

Annamacharya Institute of Technology and Sciences, Tirupati
Course structure for Four Year Regular B.Tech. Degree Program
(Effective for the batches admitted from 2019-20)

CIVIL ENGINEERING (CE)

IV B. Tech – I Semester

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CI E	SE E	Total
THEORY										
1	PCC	19APC0125	Estimation, Costing and Valuation	3	0	0	3	30	70	100
2	PCC	19APC0126	Design and Drawing of Steel Structures	3	0	0	3	30	70	100
3	PCC	19APC0127	Environmental Engineering	3	0	0	3	30	70	100
4	PCC	19APC0128	Hydrology and water resources engineering	2	0	0	2	30	70	100
5	PEC		Professional Elective III	2	0	0	2	30	70	100
		19APE0111	Ground Improvement Techniques							
		19APE0112	Watershed and River Basin Management							
		19APE0113	Engineering Materials for Sustainability							
		19APE0114	Air pollution and quality control							
19APE0115	Bridge Engineering									
6	PEC		Professional Elective IV	2	0	0	2	30	70	100
		19APE0116	Repairs and Rehabilitation of Structures							
		19APE0117	Intelligent transportation systems							
		19APE0118	Hydro Power Engineering							
		19APE0119	Industrial Waste & Waste-Water Engineering							
19APE0120	Construction Technology and Project Management									
PRACTICAL										
7	PCC	19APC0129	Structural Design and Drawing Lab	0	0	3	1.5	30	70	100
8	PCC	19APC0130	Environmental Engineering Lab	0	0	3	1.5	30	70	100
9	PRC	19APR0105	Socially Relevant Projects (15 hrs / semester)	0	0	1	0.5	50	-	50
10	PRC	19APR0106	Survey Camp/ Industrial Training/Internship/Research Projects in National Laboratories/Academic Institutions	0	0	1	0.5	50	-	50
TOTAL							19.0	340	560	900

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI

Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APC0125	ESTIMATION, COSTING AND VALUATION	3	0	0	3

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

1. Apply different types of estimates for different building elements
2. Carry out analysis of rates and bill preparation different building elements
3. Carry out estimation of earthwork and reinforcement
4. Understand the contracts and tenders
5. Carry out rate analysis and valuation of building items

Course Objective: The objective of the course is to make the student to understand about estimation of quantities and valuations of different types of structures as per standard schedule of rates.

UNIT – I

INTRODUCTION: General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

STANDARDS SPECIFICATIONS: Standard specifications for different items of building construction

UNIT – II

ESTIMATION OF BUILDINGS: Detailed Estimates of Buildings

UNIT – III

EARTHWORK ESTIMATION: Earthwork for roads and canals.

REINFORCEMENT ESTIMATION: Reinforcement bar bending and bar requirement schedules.

UNIT – IV

CONTRACTS AND TENDERS: Contracts – Types of contracts – Contract Documents – Conditions of contract – Types of Tenders – Requirement of Tendering.

UNIT – V

RATE ANALYSIS: Working out rate analysis for various items of work using Standard schedule of rates.

VALUATION: Valuation of buildings.

TEXT BOOKS

1. Estimating and Costing, 27th revised edition by B.N. Dutta, UBS publishers, 2000.
2. Civil Engineering Contracts and estimations, 4th edition by B.S.Patil, Universities Press, Hyderabad.

REFERENCES :

1. Engineering Construction Cost 6th edition by Peurifoy, TMH Publications
2. Estimation, Costing and Specifications by M. Chakraborti; Laxmi publications.
3. Standard Schedule of Rates and Standard Data Book by Public Works Department.
4. I. S. 1200 (Parts I to XXV – 1974/ Method of Measurement of Building and Civil Engineering works – B.I.S.)
5. National Building Code

Note : Standard schedule of rates is permitted in the examination hall.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

Year: IV

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Subject Code	Subject Name	L	T	P	Credits
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19APC0126	DESIGN & DRAWING OF STEEL STRUCTURES	3	0	0	3
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Course objective: *To understand design specifications, loading and design procedures of different steel structures as per BIS specifications.*

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

1. Understand the basic concepts of Steel structures and design of Tension members
2. Analyze and Design of compression members
3. Analyze and design of beams
4. Analyze and design of Plate girder
5. Analyze and design of Gantry Girder and simple roof truss

UNIT – I

Materials – Making of iron and steel – types of structural steel – mechanical properties of steel – Concepts of plasticity – yield strength. Loads–and combinations loading wind loads on roof trusses, behavior of steel, local buckling. Concept of limit State Design – Different Limit States as per IS 800 -2007 – Design Strengths- deflection limits – serviceability - Bolted connections – Welded connections – Design Strength – Efficiency of joint - Design of Tension members – Design Strength of members.

UNIT – II

Design of compression members – Buckling class – slenderness ratio / strength design – laced – battened columns –column splice – column base – slab base.

UNIT – III

Design of Beams – Plastic moment – Bending and shear strength laterally / supported beams.

UNIT – IV

Plate Girder: Design consideration – I S Code recommendations Design of plate girder- Welded – Curtailment of flange plate’s stiffeners – splicing and connections.

UNIT – V

Gantry Girder : Gantry girder impact factors – longitudinal forces, Design of Gantry girders - Design of simple roof truss.

Note: The students should prepare the following plates.

Plate 1 Detailing of simple beams

Plate 2 Detailing of Column including lacing and battens.

Plate 3 Detailing of Column bases – slab base and gusseted base

Plate 4 Detailing of Plate girder including curtailment, splicing and stiffeners.

Plate 5 Detailing of Gantry girder and simple roof truss.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. Part A consist 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%.

TEXT BOOKS

1. Design of Steel Structures by Dr.B.C.Punmia,A.K.Jain, Lakshmi Publications.
2. Limit State Design of Steel Structures by Subramanyam.N, Oxford University press, New Delhi
3. Limit State Design of Steel Structures by S.K. Duggal, Tata Mcgraw Hill, New Delhi.

REFERENCES

1. Fundamentals of Structural Steel Design by M.L.Gambhir, TMH publications.
2. Structural Design and Drawing by N.Krishna Raju, University Press, Hyderabad.
3. Structural design in steel by Sarwar Alam Raz, New Age International Publishers, New Delhi
4. Design of Steel Structures by Edwin Gaylord, Charles Gaylord, James Stallmeyer, Tata Mc.Graw-Hill, New Delhi.

Codes/Tables:

IS Codes:

- 1) IS -800 – 2007
 - 2) IS – 875 – Part III
 - 3) Steel Tables.
 - 4) Railway Design Standards Code.
- and **steel tables** to be permitted into the examination hall.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APC0127	ENVIRONMENTAL ENGINEERING	3	0	0	3

OUTCOMES: On completion of the course, the students will be able to:

- Identify the water demand and water characteristics.
- Apply the water treatment concept, methods, water distribution processes and operation.
- Carry out municipal water and wastewater treatment system operations and determine the sewage characteristics
- Prepare basic processes of designs of wastewater treatment plants.
- Design various sewage treatment plants and usage of solid wastes.

UNIT – I

INTRODUCTION: Importance and Necessity of Protected Water Supply systems, Objectives of Protected water supply system, Flow chart of public water supply system, Role of Environmental Engineer.

WATER DEMAND AND QUANTITY STUDIES: Estimation of water demand for a town or city, Types of water demands, Per capita Demand, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design period, Population Studies, Population Forecasting Studies.

QUALITY AND ANALYSIS OF WATER: Characteristics of water – Physical, Chemical and Biological. Analysis of Water – Physical, Chemical and Biological. Impurities in water, Water borne diseases. Drinking water quality standards.

UNIT - II

WATER TREATMENT: Layout and general outline of water treatment units. Screening. Sedimentation - types of sedimentation tanks - design elements. Coagulation – coagulants – feeding arrangements – flocculation. Filtration – Classification of filters – working of slow and rapid gravity filters – design of filters – troubles in operation comparison of filters. Disinfection – theory of chlorination – chlorine demand, other disinfection practices – Miscellaneous treatment methods

WATER DISTRIBUTION: Distribution systems – Requirements, Layout of Water distribution systems - Design procedures- Hardy Cross and equivalent pipe methods.

UNIT – III

INTRODUCTION TO SANITATION: Systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- types of sewers, design of sewers, cleaning and ventilation of sewers. Engineered systems for solid waste management (reuse/ recycle energy recovery, treatment and disposal).

WASTE WATER COLLECTION AND CHARACTERSTICS: characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. equations.

UNIT IV

WASTE WATER TREATMENT: Layout and general outline of various units in a waste water treatment plant – Screens – grit chambers – skimming tanks – sedimentation tanks – biological treatment – trickling filters – standard and high rate – Construction and design of Oxidation ponds – Activated sludge process.

UNIT – V

SLUDGE TREATMENT: Sludge digestion – design of Digestion tank – septic tanks and Imhoff Tanks working principles and design – soak pits.

TEXT BOOKS:

1. Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons Publishers.
2. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C. Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi
3. Environmental Engineering by Peavy, TMH Publishers.

REFERENCES:

1. Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Person Education.
2. Waste water treatment- concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India
3. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**Year: IV****Semester: I****Branch of Study: CE**

Subject Code	Subject Name	L	T	P	Credits
19APC0128	HYDROLOGY & WATER RESOURCES ENGINEERING	2	0	0	2

The objectives of this course

1. Understand the concept of hydrology and components of hydrologic cycle such as precipitation, infiltration, evaporation and transpiration
2. Quantify runoff and use concept of unit hydrograph
3. Demonstrate different methods of irrigation, methods of application of water and irrigation procedure

4. *The fundamental idea behind this course is to make student aware of canal regulation works and cross drainage works*
5. *The course also targeted to teach students the concepts of major irrigation structures such as gravity dams, earthen dams and its prerequisites namely reservoir planning*

COURSE OUTCOMES (COs)

On successful completion of this course, the student will be able to

1. *To understand importance of hydrology, hydrological cycle and estimate precipitation, runoff, evaporation, evapotranspiration and infiltration. Classify different type of geological formation of ground water and estimate yield*
2. *To understand various types of irrigation and describe principals of irrigation*
3. *To study the principals of crop water requirements and determine the irrigation crop water requirements*
4. *To Study the canal regulation works and design various elements in canal regulation works*
5. *To Understand the different types of cross drainage works , the concepts of reservoir planning and various types of dams and estimate the stability of gravity of dam*

UNIT – I

Introduction to Hydrology: Engineering Hydrology and its applications; Hydrologic Cycle; Precipitation- Types and Forms; Evaporation- Factors affecting & measurement of Evaporation; Infiltration - Factors affecting & measurement of infiltration - Infiltration Indices; Run-off- Factors affecting Run-off - Computation of Run-off

Hydrograph Analysis: Hydrograph-Unit Hydrograph- Construction and limitations of Unit Hydrograph - Application of Unit Hydrograph - S-Hydrograph

UNIT – II

Ground Water: Aquifer – Aquiclude – Aquifuge - Aquifer parameters; Porosity - Specific yield - Specific retention; Types of aquifers - Well Hydraulics - Darcy's Law - Steady radial flow to a well; Dupuit's theory for confined and unconfined aquifers

Irrigation: Introduction - Necessity and importance of Irrigation - Advantages and effects of Irrigation - Types of Irrigation - Methods of Application of Irrigation water -Duty and Delta - Relation between Duty and Delta - Factors affecting Duty - Methods of improving Duty

UNIT – III

Water Requirement of Crops: Types of Soils; 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; Consumptive use of water - Factors affecting consumptive use

Canal Regulation Works: Canal falls- Necessity and location of falls- Types and classification of falls; Roughening devices; Design of sarada type fall; Canal regulators- Off take alignment- Head regulators and cross-regulators- Design of cross-regulator and distributary head regulator

UNIT – IV

Cross Drainage Works: Introduction- Types of cross drainage works- Selection of suitable type of cross drainage work- Classification of aqueducts and siphon aqueducts.

Reservoir Planning: Introduction- Investigations for reservoir planning- Selection of site or a reservoir- Zones of storage in a reservoir; Storage capacity and yield- Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Life of reservoir; Flood routing- Methods of flood routing Graphical Method (Inflow storage discharge curves method)

UNIT – V

Dams: General: Introduction- Classification according to use- Classification according to material- Gravity dams- Arch dams- Buttress dams- Steel dams- Timber dams- Earth dams and rock fill dams- Advantages and disadvantages- Physical factors governing selection of type of dam- Selection of site for a dam

Gravity Dams: Introduction- Forces acting on a gravity dam- Modes of failure- Stability requirements- Principal and shear stresses- Stability analysis- Elementary profile of a gravity dam- Practical profile of a gravity dam- Limiting height of a gravity dam- High and low gravity dams- Design of gravity dams– Single step method- Galleries- Stability analysis of non-overflow section of Gravity dam

TEXT BOOKS

1. K Subramanya, *Engineering Hydrology*, McGraw Hill Publication, 4th Edition
2. Dr. B.C. Punmia, Dr. Pande Brij Basi Lal, Ashok Kumar Jain, Dr. Arun Kumar Jain, *Irrigation and Water Power Engineering*, Laxmi Publications, 16th Edition

REFERENCES

1. Dr. P.N. Modi, *Irrigation Water Resources and Power Engineering*, Standard Book House, 9th Edition
2. Dr. P. Jaya Rami Reddy, *A Textbook of Hydrology*, Laxmi Publications, 3rd Edition
3. Santhosh Kumar Garg, *Water Resource Engineering Vol.I & Vol. II*, Khanna Publishers, 23rd Edition
4. Arora, K.R., *Irrigation, Water Power and Water Resources Engineering*, Standard Publishers Distributors, New Delhi, 2009

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APE0111	GROUND IMPROVEMENT TECHNIQUES	2	0	0	2

OUTCOMES: On completion of the course, the students will be able to:

- CO1 :** Understand the grouting techniques and their applications
- CO2 :** Understand the densification methods used in granular soils and Cohesive soils
- CO3 :** Understand the ground Improvement methods used to stabilize soil
- CO4 :** Understand the reinforcement design principles and geosynthetic materials, functions and applications
- CO5 :** Identify the problems in Expansive soils

UNIT – I

GROUTING: Introduction to ground modification, need and objectives Objectives Of Grouting- Grouts And Their Properties- Grouting Methods Ascending, Descending And Stage Grouting- Hydraulic Fracturing In Soils And Rocks Post Grout Test.

UNIT – II

IN-SITU DENSIFICATION OF COHESIVE AND COHESIONLESS SOILS:

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT – III STABILISATION:

Methods of Stabilization-Mechanical-Cement- Lime, Chemical Stabilization With Calcium Chloride, Sodium Silicate And Gypsum

UNIT – IV REINFORCED EARTH:

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 Geomembranes – Functions and Applications.

UNIT - V EXPANSIVE SOILS:

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

TEXT BOOKS:

1. Engineering Principles of Ground Modification, Haussmann M.R. (1990), McGraw-Hill International Edition.
2. Ground Improvement Techniques by Dr.P.Purushotham Raj, Laxmi Publications, New Delhi / University Science Press, New Delhi
3. Ground Improvement Techniques by Nihar Ranajan Patra. Vikas Publications, New Delhi

REFERENCES:

1. Ground Improvement, Blackie Academic and Professional by Moseley M.P. (1993), Boca Taton, Florida, USA.
2. Ground Control and Improvement by Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994), John Wiley and Sons, New York, USA.
3. Designing with Geosynthetics by Robert M. Koerner, Prentice Hall New Jercy, USA

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Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APE0112	Water shed and River Basin Management	2	0	0	2

Course Objectives

This course

- Demonstrates Principles of Watershed Management
- Explains River basin Watershed Management Practices
- Imparts knowledge on conservation of water and its reuses
- Teaches the sustainable watershed approach
- Inculcates the knowledge of rainwater harvesting and GIS applications.

Course Outcomes

At the end of this course, the students will be able to:

CO1. Know the basic principles of watershed management.

CO2. Know the river basin management practices.

CO3. Understand better different approaches for conservation of water.

CO4. Identify sustainable watershed approach for resources management, prevention of soil erosion etc.,

CO5. Different methods of rainwater harvesting management systems and role of GIS.

UNIT – I

Principles of Watershed Management: Basics concepts, Hydrology and water availability, Surface water, Groundwater, Conjunctive use, Human influences in the water resources system, Water demand, Integrated water resources system.

UNIT – II

River basin Watershed Management Practices in Arid and Semi-arid Regions, Watershed management through wells, Management of water supply -Case studies, short term and long term strategic planning.

UNIT – III

Conservation of Water: Perspective on recycle and reuse, Waste water reclamation Social Aspects of Watershed Management: Community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations, Case studies.

UNIT – IV

Sustainable Watershed Approach: Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, Soil erosion and conservation

UNIT – V

Water Harvesting: Rainwater management -conservation, storage and effective utilisation of rainwater, Structures for rainwater harvesting, roof catchment system, check dams, aquifer storage Applications of Geographical Information System and Remote Sensing in Watershed Management, Role of Decision Support System in Watershed Management.

Text Books

1.Murthy, J.V.S., “Watershed Management in India”, Wiley Eastern, New Delhi, 1994.

Water shed management Reference Books

1. Murty, J.V.S., “Watershed Management”, New Age Intl., New Delhi 1998.
2. Allam, G.I.Y., “Decision Support System for Integrated Watershed Management”, Colorado State University, 1994.
3. Vir Singh, R., “Watershed Planning and Management”, Yash Publishing House, Bikaner, 2000.
4. American Society of Civil Engineers, Watershed Management, American Soc. of Civil Engineers, New York, 1975

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Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APE0113	ENGINEERING MATERIALS FOR SUSTAINABILITY	2	0	0	2

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

CO1 : Understand the concept of sustainability and its importance in construction.

CO2 : Understand the properties of sustainable construction materials.

CO3 : Understand the properties and applications of miscellaneous engineering materials.

CO4 : Understand the properties and applications of recycled materials.

CO5 : Development of new materials for sustainable development.

UNIT- I

Introduction: Definition of Sustainability - Need of sustainability - Advantages, and issues related to impact on Environment (Major Environment Challenges) - Life-cycle Assessment

UNIT- II

Importance of sustainable construction materials: Material composition and properties - Production, storage, distribution, testing, acceptance criteria, limitations of use, economic consideration.

UNIT- III

Miscellaneous materials: Recent development related to the following Materials to be studied - aluminum, plastic, ceramics, polymers and nuclear materials; material selection to optimize performance. Crumb modified bitumen Rubber, Glenium Concrete, Materials used in nuclear containment structures.

UNIT- IV

Alternative building materials: Introduction - Substitute for scarce materials – Ferrocement - Gypsum boards - Timber substitutions - Industrial wastes – Agricultural wastes.

UNIT- V

Advanced construction Materials: High performance concrete - Nano technology in cement concrete - Design, evaluation, and production of green construction materials.

Text Books :

1. A.M.Neville, *Properties of Concrete*, Pearson education limited.
2. M.S.Shetty, *Concrete Technology*, S.Chand Publishers, New Delhi.
3. M L Gambhir, Neha Jamwal, *Building Materials*, Tata McGraw Hill Publ.
4. *New Building Materials and Construction*, World magazine.

Reference Books :

1. William P Spence, *Construction Materials, Methods & Techniques(3e)* , Yesdee Publication Pvt. Ltd., Chennai, India
2. P.K & Mantreio P.J.M. Mehta, “*Concrete Structure properties & Materials*” Prentice hall.
3. Ferrocement Construction Mannual-Dr. D.B.Divekar-1030, Shivaji Nagar, Model Colony, Pune.
4. Civil Engineering and Construction Review magazine
5. V.K. Jain [2009], *Automation Systems in smart and Green Buildings*, Khanna Publications, New delhi.
- 6 Dr. S.V. Deodhar, *Engineering Materials*

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Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APE0114	AIR POLLUTION AND QUALITY CONTROL	2	0	0	2

Objectives:

1. To understand the aspects of atmospheric pollution
2. To know about the issues such as atmospheric composition, monitoring, acidic deposition, urban air quality
3. To understand the use of models in air pollution studies

OUTCOMES :

Students will be able to

1. Describe the main chemical components and reactions in the atmosphere and examine the factors responsible for perturbing these
2. Implement the methods for monitoring and modelling spatial and temporal patterns of pollution
3. Explore air pollution issues at a range spatial scales and how these are relaxed.

4. Assess the environmental impacts of atmospheric pollution.

UNIT – I

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

EFFECTS OF AIR POLLUTION: Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

UNIT-II

THERMODYNAMIC OF AIR POLLUTION:

Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like Sox, Nox, CO, HC etc., air-fuel ratio. Computation and Control of products of combustion.

PLUME BEHAVIOUR : Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

UNIT-III

POLLUTANT DISPERSION MODELS : Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.

CONTROL OF PARTICULATES : Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control, Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

UNIT – IV

CONTROL OF GASEOUS POLLUTANTS : General Methods of Control of Nox and Sox emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

UNIT – V

AIR QUALITY MANAGEMENT : Air Quality Management – Monitoring of SPM, SO_x; NO_x and CO Emission Standards– Air sampling – Sampling Techniques – High volume air sampler – Stack sampling - Analysis of Air pollutants – Air quality standards – Air pollution control act.

TEXT BOOKS:

1. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw Hill Company.
2. Air Quality by Thod godish, Levis Publishers, Special India Edition, New Delhi
3. Rao C.S. (2006) Environmental Pollution Control Engineering, 2nd edition, New Age International, Newdelhi

REFERENCES:

1. An introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.
2. Air Pollution and Control by K.V.S.G.Murali Krishna, Kousal & Co. Publications, New Delhi.
3. Noel De Nevers (2000), Air Pollution Control Engineering, 2nd Edition, McGraw Hill International Edition.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APE0115	BRIDGE ENGINEERING	2	0	0	2

OBJECTIVE: *It deal with different types of Bridges like deck slab bridge, T – Beam Bridge and gives a good knowledge on different components of bridges.*

Course outcomes:

On completion of the course, the students will be able to:

1. Design the basic components of bridge structures like bridge deck slabs longitudinal girders transverse girders, piers and well foundations.
2. Understand the IRC classes of loading and railway bridge rules for detailed calculation of loadings and design of various components.
3. Know the methods of design of structural components of different types of Bridges

UNIT - I

INTRODUCTION:

Importance of site investigation in Bridge design. Highway Bridge loading standards. Impact factor. Railway Bridge loading standards (B.G. ML Bridge) various loads in bridges.

BOX CULVERT : General aspects. Design loads, Design of Box culvert subjected to RC class AA tracked vehicle only.

BRIDGE BEARINGS :

General features – Types of Bearings – Design principles of steel Rocker & Roller Bearings – Design of a steel Rocker Bearing – Design of Elastometric pad Bearing.

UNIT - II

DECK SLAB BRIDGE :

Introduction – Effective width method of Analysis Design of deck slab bridge (Simply supported) subjected to class AA Tracked Vehicle only.

UNIT - III

BEAM & SLAB BRIDGE (T-BEAM BRIDGE)

General features – Design of interior panel of slab – Pigeauds method – Design of a T-beam bridge subjected to class AA tracked vehicle only.

UNIT – IV

PLATE GIRDER BRIDGE :

Introduction – elements of a plate girder and their design. Design of a Deck type welded plate girder – Bridge of single line B.G.

COMPOSITE BRIDGES :

Introduction – Advantages – Design of Composite Bridges consisting of RCC slabs over steel girders' including shear connectors

UNIT V

PIERS & ABUTMENTS:

General features – Bed Block – Materials piers & Abutments Types of piers – Forces acting on piers – Stability analysis of piers – General features of Abutments – forces acting on abutments – Stability analysis of abutments – Types of wing walls – Approaches – Types of Bridge foundations (excluding Design).

TEXT BOOKS :

1. Bridge Engineering by Ponnuswamy, TATA Mcgraw Hill Company, New Delhi.
2. Design of Bridges by N.Krishnam Raju, Oxford & IBH, Publishing Company Pvt.ltd., Delhi.
3. Relevant – IRC & Railway bridge Codes.

REFERENCE :-

1. Design of Steel structures, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi.
2. Design of Bridges Structure by D.J.Victor
3. Design of Steel structures by Ramachandra.
4. Design of R.C.C. structures B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi.
5. Design of Bridges Structure by T.R.Jagadish & M.A.Jayaram Prentice Hall of India Pvt., Delhi.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APE0116	Repair and Rehabilitation of structures	2	0	0	2

Course Objectives:

The course should enable the students to:

1. Know the causes of deterioration of structures and distress in structures
2. Assesses the damaged structures using different NDT methods
3. Materials and methods to rehabilitate and strengthen the structures with economical applications.

Course outcomes:

CO 1: Understand the causes of deterioration in structures

CO 2: Assess the damaged structures using NDT techniques

CO 3: Know about different types of repair materials

CO 4: Know about different types of repair techniques

CO 5: Identify different types of strengthening techniques used for existing structures.

UNIT – I

Deterioration of structures

Distress in Structures – Causes of deterioration of structures - Construction and design errors- Causes and mechanism of corrosion in steel reinforcement

UNIT – II

Damage assessment

Visual inspection- Assessment procedure for evaluating a damaged structure- NDT for Strength assessment- rebound hammer test, Ultrasonic pulse velocity test and pull out test - NDT for Corrosion Potential Assessment- Half cell potential survey and Electrical Resistivity - NDT for Structural Integrity- Impact Echo Method and Acoustic Emission technique

Unit III

Repair materials

Essential parameters for repair materials- Polymer concrete- Expansive cement- Sulphur Infiltrated Concrete- Ferro cement- Fibre reinforced concrete- Corrosion control materials and coatings

UNIT IV

Repair techniques

Epoxy injection- Routing and sealing- Blanketing- External stressing- Stitching- Autogenous Healing - Grouting-Dry packing- Prepacked concrete- Shotcrete- Repairs in under water structures

Unit V

Strengthening techniques

Strengthening techniques for structural members -Underpinning- Jacketing- Plate bonding- Fibre Wrap Technique- Composite construction- Post-Tensioning

Text books

1. “Concrete Technology” A.R. Santakumar, Oxford University press.
2. “Maintenance Repair & Rehabilitation & Minor Works of Buildings” P.C. Varghese, PHI Learning Pvt. Ltd.
2. “Maintenance and Repair of Civil Structures”, B.L. Gupta and Amit Gupta, Standard Publication

Reference books

1. “Handbook on Repair and Rehabilitation of R.C.C Buildings”, Central Public Works Department (CPWD), Government of India, New Delhi, 2002.
2. “Concrete Technology – Theory and Practice”, M. S. Shetty, S. Chand and Company, 7th edn,.
3. “Design and Construction Failures”, Dov Kaminetzky, Galgotia Publications Pvt. Ltd., 2001.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APE0117	INTELLIGENT TRANSPORTATION SYSTEMS	2	0	0	2

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

CO1: Understand the sensor technologies

CO2: Understand the communication techniques

CO3: Apply the various ITS methodologies

CO4: Understand the user needs

CO5: Define the significance of ITS under Indian conditions

UNIT - I

Introduction: Objectives- Advantages - Data Collection Techniques - Detectors – Automatic Vehicle Location - Automatic Vehicle Identification - Geographical Information Systems - Video Data Collection.

UNIT - II

Telecommunications in ITS: Importance of telecommunications in the ITS system - Information Management - Traffic Management Centers (TMC) - Vehicle–Road side communication – Vehicle Positioning System.

UNIT - III

ITS functional areas: Advanced Traffic Management Systems (ATMS) - Advanced Traveler Information Systems (ATIS) - Commercial Vehicle Operations (CVO) - Advanced Vehicle Control Systems (AVCS) - Advanced Public Transportation Systems (APTS) – Advanced Rural Transportation Systems (ARTS).

UNIT - IV

ITS User Needs and Services: Travel and Traffic management - Public Transportation Management - Electronic Payment - Commercial Vehicle Operations – Emergency Management - Advanced Vehicle safety systems - Information Management.

UNIT - V

Automated Highway Systems: Vehicles in Platoons – Integration of Automated Highway Systems - ITS Programs in the World – Overview of ITS implementations in developed countries - Case studies.

Text Books :

1. ITS Hand Book 2000: *Recommendations for World Road Association (PIARC)*, Kan Paul Chen, John Miles.
2. Sussman, J. M., *Perspective on ITS*, Artech House Publishers, 2005.
3. *National ITS Architecture Documentation*, US Department of Transportation, 2007 (CDROM).

Reference Books :

1. Chowdhary, M.A. and A Sadek, *Fundamentals of Intelligent Transportation systems planning*, Artech House Inc., US, 2003.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI

Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APE0118	HYDRO POWER ENGINEERING	2	0	0	2

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

CO1: Estimate and assess the water power potential

CO2: Understand the Basic Concepts of Power plants

CO3: Analyze the efficiency of various types of power plants

CO4: Understand the Basic concepts Water Conducting Systems

CO5: Select suitable type of turbine for power stations

UNIT - I

Introduction: Different sources of energy – Hydro power – Its advantages and disadvantages – Role of hydel power in the power system – Development of water power in India with particular reference to south India – Estimation of water power potential. **River Basin**

Development: Selection of site – Assessment of power potential.

UNIT - II

Basic Concepts of Power plants: Loads – Load curves – Load factor – Capacity factor – Diversity factor – Utilization factor – Load duration curve – Efficiencies – Firm and secondary power – Prediction of load.

Storage and Pondage: Definitions – Mass curve – Flow and power duration curves – Hydrograph analysis – Storage and pondage – Pondage factor.

UNIT - III

Classification of Power Plants: Classification on the basis of head and plant capacity – Runoff river plants and their general arrangement – Storage plants – Diversion canal plants – Underground power plants – Principles of layout – Some typical layouts of Indian projects –

Pumped storage plants – Basic features – Advantages – Types – Two unit, three unit and four unit installations – Merits and demerits – Reversible pump turbines – Efficiency of pumped storage plants.

UNIT - IV

Water Conducting Systems: Intakes – Power canals – Tunnels - penstocks – Economical diameter – Anchorages – Expansion joints – Other accessories – Water hammer – Rigid and elastic column theories – Surge tanks.

UNIT - V

Power Houses & Turbines: Types – Layouts – Relative merits and design principles for surface power stations and underground power stations- Types of turbines – Selection of sizes and number of units setting of turbines – Cavitation in turbines – Governing of turbines.

Tidal Power: Basic principles – Location of tidal power plants – Components.

Text Books :

1. M.M. Dandekar and K.N. Sharma [2010], A Text Book of Water Power Engineering, Vikas Publications
2. R.K.Sharma and T.K.Sharma [2003], A Text book of Water Power Engineering including Dams, Engg. Hydro & Fluid Power Engg., S. Chand Company Ltd., New Delhi–110 055

Reference Books :

1. Deshmukh M.M. [2010], Water Power Engineering.

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Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APE0119	Industrial Waste & waste-water Engineering	2	0	0	2

UNIT – I:

Sources of Pollution - Physical, Chemical, Organic & Biological properties of Industrial Wastes - Difference between industrial & municipal waste waters - Effects of industrial effluents on sewers and Natural water Bodies.

UNIT – II:

Pre & Primary Treatment - Equalization, Proportioning, Neutralization, Oil separation by Floating-Waste Reduction-Volume Reduction-Strength Reduction.

UNIT-III:

Waste Treatment Methods - Nitrification and De-nitrification-Phosphorous removal -Heavy metal removal - Membrane Separation Process - Air Stripping and Absorption Processes - Special Treatment Methods - Disposal of Treated Waste Water.

UNIT-IV:

Characteristics and Composition of waste water and Manufacturing Processes of Industries like Sugar, Characteristics and Composition of Industries like Food processing Industries, Steel, and Petroleum Refineries.

UNIT-V:

Characteristics and Composition of Industries like Textiles, Tanneries, Atomic Energy Plants and other Mineral Processing Industries – Joint Treatment of Raw Industries waste water and Domestic Sewage – Common Effluent Treatment Plants(CETP) – Location, Design, Operation and Maintenance Problems – Economical aspects

TEXTBOOKS:

1. Metcalf & Eddy, “Wastewater engineering Treatment disposal reuse”, Tata McGraw Hill.
2. Eckenfelder, W.W., “Industrial Water Pollution Control”, McGraw-Hill

REFERENCE BOOKS:

1. M.N. Rao and Dutta – Industrial Waste.
2. Mark J. Hammer, Mark J. Hammer, Jr., “Water & Wastewater Technology”, Prentice Hall of India.
3. N.L. Nemerrow –Theories and practices of Industrial Waste Engineering.
4. C.G. Gurnham –Principles of Industrial Waste Engineering.

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Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APE0120	CONSTRUCTION TECHNOLOGY & PROJECT MANAGEMENT	2	0	0	2

Course Learning Objectives:

The objective of this course is:

To introduce to the student the concept of project management including network drawing and monitoring. to introduce the various equipment related to construction like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery. To introduce the importance of safety in construction projects.

Course Outcomes

- Upon the successful completion of this course, the students will be able to:
- Appreciate the importance of construction planning.
- Understand the functioning of various earths moving equipment.
- Know the methods of production of aggregate products and concreting.
- Apply the gained knowledge to project management and construction techniques.

UNIT- I :Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling – monitoring – bar charts – milestone charts – critical path method.

UNIT -II :Project evaluation and review technique – cost analysis – updating – crashing for optimum cost – crashing for optimum resources – allocation of resources.

UNIT- III :Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks. and handling

equipment – calculation of truck production – compaction equipment – types of compaction rollers.

UNIT -IV :Hoisting and earthwork equipment – hoists – cranes – tractors – bulldozers – graders – scrapers– draglines – clamshell buckets.

UNIT -V :Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers – selection of crushing equipment – screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing.

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering.

TEXT BOOKS:

- ‘Construction Planning , Equipment and Methods’ by Peurifoy and Schexnayder , Shapira, Tata Mcgrawhill.
- ‘Construction Project Management Theory and Practice’by Kumar Neeraj Jha (2011), Pearson.
- ‘Construction Technology’ by Subir K. Sarkar and Subhajit Saraswati, Oxford University press.

REFERENCES

- ‘Construction Project Management – An Integrated Approach’ by Peter Fewings , Taylor and Francis
- ‘Construciton Management Emerging Trends and Technologies’ by Trefor Williams , Cengage learning .

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI

Year: IV

Semester: I

Branch of Study: CE

Subject Code	Subject Name	L	T	P	Credits
19APC0129	STRUCTURAL DESIGN AND DRAWING LAB	0	0	3	1.5

Course Outcomes:

CO1: Understand basic commands used in STAAD Pro and their applications

CO2: Analyse the structure for various loading conditions

CO3: Analyse and design of structural elements for various loading conditions

SOFTWARE:

1. STAAD PRO or Equivalent

EXERCISIES:

1. 2-D Frame Analysis and Design
2. Steel Tabular Truss Analysis and Design
3. 3-D Frame Analysis and Design
4. Retaining Wall Analysis and Design
5. Simple tower Analysis and Design
6. One Way Slab Analysis & Design
7. Two Way Slab Analysis & Design
8. column Analysis & Design

TEXT BOOK:

1. computer Aided Design Lab Manual by Dr.M.N.Sesha Prakash And Dr.C.S.Suresh

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI

Year: IV	Semester: I	Branch of Study: CE			
Subject Code	Subject Name	L	T	P	Credits
19APC0130	ENVIRONMENTAL ENGINEERING LAB	0	0	3	1.5

Course Objective:

The laboratory provides knowledge of estimating various parameters like PH, Chlorides, Sulphates, Nitrates in water. For effective water treatment, the determination of optimum dosage of coagulant and chloride demand are also included. The estimation status of Industrial effluents will also be taught in the laboratory by estimating BOD and COD of effluent

Course Outcomes:

CO1: Determine physical, chemical and biological characteristics of water and wastewater

CO2: Determine optimum dosage of coagulant

CO3: Assess the quality of water and wastewater

LIST OF EXPERIMENTS

1. Determination of pH and Turbidity
2. Determination of Conductivity and Total dissolved solids.
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides.
5. Determination and Estimation of total solids, organic solids and inorganic solids.
6. Determination of iron.
7. Determination of Dissolved Oxygen.
8. Determination of Nitrogen.
9. Determination of total Phosphorous.
10. Determination of B.O.D
11. Determination of C.O.D
12. Determination of Optimum coagulant dose.
13. Determination of Chlorine demand.
14. Presumptive coliform test.

NOTE: At least 8 of the above experiments are to be conducted.