prescribed Textbooks:

1. Sabina Pillai, Agna Fernandez. *Soft Skills & Employability Skills***,**2014. Cambridge Publisher. Alka Wadkar. *Life Skills for Success*, Sage Publications, 2016.
2. M. Sen Gupta, Skills for Employability, Innovative Publication, 2019.Steve Duck and David T McMahan, The Basics Communication Skills A Relational Perspective, Sage press, 2012.

Reference Books:

1. Gangadhar Joshi. Campus to Corporate Paperback, Sage Publications. 2015
2. Sherfield Montogomery Moody, Cornerstone Developing Soft Skills, Pearson Publications. 4 Ed. 2008
3. Shikha Kapoor. Personality Development and Soft Skills - Preparing for Tomorrow .1 Edition, Wiley, 2017.

Online Learning Resources:

1. https://youtu.be/gkLsn4ddmTs
2. https://youtu.be/2bf9K2rRWwo
3. https://youtu.be/FchfE3c2jzc
4. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning
23AHS74T-1	2	2	-		-	3	3	-	-	3	-	3
23AHS74T-2	2	2	-	-	-	3	3	-	-	3	-	3
23AHS74T-3	2	2	-	-	-	3	3	-	-	3	-	3
23AHS74T-4	2	2	-	-	-	3	3	-	-	3	-	3
23AHS74T-5	2	2	-	-	-	3	3	-	-	3	-	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**ELECTRIC VEHICLES**
Category:	OEC
Couse Code:	23A027JT
Branch/es:	CSE/ECE/ME/Civil
Semester:	VII

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

This course covers the fundamentals of electric vehicle (EV) systems, including their evolution, configurations, and environmental impact. It explores EV propulsion dynamics, motor technologies, and vehicle performance. Students will learn about fuel cells, hybrid systems, and battery charging techniques, including wireless charging. The course also delves into advanced energy storage technologies and management for smart grids and EV applications.

Course Outcomes:

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

1. To understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.
2. Understand Various dynamics of Electric Vehicles.
3. To remember and understand various configurations in parameters of EV system and dynamic aspects of EV.
4. To analyze fuel cell technologies in EV and HEV systems.
5. To analyze the battery charging and controls required of EVs

Unit 1 Introduction to EV Systems and Energy Sources 12

Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs- EV configuration- EV system- Fixed and Variable gearing- Single and multiple motor drive- In-wheel drives- EV parameters: Weight, size, force and energy, performance parameters. Electro mobility and the environment- History of Electric power trains- Carbon emissions from fuels- Green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems.

Unit 2 EV Propulsion and Dynamics 10

Choice of electric propulsion system- Block diagram- Concept of EV Motors- Single and multi- motor configurations- Fixed and variable geared transmission- In-wheel motor configuration- Classification - Electric motors used in current vehicle applications - Recent EV Motors- Vehicle load factors- Vehicle acceleration.

Unit 3 Fuel Cells 8

Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle - Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems- Examples.

Unit 4 Battery Charging and Control 10

Battery charging: Basic requirements- Charger architecture- Charger functions- Wireless charging- Power factor correction. Control: Introduction- Modeling of electro mechanical system- Feedback controller design approach- PI controller‘s designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.

Unit 5 Energy Storage Technologies **10**

Role of Energy Storage Systems- Thermal- Mechanical-Chemical- Electrochemical- Electrical - Efficiency of energy storage systems- Super capacitors-Superconducting Magnetic Energy Storage (SMES)- SOC- SoH -fuel cells - G2V- V2G- Energy storage in Micro-grid and Smart grid- Energy Management with storage systems- Battery SCADA.

Prescribed Textbooks:

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001,1st Edition.
2. Ali Emadi, ―Advanced Electric Drive Vehicles, CRC Press, 2014,1st Edition.

Reference Books:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.
2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt,‖ Energy Storage in Power Systems‖ Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016,1st Edition.
3. A.G.Ter- Gazarian, ―Energy Storage for Power Systems‖, the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, ―Modern Elelctric, Hybrid Elelctric and Fuel Cell Vehicles: Fundamentals, Theory and Design‖, CRC Press, 2004,1st Edition
5. James Larminie, John Lowry, ―Electric Vehicle Technology Explained‖, Wiley, 2003,2nd Edition.

Web Resources:

1. https://archive.nptel.ac.in/courses/108/103/108103009/
2. https://www.mygreatlearning.com/academy/learn-for-free/courses/introduction-to-electric-vehicles
3. https://en.diyguru.org/electric-vehicle/
4. https://intellipaat.com/electric-vehicle-design-certification-course-eict-iitg/

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
1	**3**	**2**	**1**	**1**	**2**	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**2**	**2**
2	**3**	**3**	**2**	**2**	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**3**	**2**
3	**3**	**3**	**2**	**2**	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**3**	**2**
4	**2**	**3**	**3**	**3**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**3**	**2**
5	**2**	**3**	**3**	**3**	**3**	**1**	**2**	**1**	**1**	**2**	**1**	**1**	**3**	**3**

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**TOTAL QUALITY MANAGEMENT**
Category:	Open Elective-III
Couse Code:	23A037LT
Branch/es:	MECHANICAL ENGINEERING
Semester:	VII

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. To introduce the students, the basic concepts of Total Quality Management.
2. To expose with various quality issues in Inspection.
3. To gain Knowledge on quality control and its applications to real time.
4. To know the extent of customer satisfaction by the application of various quality concepts.
5. To understand the importance of Quality standards in Production.

Course Outcomes:

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

1. Explain definition of quality, TQM, quality planning, quality costs and techniques of quality cost.
2. Explain quality council, quality statements, characteristics of a quality leader and can apply the knowledge of Deming's 14 principle of philosophy
3. Describe customer satisfaction and his perception of quality, TQM principles like Juran Trilogy, PDSA cycle, Kaizen principles for achieving continuous process improvement
4. Explain the concept of bench marking for organizational processes, the quality function deployment, Taguchi quality loss functions, TPM concepts, seven tools of quality and the concepts of six sigma in production processes
5. Summarize the ISO 9000, ISO 14000 quality systems concept, requirements and benefits and can apply the documentation procedures of quality systems

Unit 1 Introduction 10 Hrs

Introduction: Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

Unit 2 Historical Review 9 Hrs

Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

Unit 3 TQM Principles 10 Hrs

Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure Case studies.

Unit 4 TQM Tools 10 Hrs

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House 2of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies

Unit 5 Quality Systems **9 Hrs**

Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies.

Textbooks:

1. Total Quality Management, Dale H Besterfield, Fourth Edition, Pearson Education, 2015. ASIN: B07G1B484M
2. Total Quality Management, Subburaj Ramaswamy, Tata Mcgraw Hill Publishing Company Ltd., 2005I ISBN 1259001415.

Reference Books:

1. Quality Management – Concepts and Tasks, Narayana V and Sreenivasan N.S, New Age International, 1996 ISBN-10: 9395161620
2. Statistical Quality Control, Richard S. Leavenworth & Eugene Lodewick Grant, Seventh Edition, Tata Mcgraw Hill, 2015 ISBN 0070435553
3. An Integrated Approach, Samuel Ho, TQM – Kogan Page Ltd, USA, 1995.

Online Learning Resources:

1. https://www.youtube.com/watch?v=VD6tXadibk0
2. https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
3. https://onlinecourses.nptel.ac.in/noc21_mg03/preview
4. https://nptel.ac.in/courses/110/104/110104085/
5. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-mg39/

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and	Life-long learning	**PSO1**	**PSO2**
23A037LT.1	2	2	1	1	-	-	-	-	-	-	-	-	1	2
23A037LT.2	2	2	1	1	-	-	-	-	-	-	-	-	1	2
23A037LT.3	2	2	1	1	-	-	-	-	-	-	-	-	1	2
23A037LT.4	2	2	1	1	-	-	-	-	-	-	-	-	1	2
23A037LT.5	2	2	1	1	-	-	-	-	-	-	-	-	1	2

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**TRANSDUCERS AND SENSORS**
Category:	OE 2
Couse Code:	23A0475AT
Branch/es:	Civil/EEE/ME/CSE & Allied
Semester:	VII Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To understand characteristics of Instrumentation System and the operating principle of motion transducers.
2. To explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
3. To provide knowledge on flow transducers and their applications.
4. To study the working principles of pressure transducers.
5. To introduce working principles and applications of force and sound transducers.

Course Outcomes:

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

1. Comprehend the characteristics of Instrumentation System and the operating principle of motion transducers.
2. Explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
3. Gain knowledge on flow transducers and their applications.
4. Learn the working principles of pressure transducers.
5. Comprehend the working principle and applications of force and sound transducers.

Unit 1 **10**

Introduction: General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification.

Motion Transducers: Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo- electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

Unit 2 **15**

Temperature Transducers: Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics.Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo-electric sensors.

Unit 3 **15**

Flow Transducers: Bernoulli‘s principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

Unit 4 **12**

Pressure Transducers: Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high and low pressure measurement.

Unit 5 **10**

Force and Sound Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone.

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Department of Civil Engineering

Prescribed Textbooks:

1. A.K.Sawhney, ―Acourse in Electrical and Electronics Measurements and Instrumentation‖, Dhanpat Rai& Co. 3rd edition Delhi, 2010.
2. Rangan C.S, Sarma G.R and Mani V S V, ―Instrumentation Devices and Systems‖, TATA McGraw Hill publications, 2007.

Reference Books:

1. Doebelin.E.O,― Measurement Systems Application and Design, McGraw Hill International, New York, 2004.
2. Nakra B.C and Chaudhary K.K ,- Instrumentation Measurement and Analysis, Second Edition, Tata McGraw-Hill Publication Ltd.2006.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of	Conduct investigations of	Modern tool usage	The engineer and society	Ethics	Individual and team work	Communication	Project management	Life-long learning	**PSO1**	**PSO2**
23A0475AT.1	3	-	3	3	-	-	-	1	-	-	-	2	1
23A0475AT.2	3	-	3	3	-	-	-	2	-	-	-	2	1
23A0475AT.3	3	2	3	3	-	-	-	2	-	-	-	2	1
23A0475AT.4	3	-	3	3	-	-	-	2	-	-	-	2	1
23A0475AT.5	3	2	3	3	-	-	-	1	-	-	-	2	1

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**COMPUTER NETWORKS**
Category:	OE
Couse Code:	23A057KT
Semester:	VII Semester
Branch:	CE,EEE,ME,ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
This course will be able to
1. To introduce the fundamentals of the Internet, networking concepts, reference models, and transmission media.
2. To understand the data link layer design, error handling mechanisms, LAN technologies, and access networks.
3. To study the routing algorithms, internetworking concepts, and network layer functionalities.
4. To explore transport layer protocols such as UDP and TCP, and understand their mechanisms, including congestion control.
5. To introduce the principles behind network applications and protocols, and explore widely used application-layer services such as the Web, Email, DNS, peer-to-peer systems, and content distribution networks.

Course Outcomes:

At the end of the course, the student will be able to
1. Describe the architecture of the Internet, reference models, and explain different types of transmission media used in networking.
2.Apply error detection and correction techniques and analyze data link layer protocols and LAN technologies.
3.Explain routing algorithms and the structure of the network layer, including internetworking.
4.Analyze the working of transport layer protocols like TCP and UDP, including concepts of connection management and congestion control.
5. Explain the principles of network applications and describe the functionality of protocols such as HTTP, SMTP, DNS, and peer-to-peer systems, including multimedia streaming and content delivery networks.

Unit 1 Computer Networks and the Internet 8
What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Pack Switched Networks Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission

Unit 2 The Data Link Layer, Access Networks, and LANs 8
Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols Introduction to the Link Layer, Error- Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks
Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request

Unit 3 The Network Layer 10
Routing Algorithms, Internetworking, The Network Layer in The Internet

Unit 4 The Transport Layer 10

Layer Connectionless Transport: UDP, The Internet Transport Protocols: TCP, Congestion Control

Unit 5 Principles of Network Applications 10

Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks

Prescribed Textbooks:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, ―Computer Networking: A Top-Down Approach‖, 6th edition, Pearson, 2019.

Reference Books:

1. Forouzan, Data communications and Networking, 5th Edition, Mc Graw Hill Publication.

2. Youlu Zheng, Shakil Akthar, ―Networks for Computer Scientists and Engineers‖, Oxford Publishers, 2016.

Online Learning Resources:

1. https://nptel.ac.in/courses/106105183/25
2. http://www.nptelvideos.in/2012/11/computer-networks.html
3. https://nptel.ac.in/courses/106105183/3

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A057KT.1	3	2	3	3	-	1	-	1	-	-	-	2	1
23A057KT.2	3	2	3	3	-	1	-	2	-	-	-	2	1
23A057KT.3	3	2	3	3	-	1	-	2	-	-	-	2	1
23A057KT.4	3	2	3	3	-	1	-	2	-	-	-	2	1
23A057KT.5	3	2	3	3	1	1	-	1	-	-	-	2	1

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**INTERNET OF THINGS**
Category:	Open Elective-IV
Couse Code:	23A057LT
Semester:	VII Semester
Branch:	CE,EEE,ME,ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	**-**	**-**	**3**

Course Objectives:

This course will be able to

1. Understand the basics of Internet of Things and protocols.
2. Discuss the requirement of IoT technology
3. Introduce some of the application areas where IoT can be applied.
4. Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management
5. Understand the basics of Internet of Things and protocols.

Course Outcomes:

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

1. Understand general concepts of Internet of Things.
2. Apply design concept to IoT solutions
3. Analyze various M2M and IoT architectures
4. Evaluate design issues in IoT applications
5. Create IoT solutions using sensors, actuators and Devices

Unit 1 Introduction to IoT **10**

Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

Unit 2 Prototyping IoT Objects using Microprocessor/Microcontroller **9**

Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

Unit 3 IoT Architecture and Protocols **11**

Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

Unit 4 Device Discovery and Cloud Services for IoT **10**

Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

Unit 5 UAV IoT **9**

Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller (ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones (IoD)- Case study Flyt Base.

Prescribed Textbooks:

1. Vijay Madisetti and Arshdeep Bahga, ― Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

Reference Books:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, ― From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, ―Rethinking the Internet of Things: A Scalable Approach to Connecting Everything‖, 1st Edition, A press Publications, 2013
5. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 9781-4493- 9357-1
6. DGCA RPAS Guidance Manual, Revision 3 – 2020
   Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

Online Learning Resources:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A057LT.1	3	2	3	3	-	1	-	1	-	-	-	2	1
23A057LT.2	3	2	3	3	-	1	-	2	-	-	-	2	1
23A057LT.3	3	2	3	3	-	1	-	2	-	-	-	2	1
23A057LT.4	3	2	3	3	-	1	-	2	-	-	-	2	1
23A057LT.5	3	2	3	3	1	1	-	1	-	-	-	2	1

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course: FINANCIAL MATHEMATICS
Category: OE
Couse Code: 23AHS75T
Branch/es: Common to All Branches
Semester: VII Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To provide mathematical foundations for financial modeling, risk assessment and asset pricing.
2. To introduce stochastic models and their applications in pricing derivatives and interest rate modeling.
3. To develop analytical skills for fixed-income securities, credit risk, and investment strategies.
4. To equip students with computational techniques for pricing financial derivatives.

Course Outcomes:

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

1. Explain fundamental financial concepts, including arbitrage, valuation, and risk.
2. Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts.
3. Analyze mathematical techniques for pricing options and financial derivatives.
4. Evaluate interest rate models and bond pricing methodologies.
5. Utilize computational techniques such as Monte Carlo simulations for financial modeling.

Unit 1 Asset Pricing and Risk Management **8**

Fundamental financial concepts: Returns, arbitrage, valuation, and pricing. Asset/Liability management, investment income, capital budgeting, and contingent cash flows. One-period model: Securities, payoffs, and the no-arbitrage principle. Option contracts: Speculation and hedging strategies, CAP(Capital Asset Pricing) Model, Efficient market hypothesis.

Unit 2 Stochastic Models in Finance **8**

Random Walks and Brownian Motion. Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito(stochastic processes) calculus: Ito‘s(stochastic processes) Lemma, Ito(stochastic processes) Integral, and Ito(stochastic processes) Isometry.

Unit 3 Interest Rate and Credit Modelling **8**

Interest rate models and bond markets. Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR), Hull & White models, Credit risk modelling: Hazard function and hazard rate.

Unit 4 Fixed-Income Securities and Bond Pricing **8**

Characteristics of fixed-income products: Yield, duration, and convexity. Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE. Yield curve fitting and calibration techniques, Mortgage Backed Securities.

Unit 5 Exotic Options and Computational Finance 8

Stochastic volatility models and the Feynman-Kac theorem. Exotic options: Barriers, Asians, and Look backs. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications.

Prescribed Textbooks:

1. Ales Cerny, Mathematical Techniques in Finance: Tools for Incomplete Markets, Princeton University Press.
2. S.R. Pliska, Introduction to Mathematical Finance: Discrete-Time Models, Cambridge University Press.

Reference Books:

1. IoannisKaratzas& Steven E. Shreve, Methods of Mathematical Finance, Springer, New York.
2. John C. Hull, Options, Futures, and Other Derivatives, Pearson.

Online Learning Resources:

1. MIT– Mathematics for Machine Learning https://ocw.mit.edu
2. Coursera – Financial Engineering and Risk Management (Columbia University) https://www.coursera.org/
3. National Stock Exchange (NSE) India – Financial Derivatives https://www.nseindia.com/

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23AHS75T.1	3	2	-	-	1	-	-	-	-	-	2	1	-	-
23AHS75T.2	3	3	2	2	2	-	-	-	-	-	1	1	-	-
23AHS75T.3	3	3	3	3	2	1	-	-	-	-	3	2	-	-
23AHS75T.4	3	3	3	3	1	-	-	-	-	-	2	1	-	-
23AHS75T.5	3	3	3	3	3	-	-	-	-	-	2	2	-	-

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
An Autonomous Institution

Department of Civil Engineering

Title of the Course:	**Sensor and Actuators for Engineering Applications**
Category:	OE
Couse Code:	23AHS76T
Branch/es:	Common to all branches
Semester:	VII Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To provide exposure to various kinds of sensors and actuators and their engineering applications.
2. To impart knowledge on the basic laws and phenomenon behind the working of sensors and Actuators
3. To explain the operating principles of various sensors and actuators
4. To educate the fabrication of sensors
5. To explain the required sensor and actuator for interdisciplinary application

Course Outcomes:

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

1. Classify different types of Sensors and Actuators along with their characteristics
2. Summarize various types of Temperature and Mechanical sensors
3. Illustrates various types of optical and mechanical sensors
4. Analyze various types of Optical and Acoustic Sensors
5. Interpret the importance of smart materials in various devices

Unit 1 Introduction to Sensors and Actuators 9

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

Unit 2 Temperature and Mechanical Sensors 9

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo- resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).

Unit 3 Optical and Acoustic Sensors 9

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones

Unit 4 Magnetic and Electromagnetic Sensors 9

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.

Unit 5 Chemical and Radiation Sensors 9

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Prescribed Textbooks:

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

Reference Books:

1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc21_ee32/preview

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23AHS76T.1	3	3	2	2	1	-	-	-	-	-	-	-	-	-
23AHS76T.2	3	3	2	1	1	-	-	-	-	-	-	-	-	-
23AHS76T.3	3	3	1	1	1	-	-	-	-	-	-	-	-	-
23AHS76T.4	3	2	1	1	-	-	-	-	-	-	-	-	-	-
23AHS76T.5	3	3	1	1	-	-	-	-	-	-	-	-	-	-

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course: Chemistry of Nanomaterials and Applications

Category: OE
Couse Code: 23AHS77T
Branch/es: Common to all branches
Semester: VII Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To understand basics and characterization of nanomaterials.
2. To understand synthetic methods of nanomatrials.
3. To apply various techniques for charterization of nanomaterials.
4. To understand Studies of Nano-structured Materials
5. To enumerate the applications of advanced nanomaterials in engineering

Course Outcomes:

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

1. classify the nanostructure materials; describe scope of nanoscience and importance technology.
2. describe the top-down approach, explain aerosol synthesis and plasma arc technique, differentiate chemical vapor deposition method and electrode position method, Discuss about highenergy ball milling.
3. discuss different technique for characterization of nanomaterial, explain electron microscopy techniques for characterization of nanomaterial, Describe BET method for surface area analysis
4. explain synthesis and properties and applications of nanaomaterials, discuss about fullerenes and carbon nanotubes, Differentiate nanomagnetic materials and thermoelectric materials, nonlinear optical materials.
5. Illustrate advance engineering applications of Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation

Unit 1 Basics of Nanomaterials 9

Introduction, Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nanomaterials.

Unit 2 Synthesis of nanomaterials 9

Top-Down approach, Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, high energy ball milling method. Synthetic Methods: Bottom-Up approach, Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sono chemical synthesis.

Unit 3 Techniques for characterization 9

Diffraction technique (XRD), spectroscopy techniques- (UV and IR), electron microscopy techniques (EDAX, SEM and TEM) for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

Unit 4 Studies of Nano-structured Materials 9

Synthesis, properties and applications of the following nanomaterials -fullerenes, carbon nanotubes, 2D-nanomaterial (Graphene), core-shell, magnetic nanoparticles, thermoelectric materials, non-linear optical materials.

Unit 5 Advanced Engineering Applications of Nanomaterials 9

Applications of Nano Particle, nanorods, nano wires, Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

Prescribed Textbooks:

1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, BaldevRai, BB Rath and James Murday, Univ. Press, 2012
3.

Reference Books:

4. Concepts of Nanochemistry; LudovicoCademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Wiley-VCH, 2011.
5. Nanostructures &Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007.

CO-PO Mapping:

Course Outcomes	**Engineering Knowledge**	**Problem Analysis**	**Design/Development of solutions**	**Conduct investigations of complex problems**	**Modern tool usage**	**The engineer and society**	**Environment and sustainability**	**Ethics**	**Individual and team work**	**Communication**	**Project management and finance**	**Life-long learning**
23AHS77T.1	3	3	2	1	-	-	2	-	-	-	-	3
23AHS77T.2	3	3	2	1	-	-	2	-	-	-	-	3
23AHS77T.3	3	3	2	1	-	-	2	-	-	-	-	3
23AHS77T.4	3	2	1	1	-	-	2	-	-	-	-	3
23AHS77T.5	3	2	1	1	-	-	2	-	-	-	-	3

ANNAMCHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES: RAJAMPET
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Department of Civil Engineering

Title of the Course:	**LITERARY VIBES**
Category:	OE
Couse Code:	23AHS78T
Branch/es:	Common to all branches
Year:	IV B.Tech
Semester:	I Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To inculcate passion for aesthetic sense and reading skills
2. To foster humane attitude and creative thinking
3. To promote emotional intelligence, enhance communication skills, and foster critical thinking.
4. To inculcate social responsibility and sense of history
5. To provide practical wisdom and duty of responding to events of the times

Course Outcomes:

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

1. Identify genres, literary techniques and creative uses of language in literary texts
2. Explain the relevance of themes found in literary texts to contemporary, personal and cultural values and to historical forces
3. Apply knowledge and understanding of literary texts when responding to others' problems and their own and make evidence-based arguments
4. Analyze the underlying meanings of the text by using the elements of literary texts
5. Critically evaluate their own and others' work while developing creativity, independence, and the ability to make informed decisions

Unit 1 Poetry 9

Ulysses- Alfred Lord Tennyson
"If"- Rudyard Kipling
The Second Coming- W.B. Yeats
Where the Mind is Without Fear- Rabindranath Tagore

Unit 2 Drama: Twelfth Night- William Shakespeare 9

Shakespeare -life and works
Plot & sub-plot and Historical background of the play
Themes and Criticism
Style and literary elements
Characters and characterization

Unit 3 Short Story 9

The Luncheon - Somerset Maugham
The Happy Prince-Oscar Wild
Three Questions – Leo Tolstoy
Engine Trouble- R.K. Narayan

Unit 4 Prose: Essay and Autobiography 9

Ignited Minds- A.P.J. Abdul Kalam
The Essentials of Education-Richard Livingston
The story of My Life-Helen Keller
Knowledge and Wisdom- Bertrand Russell

Unit 5 Novel: Hard Times- Charles Dickens 9

Charles Dickens-Life and works-Plot and Historical background of the novel, Themes and criticism- Style and literary elements- Characters and characterization

Prescribed Textbooks:

1. Charles Dickens.Hard Times.(Sangam Abridged Texts) Vantage Press, 1983
2. DENT JC.William Shakespeare. Twelfth Night. Oxford University Press,2016.

Reference Books:

1. WJ Long.History of English Literature, Rupa Publications India; First Edition (4 October 2015)
2. RK Kaushik And SC Bhatia. Essays, Short Stories and One Act Plays, Oxford University Press .2018.

Online Learning Resources:

1. https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses
2. https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis
3. https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis- summary-and-line-by-line-explanation/#google_vignette
4. https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/
5. https://www.litcharts.com/lit/twelfth-night/themes
6. https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and-irony/

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning
23AHS78T-1	-	-	-		-	-	-	-	-	3	-	3
23AHS78T-2	-	-	-	-	-	-	-	-	-	3	-	3
23AHS78T-3	-	-	-	-	-	-	-	-	-	3	-	3
23AHS78T-4	-	-	-	-	-	-	-	-	-	3	-	3
23AHS78T-5	-	-	-	-	-	-	-	-	-	3	-	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)
Department of Civil Engineering

Title of the Course: **BUILDING MATERIALS AND SERVICES**
Category: **OE**
Couse Code: 23A017GT
Branch/es: Civil Engineering
Semester: **VII**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
1. To understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
2. To analyze the composition, manufacturing process, and properties of cement and admixtures.
3. To apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
4. To evaluate masonry, mortars, finishing techniques, and formwork systems.
5. To assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

Course Outcomes:
At the end of the course, the student will be able to
1. Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
2. Analyze the composition, manufacturing process, and properties of cement and admixtures.
3. Apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
4. Evaluate masonry, mortars, finishing techniques, and formwork systems.
5. Assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

Unit 1 Building Materials 8

Building Stones – Classifications and Quarrying – Properties –Structural Requirements – Dressing. Bricks – Composition of Brick Earth – Manufacture and Structural Requirements, Fly Ash, Ceramics. Timber, Aluminum, Glass, Paints and Plastics: Wood - Structure – Types and Properties – Seasoning – Defects; Alternate Materials for Timber – GI / Fibre – Reinforced Glass Bricks, Steel & Aluminum, Plastics.

Unit 2 Cementitious materials 8

Types of Cement - Ingredients of Cement – Manufacture – Chemical Composition – Hydration - Field & Lab Tests – Fineness – Consistency – Initial &Final Setting – Soundness. Admixtures – Mineral & Chemical Admixtures – Uses

Unit 3 Building Components 8

Lintels, Arches, Walls, Vaults – Stair Cases – Types of Floors, Types of Roofs – Flat, Curved, Trussed; Foundations – Types; Damp Proof Course; Joinery – Doors -Windows – Materials – Types.

Unit 4 Masonry and Finishing 10

Lime and Cement Mortars Brick Masonry – Types – Bonds; Stone Masonry – Types; Composite Masonry – Brick-Stone Composite; Concrete, Reinforced Brick. Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP form Work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

Unit 5 Building Services 10

Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional Requirements Systems of Ventilations. Air-Conditioning, Building Orientation - Essentials and Types; Acoustics – Characteristic – Absorption – Acoustic Design; Fire Protection – Fire Hazards – Classification of Fire-Resistant Materials and Constructions.

Prescribed Textbooks:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.

Reference Books:

1. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) Ltd., New Delhi
2. P. C. Varghese, Building Materials, Prentice Hall of India, 2015.
3. N. Subramanian ,‖Building Materials Testing and Sustainability‖, Oxford Higher Education, 2019.
4. R. Chudley, Construction Technology, Longman Publishing Group, 1973.
5. S. K. Duggal, Building Materials, Oxford & IBH Publishing Co. Ltd., New Delhi, 2019

Online Learning Resources:

1.**https://archive.nptel.ac.in/courses/105/102/105102088/**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A017GT.1	3	-	-	-	2	-	-	-	-	-	-	-	3	3
23A017GT.2	3	3	-	-	2	-	-	-	-	-	-	2	3	3
23A017GT.3	3	-	3	2	3	-	-	-	-	-	-	-	3	3
23A017GT.4	-	-	3	3	3	-	2	-	-	-	-	-	3	3
23A017GT.5	-	-	-	-	-	3	3	2	-	-	-	-	-	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)
Department of Civil Engineering

Title of the Course: **ENVIRONMENTAL IMPACT ASSESSMENT**
Category: (OE – III)
Couse Code: 23A017HT
Branch/es: Civil Engineering
Semester: **VII**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
1. Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).
2. Analyze the impact of developmental activities on land use, soil, and water resources.
3. Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.
4. Develop environmental audit procedures and assess compliance with environmental regulations.
5. Understand and apply environmental acts, notifications, and legal frameworks in EIA studies.

Course Outcomes:
At the end of the course, the student will be able to
1. Apply various methodologies for conducting Environmental Impact Assessments.
2. Analyze the impact of land-use changes on soil, water, and air quality.
3. Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.
4. Develop environmental audit reports and assess compliance with environmental policies.
5. Interpret and apply environmental acts and regulations related to EIA.

Unit 1 Concepts and methodologies of EIA 8
Initial Environmental Examination, Elements of EIA, - Factors Affecting E-I-A Impact Evaluation and Analysis, Preparation of Environmental Base Map, Classification of
Environmental Parameters- Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis.

Unit 2 Impact of Developmental Activities and Land Use 8
Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I A in Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts on Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact.

Unit 3 Assessment of Impact on Vegetation, Wildlife and Risk Assessment 8
Introduction - Assessment of Impact of Development Activities on Vegetation and Wildlife,
Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing an Environmental Risk Assessment- Advantages of Environmental Risk Assessment.

Unit 4 Environmental Audit 10
Introduction - 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

Unit 5 Environmental Acts and Notifications 10
The Environmental Protection Act, The Water Preservation Act, The Air (Prevention & Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report.

Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, Concept of ISO and ISO 14000.

Prescribed Textbooks:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011
2. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)

Reference Books:

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

Online Learning Resources:

1.**https://archive.nptel.ac.in/courses/124/107/124107160/**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A017HT.1	3	2	2	2	2	3	-	-	-	-	-	1	2	2
23A017HT.2	3	3	3	2	2	3	-	-	-	-	-	1	3	2
23A017HT.3	3	3	3	2	2	3	3	-	-	-	-	1	3	3
23A017HT.4	3	3	3	3	2	3	3	-	-	-	-	1	3	3
23A017HT.5	2	2	2	2	2	3	3	3	-	-	-	1	2	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)
Department of Civil Engineering

Title of the Course: **GEO-SPATIAL TECHNOLOGIES**
Category: **OE**
Couse Code: 23A017IT
Branch/es: Civil Engineering
Semester: **VII**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:

1. To understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
2. To analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
3. To apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
4. To evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
5. To assess GIS customization, Web GIS, and mobile mapping techniques for real- world applications.

Course Outcomes:

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

1. Understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
2. Analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
3. Apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
4. Evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
5. Assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

Unit 1 Raster Analysis 8

Raster Data Exploration: Query Analysis - Local Operations: Map Algebra, Reclassification, Logical and Arithmetic Overlay Operations—Neighborhood - Operations: Aggregation, Filtering – Extended Neighborhood-Operations- Zonal Operations - Statistical Analysis – Cost-Distance Analysis-Least Cost Path.

Unit 2 Vector Analysis 8

Non-Topological Analysis: Attribute Database Query, Structured Query Language, Co-Ordinate Transformation, Summary Statistics, Calculation of Area, Perimeter and Distance – topological Analysis: Reclassification, Aggregation, Overlay Analysis: Point-In-Polygon, Line-In-Polygon, Polygon-On-Polygon: Clip, Erase, Identity, Union, Intersection – Proximity Analysis: Buffering

Unit 3 Network Analysis 8

Network – Introduction - Network Data Model – Elements of Network - Building A Network Database - Geocoding – Address Matching - Shortest Path in A Network – Time and Distance Based Shortest Path Analysis – Driving Directions – Closest Facility Analysis – Catchment / Service Area Analysis-Location-Allocation Analysis

Unit 4 Surface and Geostatistical Analysis 10

Surface Data – Sources of X, Y, Z Data – DEM, TIN – Terrain Analysis – Slope, Aspect, Viewshed, Watershed Analysis: Watershed Boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram.

Unit 5 Customisation, Web GIS, Mobile Mapping 10

Customisation of GIS: Need, Uses, Scripting Languages –Embedded Scripts – Use of Python Script - Web GIS: Web GIS Architecture, Advantages of Web GIS, Web Applications- Location Based Services: Emergency and Business Solutions - Big Data Analytics.

Prescribed Textbooks:

1. Kang – Tsung Chang, Introduction to Geographical Information System, 4th Ed., Tata McGraw Hill Edition, 2008.
2. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

Reference Books:

1. Michael N. Demers, Fundamentals of Geographic Information Systems, Wiley,2009
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa raju, –An Introduction to Geographical Information Systems, Pearson Education, 2nd Edition, 2007.
3. John Peter Wilson, The Handbook of Geographic Information Science, Blackwell Pub.,2008

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/105/105/105105202/**
2. **https://onlinecourses.nptel.ac.in/noc19_cs76/preview**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A017IT.1	3	-	-	-	2	-	-	-	-	-	-	-	3	3
23A017IT.2	3	3	-	-	2	-	-	-	-	-	-	2	3	3
23A017IT.3	3	-	3	2	3	-	-	-	-	-	-	-	3	3
23A017IT.4	-	-	3	3	3	-	2	-	-	-	-	-	3	3
23A017IT.5	-	-	-	-	3	3	3	2	-	-	-	-	3	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)
Department of Civil Engineering

Title of the Course: **SOLID WASTE MANAGEMENT**
Category: **OE**
Couse Code: 23A017JT
Branch/es: Civil Engineering
Semester: **VII**

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	-	-	3

Course Objectives:
1. To understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
2. To analyze engineering systems for solid waste collection, storage, and transportation.
3. To apply resource and energy recovery techniques for sustainable solid waste management.
4. To evaluate landfill design, construction, and environmental impact mitigation strategies.
5. To assess hazardous waste management techniques

Course Outcomes:
At the end of the course, the student will be able to
1. Understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
2. Analyze engineering systems for solid waste collection, storage, and transportation.
3. Apply resource and energy recovery techniques for sustainable solid waste management.
4. Evaluate landfill design, construction, and environmental impact mitigation strategies.
5. Assess hazardous waste management techniques, including biomedical and e-waste

Unit 1 **Solid Waste** 8

Definitions, Types of Solid Wastes, Sources of Solid Wastes, Characteristics, and Perspectives; Properties of Solid Wastes, Sampling of Solid Wastes, Elements of Solid Waste Management - Integrated Solid Waste Management, Solid Waste Management Rules 2016.

Unit 2 **Solid Waste Management:** 8

Solid Waste Generation; On-Site Handling, Storage and Processing; Collection of Solid Wastes; Stationary Container System and Hauled Container Systems – Route Planning - Transfer and Transport; Processing Techniques;

Unit 3 **Resource and Energy Recovery** 8

Processing Techniques; Materials Recovery Systems; Recovery of Biological Conversion Products – Composting, Pre and Post Processing, Types of Composting, Critical Parameters, Problems with Composing - Recovery of Thermal Conversion Products; Pyrolisis, Gasification, RDF - Recovery of Energy from Conversion Products; Materials and Energy Recovery Systems.

Unit 4 **Landfills** 10

Evolution of Landfills – Types and Construction of Landfills – Design Considerations – Life of Landfills- Landfill Problems – Lining of Landfills – Types of Liners- Leachate Pollution and Control – Monitoring Landfills – Landfills Reclamation.

Unit 5 **Hazardous Waste Management** 10

– Sources and Characteristics, Effects On Environment, Risk Assessment – Disposal of Hazardous Wastes – Secured Landfills, Incineration - Monitoring – Biomedical Waste Disposal, E-Waste Management, Nuclear Wastes, Industrial Waste Management

Prescribed Textbooks:
1. Tchobanoglous G, Theisen H and Vigil SA Integrated Solid Waste Management, Engineering Principles and Management Issues, McGraw-Hill, 1993.

2. Vesilind PA, Worrell W and Reinhart D, Solid Waste Engineering‘ Brooks/Cole Thomson Learning Inc., 2002.

Reference Books:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, _Environmental Engineering, McGraw Hill Inc., New York, 1985.
2. Qian X, Koerner R.M and Gray DH, _Geotechnical Aspects of Landfill Design and Construction Prentice Hall, 2002.

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/105/103/105103205/**
2. **https://archive.nptel.ac.in/courses/120/108/120108005/**

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	**PSO1**	**PSO2**
23A017JT	3	-	-	-	2	-	2	-	-	-	-	-	3	3
23A017JT	3	3	-	-	2	-	3	-	-	-	-	2	3	3
23A017JT	3	-	3	2	3	-	3	-	-	-	-	-	3	3
23A017JT	-	-	3	3	3	-	3	2	-	-	-	-	3	3
23A017JT	-	-	-	-	3	3	3	3	-	-	-	-	3	3

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Title of the Course:	**Civil Engineering Software (STAADPRO/CAD/TEKLA)**
Category:	SC
Couse Code:	23A0172L
Branch/es:	Civil Engineering
Semester:	**VII**

Lecture Hours	**Tutorial Hours**	**Practice Hours**	**Credits**
3	-	-	3

Course Objectives:

1. Provide fundamental knowledge of Auto CAD and Tekla for 2D drafting and 3D modeling.
2. Train students in structural analysis and design using STAAD.Pro
3. Develop skills in reinforcement detailing and structural component modeling.
4. Introduce seismic and nonlinear analysis for structural safety evaluation.
5. Enable students to apply civil engineering software tools for real-world projects.

Course Outcomes:

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

1. Create 2D drawings and structural detailing using AutoCAD.
2. Develop 3D building models and analyze site topography in Revit.
3. Perform structural analysis and design of multi-story buildings using STAAD.Pro and ETABS.
4. Conduct seismic and performance-based analysis for high-rise structures.
5. Apply SAP2000 for bridge modeling, water tank design, and advanced structural systems.

List of Experiments: -

1. Determination of Basic Drawing and Editing Commands in AutoCAD
2. Creation of a 2D Floor Plan for a Residential Building in AutoCAD
3. Development of Structural Detailing for Beams and Columns in AutoCAD
4. Application of Reinforcement Detailing for Slabs and Footings in AutoCAD
5. Creation and analysis of a steel column using TEKLA
6. Modelling a Roof Truss by TEKLA
7. Design of a Composite Beam by TEKLA
8. Column Base Plate Design by TEKLA
9. Determination of STAAD.Pro Interface and Structural Model Setup
10. Analysis and Design of a Simply Supported Beam in STAAD.Pro
11. Development of Structural Analysis for a Multi-Story RCC Building in STAAD.Pro
12. Application of Seismic Load Analysis on a Building Structure in STAAD.Pro

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CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
23A0172L.1	**3**	**1**	**1**	**-**	**2**	**-**	**-**	**1**	**-**	**1**	**1**	**1**	**2**	**1**
23A0172L.2	**3**	**1**	**2**	**-**	**3**	**-**	**-**	**2**	**-**	**2**	**2**	**2**	**1**	**1**
23A0172L.3	**3**	**1**	**2**	**-**	**3**	**-**	**-**	**2**	**-**	**2**	**2**	**2**	**2**	**2**
23A0172L.4	**3**	**1**	**1**	**-**	**3**	**-**	**-**	**1**	**-**	**1**	**1**	**1**	**1**	**2**
23A0172L.5	**3**	**1**	**1**	**-**	**3**	**-**	**-**	**1**	**-**	**1**	**1**	**1**	**1**	**1**

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Title of the Course:	**GENDER SENSITIZATION**
Category:	AC
Couse Code:	23AHS79T
Branch/es:	Common to all
Semester:	VII Semester

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	2	0

Course Objectives:

1. To enable students to understand the gender related issues, vulnerability of women and menTo foster humane attitude and creative thinking
2. To familiarize them about constitutional safeguard for gender equality
3. To expose the students to debates on the politics and economics of work
4. To help students reflect critically on gender violence
5. To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

Course Outcomes:

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

1. Understand the basic concepts of gender and its related terminology.
2. Identify the biological, sociological, psychological and legal aspects of gender.
3. Use the knowledge in understanding how gender discrimination works in our society and how to counter it.
4. Analyzethe gendered division of labour and its relation to politics and economics.
5. Appraise how gender-role beliefs and sharing behavior are associated with more well-being in all culture and gender groups.

Unit 1 **Understanding Gender** 6

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit 2 **Gender Roles and Relations** 6

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio-Demographic Consequences-Gender Spectrum.

Unit 3 **Gender and labour** 7

Division and Valuation of Labour-Housework: The Invisible Labor- “My Mother doesn‘t Work”. “Share the Load”. -Work: Its Politics and Economics -Fact and Fiction- Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit 4 **Gender-based Violence** 7

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

Unit 5 **Gender and Culture** 6

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature-Gender Development Issues-Gender Issues-Gender Sensitive Language- Just Relationships

Prescribed Textbooks:

1. A.Suneetha, Uma Bhrugubanda, et al. Towards a World of Equals: A Bilingual Textbook on Gender‖, Telugu Akademi, Telangana, 2015.

2. Butler, Judith. Gender Trouble: Feminism and the Subversion of Identity. UK Paperback Edn. March 1990

Reference Books:

1. Wtatt, Robin and Massood, Nazia, Broken Mirrors: The dowry Problems in India,London : Sage Publications, 2011.
2. Datt, R. and Kornberg, J.(eds), Women in Developing Countries, Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002.
3. Brush, Lisa D., Gender and Governance, New Delhi, Rawat Publication, 2007.
4. Singh, Direeti, Women and Politics World Wide, New Delhi, Axis Publications, 2010 5.
5. Raj Pal Singh, Anupama Sihag, Gender Sensitization: Issues and Challenges (English, Hardcover), Raj Publications, 2019.
6. A.Revathy& Murali, Nandini, A Life in Trans Activism(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016.

Online Learning Resources:

1. https://onlinecourses.swayam2.ac.in/nou24_hs53/preview
2. https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes
3. https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be-redressed
4. https://onlinecourses.nptel.ac.in/noc23_mg67/preview
5. https://eige.europa.eu/gender-based-violence/what-is-gender-based violence?language_content_entity=en
6. https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls
7. https://onlinecourses.swayam2.ac.in/nou25_ge38/preview
8. https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/
9. https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/
10. https://archive.nptel.ac.in/courses/109/106/109106136/