

**KONERU LAKSHMAIAH EDUCATION FOUNDATION**  
**DEPARTMENT OF CIVIL Engineering**  
**Green Fields, Vaddeswaram Guntur Dist-522502**  
**Y20 Batch, AY 2020-2024, Description of Course Outcome**

**Program: B.Tech**

20MT1101	Mathematics for Computing	CO1	Model the physical laws and relations mathematically as a first order differential equation, solve by analytical and numerical methods also interpret the solution.
		CO2	Model physical laws and relations mathematically as a second/higher order differential equation, solve by analytical method and interpret the solution.
		CO3	Obtain the Fourier series expansions of periodic functions and use the series to solve ordinary differential equations.
		CO4	Model physical problems mathematically as a system of linear equations and solve them by analytical and numerical methods. Also, determine the nature of Quadratic form using Eigen values.
		CO5	Verify the solution of problems through MATLAB.
20SC1102	Introduction To Design	CO1	Be able to understand elements and principles of design
		CO2	. Able to grasp stage model of action cycle
		CO3	Be able to understand design laws and their importance in design field
		CO4	To comprehend various rules of composition of design
		CO5	To gain hands-on experience of fundamentals of design
20SC1203	User Centric Design Techniques	CO1	Understand the different roles and responsibilities in phases of User centered Design
		CO2	Identify user pain points and opportunity areas through empathy and collaborative design.
		CO3	To be able to design a better User Experience using UCD and 6D process
20SC2104	Design Thinking And Innovation	CO1	Understand the basics of design thinking and its implications in product or service development
		CO2	Understand and Analyse the requirements of a typical problem
		CO3	Plan the necessary activities towards solving the problem through ideation and prototyping
		CO4	evaluate the solution and refine them based on the customer feedback
19BT1001	Biology For Engineers	CO1	Acquire the Knowledge of basic biology
		CO2	Acquire the Knowledge of Human Biological Systems
		CO3	Acquire Knowledge on Microorganisms and Biosensors
19MT2102	Mathematics For Engineers	CO1	Apply differential and integral calculus to find maxima & minima of functions and evaluate the integrals
		CO2	Model and solve the relevant phenomena as a differential equation
		CO3	Demonstrate Fourier series and Analytic functions
		CO4	Describe probability , Random Variables and Algebraic structures
19MT2007	Probability And Optimization Techniques	CO1	Identify the basic concept of probability theory and types of random variables and also their applications in probability distributions.
		CO2	Apply discrete and Continuous probability distributions to analyse the various real-world situations.
		CO3	Illustrate the bivariate data using correlation and regression analysis and formulate the given phenomena as a linear programming problem and solve it by graphical method. and simplex methods.
		CO4	Demonstrate the Big- M method, dual simplex method and obtain the solutions of non-linear programming problems using Pivot, Wolfe's algorithms and separable programming technique

20UC1101	Integrated Professional English	CO1	Understand the concepts of grammar to improve communication, reading, and writing skills
		CO2	Demonstrate required knowledge over Dos and Don'ts of speaking in the corporate context. Demonstrate ability to face formal situations / interactions.
		CO3	Understand the varieties of reading and comprehend the tone and style of the author. Skim and scan effectively and appreciate rhetorical devices
		CO4	Apply the concepts of writing to draft corporate letters, emails, and memos
20UC1202	English Proficiency	CO1	Demonstrating different interpersonal skills for employability
		CO2	Distinguishing business essential skills
		CO3	Classifying social media and corporate communication skills
		CO4	Applying analytical thinking skills
20UC2103	Professional Communication Skills	CO1	Knowledge about Verbal Ability
		CO2	Knowledge about Critical Thinking Skills
		CO3	Knowledge about Quantitative Aptitude:
		CO4	Knowledge about Reasoning
20UC2204	Corporate Communication Skills	CO1	Knowledge about Verbal Ability
		CO2	Knowledge about Soft Skills
		CO4	Knowledge about Quantitative Aptitude
		CO4	Knowledge about Reasoning
20UC3005	Aptitude Builder	CO1	Knowledge about Critical Reading
		CO2	Knowledge about Trinity Guild Hall
		CO3	Knowledge about Quantitative Aptitude
		CO4	Knowledge about Reasoning: Number and Letter Series, Number and Letter Analogy, Coding and decoding, Odd man out. Selections
20SC1101	Computational Thinking For Design	CO1	Design Basic and Complex Building Blocks for real world problems using structured programming paradigm.
		CO2	Translate computational thinking into Logic Design for Solving real world problems.
		CO3	Apply and Analyse CRUD operations on Basic Data Structures using Asymptotic Notations
		CO4	Apply and Analyse CRUD operations on Linear Data Structures using Asymptotic Notations.
		CO5	Apply the structured programming paradigm with logic building skills on Basic and Linear Data Structures for solving real world problems.
20ME1103	Design Tools Workshop - I	CO1	Practice design thinking by developing artistic skills
		CO2	Visualize and practice innovative design by final drafting using photogrammetric and model the design using prototyping technique
		CO3	Apply the concept of AI & Data analytics & finalize the requirements to design his idea
		CO4	Draft a report of his project from the initial stage & make a report which include scope, time and cost management of his project
19SC1202	Data Structures	CO1	Illustrate solving typical problems using Arrays, Strings and Lists.
		CO2	Demonstrate applications of stacks & queues and solving typical problems using recursion.
		CO3	Demonstrate use of sorting, Heaps and binary tree techniques in problem solving.
		CO4	Examine AVL trees and Hashing techniques.
		CO5	Apply the knowledge obtained by the course to solve real world problems.

19SC1203	Object Oriented Programming	CO1	Understand basic Concepts of OOP, fundamentals of java and apply the concepts of classes and objects through Java Language. Apply constructors, Overloading, parameter passing.
		CO2	Apply access control, Inheritance, Packages
		CO3	Apply Interfaces, Exception Handling, multi- threading, I/o.
		CO4	Apply collection framework and event driven programming.
		CO5	Apply object-oriented programming concepts to write programs and Analyses requirements and design to implement lab-based project with SDLC in a group of students.
19SC1209	Design Tools Workshop - II	CO1	Practice the design ideology by artistic skill
		CO2	Visualize the design ideology by using VR technology
		CO3	Visualize the design ideology by incorporating VR technique
		CO4	Visualize and present his design idea by applying AR technique
20PH1010	Mechanics	CO1	Apply the concept of forces, governing static equations and analyse planer system of forces.
		CO2	Use analytical techniques for analyzing forces in statically determinate structures.
		CO3	Understanding the concepts of planar and non-planar system of parallel forces and analysing them. Estimate moment of inertia of lamina and material bodies.
		CO4	Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
19CE1002	Engineering Graphics for civil engineers	CO1	Understand the principles of drawing and use of drafting instruments
		CO2	Draw engineering curves and scales.
		CO3	Draw the projections of points, lines, planes and solids
		CO4	Draw the surface sheath of solids by development of surfaces and the sections of Solids.
		CO5	Prepare 2D & 3D drawings of solids and their transformations.
		CO5	Apply the knowledge on structure and properties of materials while executing experiments and develop inter disciplinary projects.
19CE2105	AI&ML Applications in Civil Engineering	CO1	Apply the basic operations and data modifications in python
		CO2	Apply the regression analysis on the given data
		CO3	Apply some basic machine learning techniques on given data
		CO4	Understand the deep learning concepts
		CO5	Apply AI and ML techniques in Python
19CE2102	Mechanics of Fluids	CO1	To understand concept of flow phenomenon and determination of fluid properties.
		CO2	To understand the mechanics pressure and its measurement.
		CO3	To get the concepts of kinematic principles and solutions for simple mathematical equations, to understand the energy principle, continuity equation of fluid in 3-dimensions
		CO4	To know various hydraulic principles of pipe flow and losses in pipe systems. To Understand the Dimensional analysis concept and deriving the relevant equations.

19CE2101	Solid Mechanics	CO1	Associate with the stress-strain diagrams and the relationship between the elastic constants, estimate temperature stresses in compound bars and find the stresses in thin walled pressure vessels
		CO2	Draw Shear force and Bending moment diagrams for statically determinate beams
		CO3	Calculate the Bending and shear stresses and draw the distribution diagrams for various cross sections.
		CO4	Estimate the transformation of stress in a plane and draw Mohr's circle, estimate stresses due to torsion for circular shafts and find buckling load for centric and eccentric columns
19CE2205	Geology	CO1	Understand various geological processes operate on the surface of the earth, impact of the processes on the construction materials.
		CO2	Understand the formation of different types of rocks and their identification and properties and use in sourcing suitable geological materials for construction
		CO3	Equip with factors leading to various geological hazards and able to identify areas vulnerable to sliding, come out measures to stabilize slopes and seismic vulnerability.
		CO4	Equip with basic knowledge required for identification of suitable site for the proposed construction project, equip with basic knowledge of hydro geological properties of rocks, identification of potential pockets for tapping groundwater and geological settings that are unfavorable / unsafe for construction of dams and driving the tunnels.
19CE2103	Surveying	CO1	Understand basic concepts of surveying
		CO2	Understand how to operate instruments required for surveying
		CO3	Applying the surveying equipments required based on the functionality and nature of work
		CO4	Apply field data to prepare a plan required for a given civil engineering project
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19CE3221	Prestressed Concrete	CO1	To introduce prestressing methods, principles and concepts
		CO2	To determine losses in prestress
		CO3	To Analyse PSC Sections both at transfer of prestress and Service load conditions
		CO4	To design prestressed concrete beams as per IS Code, to design end block of PSC beams.
19CE4141	Bridge Engineering	CO1	To design slab culvert as per IRC Code
		CO2	To design simple supported T-beam girder beam
		CO3	To design pier and abutments
		CO4	To design various bridge bearing, to design bridge foundation like well foundation
19CE4151	Sustainable construction Technologies	CO1	Understand the construction basics of a Common building construction methods conventional
		CO2	Understand the modern construction methods basics of construction Modular Construction Precast concrete.
		CO3	Understand the sustainable construction materials technologies and project management strategies
		CO4	Understand the LEED for New Construction rating system
19CE3222	Ground Improvement Techniques	CO1	Knowledge about the different techniques of ground improvement and their suitability.
		CO2	Understanding and design of stone columns for enhancing soil bearing capacity.
		CO3	Knowledge of the grouts, their types, properties and application.
		CO4	Introduction to geo synthetics, their types, function and application, Ability to design and analyse the earth-reinforcements with their connections

19CE3232	Geotechnical Earthquake Engineering	CO1	Knowledge of the seismic phenomenon, its occurrence, tectonic theories, seismic waves and their motion in different media and measurement of ground motions.
		CO2	Analysis skills of 1-D ground responses using linear and non-linear approaches.
		CO3	Ability to analyze the seismic hazard through deterministic and probabilistic approaches.
		CO4	Ability of modifying the actual ground motion records and their time and frequency domain generation. Knowledge of dynamic soil properties and their measurements using field and laboratory tests, Knowledge of the liquefaction phenomenon and its effects and the remedial measures to be taken for soil improvement.
19CE4142	Design of Earth Retaining Structures	CO1	Knowledge about the different techniques of earth retaining structures and their suitability.
		CO2	Understanding and design of retaining walls, braced cuts and sheet piles.
		CO3	Knowledge of the grouts, their types, properties and application.
		CO4	Introduction to reinforced earth and geo synthetics, their types, function and application, Ability to design and analyse the earth-reinforcements and coffer dams with their functions.
19CE4152	Rock Mechanics	CO1	Analyze the physical properties of rocks and failure criterion
		CO2	Analyze the rock mass classification, stress around mine openings
		CO3	Analyze the strain and displacement of the rock mass
		CO4	Analyze shear strength of soil and analyze and interpret the laboratory and field tests required for any geotechnical investigation
19CE3213	Sustainable engineering & technology	CO1	Design and draw the Vertical drop weir on permeable foundations
		CO2	Design and draw the Canal regulator, Irrigation canal, direct sluice, Surplus weir of a tank
		CO3	Design and draw the Profile of a Ogee spillway
		CO4	Design and draw the Cross Drainage works
19CE3223	Environmental impact assessment and life cycle analyses	CO1	Understand stream flow and its measurements
		CO2	Understand the classification of the rivers and design of cross drainage works
		CO3	Understand the reservoir planning and classification of dams
		CO4	Able to design gravity and earth dams
19CE3233	Solid Waste Management and Landfills	CO1	Understand the basic concept of Environmental impact assessment, types of environmental impacts, significance and criteria for selection
		CO2	Select methodology for identification of environmental impact.
		CO3	Apply the knowledge of predicting impact of proposed project on air & water
		CO4	Acquire knowledge of predicting impact of proposed project on Noise, Soil, Biological and Socio-economic conditions, Acquire the skills of preparing environment management plans.
19CE4168	Solid Waste Management and Landfills	CO1	Understand types, sources of solid waste, composition and their Properties.
		CO2	Understand the present scenario, challenges of solid waste management and various waste disposal options available.
		CO3	Understand methods of solid waste disposal methods of land filling, systems adopted for conversion of solid waste and recovery of materials and energy from solid waste.
		CO4	Understand the components of hazardous waste types, composition, properties and acquire skills of designing of various lining system for landfill and treatment as per MoEF and CPCB

17CE4173	Advanced Environmental Engineering	CO1	Understand the basic concepts of Stream Sanitation & design of Stabilization ponds
		CO2	Acquire the knowledge of industrial wastewater treatment process
		CO3	Acquire the knowledge on new concepts in biological waste treatment
		CO4	Analyze air pollution and plume behavior, measuring of noise pollution, understand various aspects related to Solid & Hazardous waste management
19CE3251	Intelligent transportation systems	CO1	Understand the Objectives ITS
		CO2	Understand the Importance of telecommunications in the ITS system
		CO3	Understand Advanced Traffic Management Systems
		CO4	Understand Integration of Automated Highway Systems
19CE3235	Traffic Engineering & maintenance	CO1	Apply the Concepts of Probability in traffic Engineering
		CO2	Know the Fundamental design concepts of Interchanges, Parking Facilities, Freeways
		CO3	Design Traffic Facilities include Un signalized Intersections (Rotary), Signalized Intersection (signal design)
		CO4	Know the Accident Situation in India, road safety measures, Understand Detrimental Effects of traffic on the environment
19CE3225	Pavement materials & design	CO1	Characterize pavement materials and also carry the advance tests on bituminous mixtures
		CO2	Thorough with stresses and strains of flexible and rigid pavements.
		CO3	Thorough with analysis and design of flexible highway and airport pavements
		CO4	Thorough with analysis and design of rigid highway and airport pavements
19CE4145	Urban Transport Systems Planning	CO1	Learn the concept of travel demand and supply and modes available for transportation
		CO2	Understand the different types of Traffic Surveys used in planning
		CO3	Identify and analyze trips as a part of transport planning
		CO4	Plan Public Transport Systems, Utilize ITS in Transport Planning
19CE4155	Railway engineering airport planning and design	CO1	Understand about the Classification of Railways, Permanent Way & its components, functions.
		CO2	Analyze track alignment, geometric elements, Horizontal and Vertical curves, super elevation, and Negative Super elevation.
		CO3	Understand about the various factors affecting Selection of site for Airport.
		CO4	Geometric Design of Runway, Computation of Runway length, Correction for runway length, Understand the layout of port components and operation of navigational aids that involved in functions of ports.
19CE3216	Construction Contracts	CO1	Understand the Engineering and Technology of Materials
		CO2	Understand the Development of Microstructure.
		CO3	Understand the Construction Materials and Criteria for Selection
		CO4	Understand the Non-structural materials
19CE4156	Advanced Concrete Technology	CO1	Understand the Materials
		CO2	Understand the Nondestructive evaluation
		CO3	Understand the Properties of constituent materials of Fibre reinforced concrete
		CO4	Understand the Durability of flyash concretes and High-performance concretes
19CE4166	Engineering Economy	CO1	Understand the unique features of construction
		CO2	Understand the Construction project planning
		CO3	Understand the Techniques of planning
		CO4	Understand the Planning and organizing construction site and resources involving Monitoring & control-Supervision

19CE40A2	Environmental Pollution Control Methods	CO1	Understand the sources and types of pollutants
		CO2	Understand the Meteorological factors
		CO3	Understand Water quality and Effluent discharge standards
		CO4	Understand the Disposal methods and Noise and its measurement
19CE30A3	Solid and Hazardous Waste Management	CO1	Understand the importance types, sources and disposal methods of Solid Waste Management.
		CO2	To understand the importance of conversion and recycling of waste.
		CO3	Understand types, Sources of Hazardous Waste Management.
		CO4	Understand disposal and treatment methods of Hazardous Waste Management.
19CE40A4	Remote Sensing and GIS	CO1	To understand the basic concepts of remote sensing and image processing.
		CO2	To understand the basic concepts of Geographical Information System
		CO3	To acquire the knowledge of Integrating the Remote sensing and GIS
		CO4	To apply the remote sensing and GIS tool for solving various civil engineering and societal problems
19CE40A5	Disaster Management	CO1	Understand the types of disasters, related hazards and the causes for disasters
		CO2	Apply the resilience and mitigation measures for various disasters by proper planning with respect to the kind of disaster that occur.
		CO3	Understand the disaster risk, reduction and the various organizations involved with related to disasters.
		CO4	Understand the disaster vulnerability with the help of case studies
19CE3216	Resource, Safety and Quality Management	CO1	Understand the basics systems of men and materials management
		CO2	Understand the basics systems of machinery management
		CO3	Understand the basics systems of safety management
		CO4	Understand the basics systems of quality management