# Shree Sathyam
## College of Engineering and Technology
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai.

NH-544, Salem - Coimbatore Highways, Kuppanur, Sankari Taluk, Salem - 637301, TamilNadu, India.

Email : principal@shreesathyam.edu.in      Web : www.shreesathyam.edu.in      Phone : 04283 - 244080

**DEPARTMENT OF CIVIL  ENGINEERING**

**ANNA UNIVERSITY REGULATIONS: 2021**

**LIST OF COURSES**

| FIRST YEAR COURSES | | | |
|---|---|---|---|
| S.NO | NAAC CODE | SUBJECT CODE | SUBJECT NAME |
| 01 | C101 | HS3152 | PROFESSIONAL ENGLISH - I |
| 02 | C102 | MA3151 | MATRICES AND CALCULUS |
| 03 | C103 | PH3151 | ENGINEERING PHYSICS |
| 04 | C104 | CY3151 | ENGINEERING CHEMISTRY |
| 05 | C105 | GE3151 | PROBLEM SOLVING AND PYTHON PROGRAMMING |
| 06 | C107 | GE3171 | ROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY |
| 07 | C108 | BS3171 | PHYSICS AND CHEMISTRY LABORATORY - ( PHYSICS LABORATORY ) |
| 08 | C108 | BS3171 | PHYSICS AND CHEMISTRY LABORATORY - ( CHEMISTRY LABORATORY ) |
| 09 | C109 | GE3172 | ENGLISH LABORATORY |
| 10 | C110 | HS3252 | PROFESSIONAL ENGLISH - II |
| 11 | C111 | MA3251 | STATISTICS AND NUMERICAL METHODS |
| 12 | C112 | PH3201 | PHYSICS FOR CIVIL ENGINEERING |
| 13 | C113 | BE3252 | BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING |
| 14 | C114 | GE3251 | ENGINEERING GRAPHICS |

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| 15 | C115 | GE3271 | ENGINEERING PRACTICES LABORATORY |
| 16 | C117 | BE3272 | BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING LABORATORY |
| 17 | C118 | GE3272 | COMMUNICATION LABORATORY / FOREIGN LANGUAGE |
| **SECOND YEAR COURSES** | | | |
| 18 | C201 | MA3351 | TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS |
| 19 | C202 | ME3351 | ENGINEERING MECHANICS |
| 20 | C203 | CE3301 | FLUID MECHANICS |
| 21 | C204 | CE3302 | CONSTRUCTION MATERIALS AND TECHNOLOGY |
| 22 | C205 | CE3303 | WATER SUPPLY AND WASTEWATER ENGINEERING |
| 23 | C206 | CE3351 | SURVEYING AND LEVELLING |
| 24 | C207 | CE3361 | SURVEYING AND LEVELLING LABORATORY |
| 25 | C208 | CE3311 | WATER AND WASTEWATER ANALYSIS LABORATORY |
| 26 | C209 | GE3361 | PROFESSIONAL DEVELOPMENT |
| 27 | C210 | CE3401 | APPLIED HYDRAULICS ENGINEERING |
| 28 | C211 | CE3402 | STRENGTH OF MATERIALS |
| 29 | C212 | CE3403 | CONCRETE TECHNOLOGY |
| 30 | C213 | CE3404 | SOIL MECHANICS |
| 31 | C214 | CE3405 | HIGHWAY AND RAILWAY ENGINEERING |
| 32 | C215 | GE3451 | ENVIRONMENTAL SCIENCES AND SUSTAINABILITY |
| 33 | C216 | CE3411 | HYDRAULIC ENGINEERING LABORATORY |
| 34 | C217 | CE3412 | MATERIALS TESTING LABORATORY |
| 35 | C218 | CE3413 | SOIL MECHANICS LABORATORY |

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| THIRD YEAR COURSES | | | |
|---|---|---|---|
| 36 | C301 | CE3601 | DESIGN OF STEEL STRUCTURAL ELEMENTS |
| 36 | C302 | CE3602 | STRUCTURAL ANALYSIS II |
| 37 | C303 | CE3003 | PREFABRICATED STRUCTURES |
| 38 | C304 | CE3033 | SOLID AND HAZARDOUS WASTE MANAGEMENT |
| 39 | C305 | CE3026 | TRAFFIC ENGINEERING AND MANAGEMENT |
| 40 | C306 | MX3084 | DISASTER RISK REDUCTION AND MANAGEMENT |
| 41 | C307 | CE3511 | HIGHWAY ENGINEERING LABORATORY |
| 42 | C308 | CE3512 | SURVEY CAMP (2 weeks) |
| 48 | C309 | CE3601 | DESIGN OF STEEL STRUCTURAL ELEMENTS |
| 49 | C310 | CE3602 | STRUCTURAL ANALYSIS II |
| 50 | C311 | AG3601 | ENGINEERING GEOLOGY |
| 51 | C312 | CCE331 | AIR AND NOISE POLLUTION CONTROL ENGINEERING |
| 52 | C313 | OCS353 | DATA SCIENCE FUNDAMENTALS |
| 53 | C314 | CE3611 | BUILDING DRAWING AND DETAILING LABORATORY |
| FINAL YEAR COURSES | | | |
| 54 | C401 | CE3701 | ESTIMATION, COSTING AND VALUATION ENGINEERING |
| 55 | C402 | AI3404 | HYDROLOGY AND WATER RESOURCES ENGINEERING |
| 56 | C403 | GE3791 | HUMAN VALUES AND ETHICS |
| 57 | C404 | GE3752 | TOTAL QUALITY MANAGEMENT |
| 58 | C405 | CME365 | RENEWABLE ENERGY TECHNOLOGIES |
| 59 | C406 | OBT355 | BIOTECHNOLOGY FOR WASTE MANAGEMENT |
| 60 | C407 | CE3811 | PROJECT WORK/INTERNSHIP |

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**DEPARTMENT OF CIVIL ENGINEERING**

**ANNA UNIVERSITY REGULATIONS: 2021**

**FIRST YEAR COURSES (I& II SEMESTER)**

Course Outcomes (Cos) of the Civil Engineering

| C101 | HS3152 | Professional English - I |
|------|--------|--------------------------|

| | |
|--------|-----------------------------------------------------------------------------|
| C101.1 | To use appropriate words in a professional context |
| C101.2 | To gain understanding of basic grammatical structures and use them in right context. |
| C101.3 | To read and infer the denotative and connotative meanings of technical texts |
| C101.4 | To read and interpret information presented in tables, charts and other graphic forms |

| C102 | MA3151 | Matrices and Calculus |
|------|--------|-----------------------|

| | |
|--------|----------------------------------------------------------------------------|
| C102.1 | Use the matrix algebra methods for solving practical problems. |
| C102.2 | Apply differential calculus tools in solving various application problems. |
| C102.3 | Able to use differential calculus ideas on several variable functions. |
| C102.4 | Apply different methods of integration in solving practical problems |
| C102.5 | Apply multiple integral ideas in solving areas, volumes and other practical problems. |

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| C103 | PH3151 | Engineering Physics |
|------|--------|---------------------|

| | |
|------|------------------------------------------------------------|
| C103.1 | Understand the importance of mechanics. |
| C103.2 | Express their knowledge in electromagnetic waves. |
| C103.3 | Demonstrate a strong foundational knowledge in oscillations, optics and lasers. |
| C103.4 | Understand the importance of quantum physics. |
| C103.5 | Comprehend and apply quantum mechanical principles towards the formation of energy bands |

| C104 | CY3151 | Engineering Chemistry |
|------|--------|-----------------------|

| | |
|------|------------------------------------------------------------|
| C104.1 | To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water |
| C104.2 | To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications. |
| C104.3 | To apply the knowledge of phase rule and composites for material selection requirements. |
| C104.4 | To recommend suitable fuels for engineering processes and applications. |
| C104.5 | To recognize different forms of energy resources and apply them for suitable applications in energy sectors. |

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| C105 | GE3151 | Problem Solving and Python Programming |
|------|--------|----------------------------------------|

| C105.1 | Develop algorithmic solutions to simple computational problems |
|--------|----------------------------------------------------------------|
| C105.2 | Develop and execute simple Python programs. |
| C105.3 | Write simple Python programs using conditionals and looping for solving problems. |
| C105.4 | Decompose a Python program into functions |
| C105.5 | Represent compound data using Python lists, tuples, dictionaries etc. |
| C105.6 | Read and write data from/to files in Python programs. |

| C107 | GE3171 | Problem Solving and Python Programming Laboratory |
|------|--------|---------------------------------------------------|

| C107.1 | Develop algorithmic solutions to simple computational problems |
|--------|----------------------------------------------------------------|
| C107.2 | Develop and execute simple Python programs. |
| C107.3 | Implement programs in Python using conditionals and loops for solving problems. |
| C107.4 | Deploy functions to decompose a Python program. |
| C107.5 | Process compound data using Python data structures. |
| C107.6 | Utilize Python packages in developing software applications. |

| C108 | BS3171 | Physics and Chemistry Laboratory |
|------|--------|----------------------------------|

| C108.1 | Understand the functioning of various physics laboratory equipment. |
|--------|--------------------------------------------------------------------|
| C108.2 | Use graphical models to analyze laboratory data. |
| C108.3 | Use mathematical models as a medium for quantitative reasoning and describing physical reality |
| C108.4 | Access, process and analyze scientific information. |
| C108.5 | Solve problems individually and collaboratively. |

| C108.1 | To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO. |
|--------|-----------------------------------------------------------------------------------------------------|
| C108.2 | To determine the amount of metal ions through volumetric and spectroscopic techniques |
| C108.3 | To analyse and determine the composition of alloys. |
| C108.4 | To learn simple method of synthesis of nanoparticles |
| C108.5 | To quantitatively analyse the impurities in solution by electroanalytical techniques |

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| C109 | GE3172 | English Laboratory |
|------|--------|---------------------|

| | |
|------|---------------------------------------------------------------|
| C109.1 | To listen to and comprehend general as well as complex academic information |
| C109.2 | To listen to and understand different points of view in a discussion |
| C109.3 | To speak fluently and accurately in formal and informal communicative contexts |
| C109.4 | To describe products and processes and explain their uses and purposes clearly and accurately |
| C109.5 | To express their opinions effectively in both formal and informal discussions |

| C110 | HS3252 | Professional English - II |
|------|--------|---------------------------|

| | |
|------|---------------------------------------------------------------|
| C110.1 | To compare and contrast products and ideas in technical texts |
| C110.2 | To identify and report cause and effects in events, industrial processes through technical texts |
| C110.3 | To analyse problems in order to arrive at feasible solutions and communicate them in the written format. |
| C110.4 | To present their ideas and opinions in a planned and logical manner |
| C110.5 | To draft effective resumes in the context of job search. |

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| C111 | MA3251 | Statistics and Numerical Methods |
|------|--------|----------------------------------|

| C111.1 | Apply the concept of testing of hypothesis for small and large samples in real life problems. |
|--------|-----------------------------------------------------------------------------------------------|
| C111.2 | Apply the basic concepts of classifications of design of experiments in the field of agriculture. |
| C111.3 | Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems. |
| C111.4 | Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations. |
| C111.5 | Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications. |

| C112 | PH3201 | PHYSICS FOR CIVIL ENGINEERING |
|------|--------|-------------------------------|

| C112.1 | Acquire knowledge about heat transfer through different materials, thermal performance of building and thermal insulation |
|--------|------------------------------------------------------------------------------------------------------------------------|
| C112.2 | Gain knowledge on the ventilation and air conditioning of buildings |
| C112.3 | Understand the concepts of sound absorption, noise insulation and lighting designs |
| C112.4 | Now about the processing and applications of composites, metallic glasses, shape memory alloys and ceramics |
| C112.5 | Get an awareness on natural disasters such as earth quake, cyclone, fire and safety measures |

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| C113 | BE3252 | BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING |
|------|--------|---------------------------------------------------------------|

| C113.1 | Compute the electric circuit parameters for simple problems |
|--------|-------------------------------------------------------------|
| C113.2 | Explain the concepts of domestics wiring and protective devices |
| C113.3 | Explain the working principle and applications of electrical machines |
| C113.4 | Analyze the characteristics of analog electronic devices |
| C113.5 | Explain the types and operating principles of sensors and transducers |

| C114 | GE3251 | Engineering Graphics |
|------|--------|----------------------|

| C114.1 | Use BIS conventions and specifications for engineering drawing. |
|--------|----------------------------------------------------------------|
| C114.2 | Construct the conic curves, involutes and cycloid. |
| C114.3 | Solve practical problems involving projection of lines. |
| C114.4 | Draw the orthographic, isometric and perspective projections of simple solids. |
| C114.5 | Draw the development of simple solids. |

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| C115 | GE3271 | Engineering Practices Laboratory |
|------|--------|----------------------------------|

| C115.1 | Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work. |
|--------|--------|
| **C115.2** | Wire various electrical joints in common household electrical wire work. |
| **C115.3** | Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work. |
| **C115.4** | Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB. |

| C116 | BE3272 | BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING LABORATORY |
|------|--------|----------------------------------|

| C116.1 | Use experimental methods to verify the Ohm's law and Kirchhoff's Law and to measure three phase power |
|--------|--------|
| **C116.2** | Analyze experimentally the load characteristics of electrical machines |
| **C116.3** | Analyze the characteristics of basic electronic devices |
| **C116.4** | Use LVDT to measure displacement |

| C117 | GE3272 | Communication Laboratory / Foreign Language |
|------|--------|---------------------------------------------|

| C117.1 | Speak effectively in group discussions held in a formal/semi formal contexts |
|--------|------------------------------------------------------------------------------|
| C117.2 | Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions |
| C117.3 | Write emails, letters and effective job applications. |
| C117.4 | Write critical reports to convey data and information with clarity and precision |
| C116.5 | Give appropriate instructions and recommendations for safe execution of tasks |

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**ANNA UNIVERSITY REGULATIONS: 2021**

**SECOND YEAR COURSES (III & IV SEMESTER)**

**Course Outcomes (Cos)**

| C201 | MA3351 | TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS |
|------|--------|-----------------------------------------------|

| | |
|------|----------------------------------------------------------------------|
| **C201.1** | Understand how to solve the given standard partial differential equations. |
| **C201.2** | Solve differential equations using Fourier series analysis which plays a vital role in engineering applications. |
| **C201.3** | Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations. |
| **C201.4** | Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering. |
| **C201.5** | Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems. |

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| C202 | ME3351 | ENGINEERING MECHANICS |
|------|--------|------------------------|

| C202.1 | llustrate the vectorial and scalar representation of forces and moments |
|--------|-------------------------------------------------------------------------|
| C202.2 | Analyse the rigid body in equilibrium |
| C202.3 | Evaluate the properties of distributed forces |
| C202.4 | Determine the friction and the effects by the laws of friction |
| C202.5 | Calculate dynamic forces exerted in rigid body |

| C203 | CE3301 | FLUID MECHANICS |
|------|--------|-----------------|

| C203.1 | Demonstrate the difference between solid and fluid, its properties and behaviour in static conditions |
|--------|--------------------------------------------------------------------------------------------------------|
| C203.2 | Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics |
| C203.3 | Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performance of prototypes by model studies. |
| C203.4 | Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel. |
| C203.5 | Explain the concept of boundary layer and its application to find the drag force by the fluid on the flat solid surface |

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| C204 | CE3302 | CONSTRUCTION MATERIALS AND TECHNOLOGY |
|------|--------|----------------------------------------|

| | |
|------|--------------------------------------------------------------|
| C204.1 | Identify the good quality brick, stone and blocks for construction |
| C204.2 | Recognize the market forms of timber, steel, aluminum and applications of various composite materials. |
| C204.3 | Identify the best construction and service practices such as thermal insulations conditioning of the building |
| C204.4 | Select various equipments for construction works conditioning of building |
| C204.5 | Understand the construction planning and scheduling techniques |

| C205 | CE3303 | WATER SUPPLY AND WASTEWATER ENGINEERING |
|------|--------|------------------------------------------|

| | |
|------|--------------------------------------------------------------|
| C205.1 | Understand the various components of water supply scheme and design of intake structure and conveyance system for water transmission |
| C205.2 | Understand on the characteristics and composition of sewage, ability to estimate sewage generation and design sewer system including sewage pumping stations |
| C205.3 | Understand the process of conventional treatment and design of water and wastewater treatment system and gain knowledge of selection of treatment process and biological treatment process |
| C205.4 | Ability to design and evaluate water distribution system and water supply in buildings and understand the self-purification of streams and sludge and septage disposal methods. |
| C205.5 | Able to understand and design the various advanced treatment system and knowledge about the recent advances in water and wastewater treatment process and reuse of sewage |

| C206 | CE3351 | SURVEYING AND LEVELLING |
|------|--------|-------------------------|

| | |
|--------|----------------------------------------------------------------|
| C206.1 | Introduce the rudiments of various surveying and its principles |
| C206.2 | Imparts knowledge in computation of levels of terrain and ground features |
| C206.3 | Imparts concepts of Theodolite Surveying for complex surveying operations |
| C206.4 | Understand the procedure for establishing horizontal and vertical control |
| C206.5 | Imparts the knowledge on modern surveying instruments |

| C207 | CE3361 | SURVEYING AND LEVELLING LABORATORY |
|------|--------|-------------------------------------|

| | |
|--------|----------------------------------------------------------------|
| C207.1 | Impart knowledge on the usage of basic surveying instruments like chain/tape, compass and levelling instruments |
| C207.2 | Able to use levelling instrument for surveying operations |
| C207.3 | Able to use theodolite for various surveying operations |
| C207.4 | Able to carry out necessary surveys for social infrastructures |
| C207.5 | Able to prepare planimetric maps |

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| C208 | CE3311 | WATER AND WASTEWATER ANALYSIS LABORATORY |
|------|--------|-------------------------------------------|

| C208.1 | Calibrate and standardize the equipment |
|--------|------------------------------------------|
| C208.2 | Collect proper sample for analysis |
| C208.3 | To know the sample preservation methods |
| C208.4 | To perform field oriented testing of water, wastewater |
| C208.5 | To perform coliform analysis |

| C209 | GE3361 | PROFESSIONAL DEVELOPMENT |
|------|--------|---------------------------|

| C209.1 | Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements |
|--------|----------------------------------------------------------------------------------------------------------------------------------------|
| C209.2 | Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding |
| C209.3 | Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects. |

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| C210 | CE3401 | APPLIED HYDRAULICS ENGINEERING |
|------|--------|-------------------------------|

| | |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C210.1 | Describe the basics of open channel flow, its classification and analysis of uniform flow in steady state conditions with specific energy concept and its application |
| C210.2 | Analyse steady gradually varied flow, water surface profiles and its length calculation using direct and standard step methods with change in water surface profiles due to change in grades. |
| C210.3 | Derive the relationship among the sequent depths of steady rapidly varied flow and estimating energy loss in hydraulic jump with exposure to positive and negative surges. |
| C210.4 | Design turbines and explain the working principle |
| C210.5 | Differentiate pumps and explain the working principle with characteristic curv and design centrifugal and reciprocating pumps |

| C211 | CE3402 | STRENGTH OF MATERIALS |
|------|--------|----------------------|

| | |
|------|----------------------------------------------------------------------------------------------------------------|
| C211.1 | Understand the concepts of stress and strain, principal stresses and principal planes. |
| C211.2 | Determine Shear force and bending moment in beams and understand concept of theory of simple bending. |
| C211.3 | Calculate the deflection of beams by different methods and selection of method for determining slope or deflection |
| C211.4 | Analyze propped cantilever, fixed beams and continuous beams for external loadings and support settlements. |
| C211.5 | Determine the stresses due to Unsymmetrical bending of beams, locate the shear center, and study the various theories of failure |

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| C212 | CE3403 | CONCRETE TECHNOLOGY |
|------|--------|---------------------|

| | |
|--------|------------------------------------------------------------------|
| C212.1 | Understand the requirements of cement, aggregates and water for concrete |
| C212.2 | Select suitable admixtures for enhancing the properties of concrete |
| C212.3 | Design concrete mixes as per IS method of mix design |
| C212.4 | Design concrete mixes as per IS method of mix design |
| C212.5 | Know the importance of special concretes for specific requirements |

| C213 | CE3404 | SOIL MECHANICS |
|------|--------|----------------|

| | |
|--------|------------------------------------------------------------------|
| C213.1 | Demonstrate an ability to identify various types of soils and its properties, formulate and solve engineering Problems |
| C213.2 | Show the basic understanding of flow through soil medium and its impact of engineering solution |
| C213.3 | Understand the basic concept of stress distribution in loaded soil medium and soil settlement due to consolidation |
| C213.4 | Show the understanding of shear strength of soils and its impact of engineering solutions to the loaded soil medium and also will be aware of contemporary issues on shear strength of soils |
| C213.5 | Demonstrate an ability to design both finite and infinite slopes, component and process as per needs and specifications |

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| C214 | CE3405 | HIGHWAY AND RAILWAY ENGINEERING |
|---|---|---|

| | |
|---|---|
| **C214.1** | Plan a highway according to the principles and standards adopted in various institutions in India. |
| **C214.2** | Design the geometric features of road network and components of pavement. |
| **C214.3** | Test the highway materials and construction practice methods and know its properties and able to perform pavement evaluation and management. |
| **C214.4** | Show the understanding of shear strength of soils and its impact of engineering solutions to the loaded soil medium and also will be aware of contemporary issues on shear strength of soils |
| **C214.5** | Demonstrate an ability to design both finite and infinite slopes, component and process as per needs and specifications |

| C215 | GE3451 | ENVIRONMENTAL SCIENCES AND SUSTAINABILITY |
|---|---|---|

| | |
|---|---|
| **C215.1** | To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation |
| **C215.2** | To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society. |
| **C215.3** | To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations |
| **C215.4** | To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development. |
| **C215.5** | To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization |

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| C216 | CE3411 | HYDRAULIC ENGINEERING LABORATORY |
|------|--------|----------------------------------|

| | |
|--------|------------------------------------------------------------------|
| C216.1 | Apply Bernoulli equation for calibration of flow measuring devices. |
| C216.2 | Measure friction factor in pipes and compare with Moody diagram |
| C216.3 | Determine the performance characteristics of rotodynamic pumps. |
| C216.4 | Determine the workability and compressive strength of concrete. |
| C216.5 | Determine the performance characteristics of turbines. |

| C217 | CE3412 | MATERIALS TESTING LABORATORY |
|------|--------|------------------------------|

| | |
|--------|------------------------------------------------------------------|
| C217.1 | Determine the mechanical properties of steel. |
| C217.2 | Determine the physical properties of cement |
| C217.3 | Determine the physical properties of fine and coarse aggregate |
| C217.4 | Determine the workability and compressive strength of concrete. |
| C217.5 | Determine the strength of brick and wood. |

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| C218 | CE3413 | SOIL MECHANICS LABORATORY |
|------|--------|---------------------------|

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|--------|-----------------------------------------------------------------|
| C217.1 | Conduct tests to determine the index properties of soils |
| C217.2 | Determine the insitu density and compaction characteristics |
| C217.3 | Conduct tests to determine the compressibility, permeability and shear strength of soils. |
| C217.4 | Understand the various tests on Geo synthetics. |

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**DEPARTMENT OF CIVIL ENGINEERING**

**ANNA UNIVERSITY REGULATIONS: 2021**

**THIRD YEAR COURSES (V & VI SEMESTER)**

**Course Outcomes (Cos)**

| C301 | CE3601 | Design of Steel Structural Elements |
|------|--------|-------------------------------------|

| C301.1 | Recognize the design philosophy of steel structures and identify the different failure modes of bolted and welded connections, and determine their design strengths |
|--------|--------|
| C301.2 | Select the most suitable section shape and size for tension and compression members and beams according to specific design criteria |
| C301.3 | Apply the principles, procedures and current code requirements to the analysis and design of steel tension members, columns, column bases and beams |
| C301.4 | Identify and compute the design loads on Industrial structures, and gantry girder |
| C301.5 | Find out ultimate load of steel beams and portal frames using plastic analysis |

| C302 | CE3602 | STRUCTURAL ANALYSIS II |
|------|--------|------------------------|

| C302.1 | Draw influence lines for statically determinate structures and calculate critical stress resultants. |
|--------|--------|
| C302.2 | Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams. |
| C302.3 | Analyse three hinged, two hinged and fixed arches. |
| C302.4 | Analyse the suspension bridges with stiffening girders |
| C302.5 | Analys HYDe rigid frames by approximate methods for gravity and horizontal loads. |

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| C303 | CE3003 | PREFABRICATED STRUCTURES |
|------|--------|--------------------------|

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|--------|---|
| **C303.1** | Understand concepts about principles of prefabrication, production, transportation, erection. |
| **C303.2** | Acquire knowledge about design of cross section, joint flexibility |
| **C303.3** | Acquire knowledge about design of cross section, joint flexibility |
| **C303.4** | Acquire knowledge about joints and connection in precast construction |
| **C303.5** | Acquire knowledge about structural stability. |

| C304 | CE3033 | SOLID AND HAZARDOUS WASTE MANAGEMENT |
|------|--------|--------------------------------------|

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|--------|---|
| **C304.1** | Explain the various functional elements of solid and hazardous waste management including the associated legal, health, safety, and cultural issues as well as responsibilities of different stakeholders |
| **C304.2** | Apply the knowledge of science and engineering fundamentals to characterize different types of solid and hazardous wastes, assess the factors affecting variation and assess performance |
| **C304.3** | Design of systems and processes to meet specified needs of waste minimization, storage, collection, transport, recycling, processing and disposal. |
| **C304.4** | Select appropriate methods for processing and disposal of solid and hazardous wastes, taking into account the impact of the solutions in a sustainability context |
| **C304.5** | Conduct research pertinent to solid and hazardous waste management and communicate effectively to different stakeholders as well as engage in independent lifelong learning |

| C305 | CE3026 | TRAFFIC ENGINEERING AND MANAGEMENT |
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|---|---|
| C305.1 | Apply the knowledge of science and engineering fundamentals in conducting traffic surveys, analyze the problems and relating it with standards |
| C305.2 | Understand the principles of traffic flow characteristics and their relationships |
| C305.3 | Understand various traffic management measures in addressing the demand Pricing and ITS applications |
| C305.4 | Designing various types of control and regulatory measures to meet an efficient traffic network. |
| C305.5 | Understand various type of facilities and plan for Non Motorised Transport |

| C306 | MX3084 | Disaster Risk Reduction and Management |
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| C306.1 | To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR) |
| C306.2 | To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction |
| C306.3 | To develop disaster response skills by adopting relevant tools and technology |
| C306.4 | Enhance awareness of institutional processes for Disaster response in the country |
| C306.5 | Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity |

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| C307 | CE3511 | HIGHWAY ENGINEERING LABORATORY |
|------|--------|--------------------------------|

| C307.1 | Characterize Pavement Aggregate through relevant test |
|--------|-------------------------------------------------------|
| C307.2 | Ascertain the Quality of Bitumen. |
| C307.3 | Determine the Optimum Binder Content Using Marshall Method. |
| C307.4 | Evaluate the Consistency and Properties of Bitumen. |
| C307.5 | Determine the Bitumen Content in the Bituminous Mixes |

| C308 | CE3512 | SURVEY CAMP (2 weeks) |
|------|--------|-----------------------|

| C308.1 | Handle the modern surveying instruments like Total station and GPS |
|--------|---------------------------------------------------------------------|
| C308.2 | Apply modern surveying techniques in field to establish horizontal control. |
| C308.3 | Understand the surveying techniques in field to establish vertical control |
| C308.4 | Apply different survey adjustment techniques. |
| C307.5 | Carry out different setting out works in the field |

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| C309 | CE3601 | Design of Steel Structural Elements |
|------|--------|-------------------------------------|

| | |
|---|---|
| C309.1 | Recognize the design philosophy of steel structures and identify the different failure modes  of bolted and welded connections, and determine their design strengths |
| C309.2 | Select the most suitable section shape and size for tension and compression members and beams according to specific design criteria |
| C309.3 | Apply the principles, procedures and current code requirements to the analysis and design of steel tension members, columns, column bases and beams |
| C309.4 | Identify and compute the design loads on Industrial structures, and gantry girder |
| C309.5 | Find out ultimate load of steel beams and portal frames using plastic analysis |

| C310 | CE3602 | STRUCTURAL ANALYSIS II |
|------|--------|------------------------|

| | |
|---|---|
| C310.1 | Draw influence lines for statically determinate structures and calculate critical stress resultants. |
| C310.2 | Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams. |
| C310.3 | Analyse three hinged, two hinged and fixed arches. |
| C310.4 | Analyse the suspension bridges with stiffening girders |
| C310.5 | Analys HYDe rigid frames by approximate methods for gravity and horizontal loads. |

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| C311 | AG3601 | ENGINEERING GEOLOGY |
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|---|---|
| C311.1 | Knowing the internal structure of earth and its relation to earthquakes. Landforms created by various geological agents and their importance in civil engineering. |
| C311.2 | Getting knowledge on various minerals and rocks that can be used as construction materials and road aggregates. In addition, testing the suitability of rocks for foundation purposes |
| C311.3 | Studying various geological structures and their impact in engineering constructions. Further, learning the geo mechanical properties of rocks and their significance in engineering projects |
| C311.4 | Gaining knowledge on the role of geological mapping, remote sensing and geophysics for surface and subsurface investigations. In addition, students will also gain knowledge on borehole logging techniques and their applications in civil engineering |
| C311.5 | Applying geological knowledge for designing and constructing major civil engineering structures, and also mitigating various geological hazards such as earthquakes, landslides and tsunamis. |

| C312 | CCE331 | AIR AND NOISE POLLUTION CONTROL ENGINEERING |
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|---|---|
| C312.1 | Understand various types and sources of air pollution and its effects |
| C312.2 | Know the dispersion of air pollutants and their modeling |
| C312.3 | Know about the principles and design of control of particulate pollutants |
| C312.4 | Understand the principles and design of control of gaseous pollutant |
| C312.5 | Know the sources, effects and control of vehicular, indoor air and noise pollution |

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| C313 | OCS353 | DATA SCIENCE FUNDAMENTALS |
|------|--------|---------------------------|

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|--------|-------------------------------------------------------|
| C313.1 | Gain knowledge on data science process. |
| C313.2 | Perform data manipulation functions using Numpy and Pandas. |
| C313.3 | Understand different types of machine learning approaches. |
| C313.4 | Perform data visualization using tools. |
| C313.5 | Handle large volumes of data in practical scenarios |

| C314 | CE3611 | BUILDING DRAWING AND DETAILING LABORATORY |
|------|--------|-------------------------------------------|

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|--------|-------------------------------------------------------|
| C314.1 | Draft the plan, elevation and sectional view of the load bearing and framed buildings |
| C314.2 | Draw the structural detailing of RCC elements |
| C314.3 | Draw the structural detailing of RCC water tanks, footings and retaining walls |
| C314.4 | Draw the structural detailing of steel structures |
| C314.5 | Draft the structural detailing of Industrial structures |

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**DEPARTMENT OF CIVIL ENGINEERING**

**ANNA UNIVERSITY REGULATIONS: 2021**

**FINAL YEAR COURSES (VII& VIII SEMESTER)**

**Course Outcomes (Cos)**

| C401 | CE3701 | ESTIMATION, COSTING AND VALUATION ENGINEERING |
|------|--------|-----------------------------------------------|

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|------|--------------------------------------------------------------------------|
| **C401.1** | Gain knowledge on types of contracts. |
| **C401.2** | Understand types of specifications, principles for report preparation, tender notices types. |
| **C401.3** | Rate Analysis for all Building works, canals, and Roads and Cost Estimate. |
| **C401.4** | Estimate the quantities for buildings. |
| **C401.5** | Evaluate valuation for building and land. |

| C402 | AI3404 | HYDROLOGY AND WATER RESOURCES ENGINEERING |
|------|--------|-------------------------------------------|

| | |
|------|-----------------------------------------------------------------------|
| **C402.1** | Define the hydrological processes and their integrated behaviour in catchments |
| **C402.2** | Apply the knowledge of hydrological processes to address basin characteristics, runoff and hydrograph |
| **C402.3** | Explain the concept of hydrological extremes and its management strategies |
| **C402.4** | Describe the principles of storage reservoirs |
| **C402.5** | Understand and apply the concepts of groundwater management |

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| C403 | GE3791 | HUMAN VALUES AND ETHICS |
|------|--------|--------------------------|

| C403.1 | Identify the importance of democratic, secular and scientific values in harmonious functioning of social life. |
|--------|------------------------------------------------------------------------------------------------------------------|
| C403.2 | Practice democratic and scientific values in both their personal and professional life. |
| C403.3 | Find rational solutions to social problems. |
| C403.4 | Behave in an ethical manner in society. |
| C403.4 | Behave in an ethical manner in society. |

| C404 | GE3752 | TOTAL QUALITY MANAGEMENT |
|------|--------|---------------------------|

| C404.1 | Ability to apply TQM concepts in a selected enterprise |
|--------|---------------------------------------------------------|
| C404.2 | Ability to apply TQM principles in a selected enterprise |
| C404.3 | Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA. |
| C404.4 | Ability to understand Taguchi's Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR |
| C404.5 | Ability to apply QMS and EMS in any organization. |

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| C405 | CME365 | RENEWABLE ENERGY TECHNOLOGIES |
|------|--------|-------------------------------|

| | |
|--------|-----------------------------------------------------------|
| C405.1 | Discuss the Indian and global energy scenario. |
| C405.2 | Describe the various solar energy technologies and its applications. |
| C405.3 | Explain the various wind energy technologies |
| C405.4 | Explore the various bio-energy technologies |
| C405.5 | Discuss the ocean and geothermal technologies |

| C406 | OBT355 | BIOTECHNOLOGY FOR WASTE MANAGEMENT |
|------|--------|-------------------------------------|

| | |
|--------|-----------------------------------------------------------|
| C406.1 | To learn the various methods biological treatment |
| C406.2 | To know the details of waste biomass and its value addition |
| C406.3 | To develop the bioconversion processes to convert wastes to energy |
| C406.4 | To synthesize the chemicals and enzyme from wastes |
| C406.5 | To produce the biocompost from wastes |
| C406.6 | To apply the theoretical knowledge for the development of value added products |

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| C407 | CE3811 | PROJECT WORK/INTERNSHIP |
|------|--------|-------------------------|

| C407.1 | Identify civil engineering problems reviewing available literature. |
|--------|---------------------------------------------------------------------|
| C407.2 | Identify appropriate techniques to analyze complex civil engineering problems |
| C407.3 | Apply engineering and management principles through efficient handling of Project have a clear idea of his/her area of work and they are in a position to carry out the work in a systematic way. |