KONERU LAKSHMAIAH EDUCATION FOUNDATION
DEPARTMENT OF CIVIL Engineering
Green Fields, Vaddeswaram Guntur Dist-522502
Y18 Batch, AY 2018-2022, Description of Course Outcome

Program: B.Tech

18SC1103	Single Variable Calculus and Matrix Algebra	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.
18SC1104	Foundations of Computational Mathematics	CO1	Evaluate mathematical expressions by using different types of operations on numbers.
		CO2	Simplify expressions and solve equations & in equations.
		CO3	Apply different types of arithmetic expressions to solve given problems.
		CO4	Apply methods to find areas, volumes and use graphs to reduce non-linear to linear forms.
18MT1201	Multivariate Calculus	CO1	Determine extreme values for functions of several variables
		CO2	Determine area, volume moment of inertia through multiple integrals in Cartesian or polar coordinates.
		CO3	Apply the concepts of vector calculus to calculate the gradient, directional derivative, arc length, areas of surfaces and volume of solids in practical problems
		CO4	Obtain analytical and numerical solutions of Heat and wave equations
		CO5	Verify the solution of problems through MATLAB
18SC1105	Logic and Reasoning	CO1	Apply the fundamental principle of counting and use them to measure the uncertainty in random experiments.
		CO2	Apply Venn diagrams to find the conclusion of statements, solve puzzles using binary logic and problems relating to cubes.
		CO3	Apply the available models for Data sufficiency & redundancy and interpret it, when given, in tabular and graphical forms.
		CO4	Apply the Reasoning techniques to solve problems on arrangements, series, analogies, coding and decoding.
18CY1001	Engineering Chemistry	CO1	Predict potential complications from combining various chemicals or metals in an engineering setting
		CO2	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena
		CO3	Examine water quality and select appropriate purification technique for intended problem
		CO4	Apply polymers, conducting polymers, green chemistry and nano chemistry to engineering processes
		CO5	An ability to analyze & generate experimental skills
18SC1101	Problem Solving and Computer Programming	CO1	Illustrate how problems are solved using computers and programming.
		CO2	Illustrate and use Control Flow Statements in C.
		CO3	Interpret & Illustrate user defined C functions and different operations on list of data.
		CO4	Implement Linear Data Structures and compare them.
		CO5	Apply the knowledge obtained by the course to solve real world problems.
18SC1202	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.
18PH1002	Physics for Civil Engineers	CO1	Understand the concept of forces and apply the static equilibrium equations.
		CO2	Analyze co-planar and non-co-planar system of forces.
		CO3	Apply the concept of centroid & centre of gravity to determine moment of inertia.
		CO4	Analyze the rigid bodies under translation and rotation with and without considering forces.
		CO5	Understand and analyze the engineering systems with the help of mechanics concept to solve the engineering problems.
18CE1201	Engineering Mechanics	CO1	Understand the concept of forces and apply the static equilibrium equations.
		CO2	Analyze co-planar and non-co-planar system of forces.
		CO3	Apply the concept of centroid & centre of gravity to determine moment of inertia.
		CO4	Analyze the rigid bodies under translation and rotation with and without considering forces.
		CO5	Understand and analyze the engineering systems with the help of mechanics concept to solve the engineering problems.
18CE1002	Engineering Graphics & Design 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.

18CE1003	Workshop Practice for civil engineering	CO1	prepare the different joints using carpentary trade by using wood as raw material
		CO2	prepare the different fits using fitting trade with MS plates as raw material
		CO3	prepare the different components using Tinsmithy trade by using GI sheet as raw material
		CO4	Analyse the concept of Group Discussion and speak effectively during the discussion.
18UC1101	Basic English	CO1	Apply and analyze various concepts of writing strategies in professional communication skills like, reports, proposals and minutes of the meeting.
		CO2	Analyse vocabulary and apply the types of reasoning in comprehending the information.
		CO3	Apply the mechanics and application of presentation skills and apply people skills in various social organizational and corporate ambiences.
		CO4	Analyse the concept of Group Discussion and speak effectively during the discussion.
18UC2103	Professional Communication Skills	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
18UC1202	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
18UC2204	Aptitude Builder-1	CO1	Knowledge about Verbal Ability
		CO2	Knowledge about Soft Skills
		CO4	Knowledge about Quantitative Aptitude
		CO4	Knowledge about Reasoning
18UC3105	Aptitude Builder-2	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/
18CE2103	Fluids Mechanics	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.
18CE2102	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 statistically 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
18CE2204	Engineering 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 un favorable / unsafe for construction of dams and driving the tunnels.
18CE2104	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
18CE2105	Construction Materials and Concrete Technology	CO1	Compare the properties of most common and advanced building materials
		CO2	Understand the typical and potential applications of these materials such as concrete and its mix proportioning
		CO3	Understand the relationship between material properties and structural form
		CO4	Understand the importance of experimental verification of material properties.
18CE2205	Environmental Engineering	CO1	Understand various aspects related to water supply process and water quality
		CO2	Design and analyze water treatment system
		CO3	Assess Sewage quantity and design of sewerage system
		CO4	Design and analyze of sewage treatment process, Learn the impacts of air pollution its control techniques and disposal of solid wastes
18CE2202	Building Planning, drawing and Construction management	CO1	Understand the concept of building planning and the building bye laws and the regulations
		CO2	Understand the stages involved in building planning
		CO3	Understand different techniques of construction viz., Brick Masonry and stone Masonry
		CO4	Understand the different types of floors, roofs, doors, stairs and its use, know about the supporting structures and building amenities.

18CE2201	Structural Analysis	CO1	Find the deformation using energy theorems i.e. Castigliano's theorems, Betti's theorem and Maxwell's reciprocal theorem.
		CO2	Students will be able to estimate the deflection of beams by various methods such as deflection curves, moment area method, conjugate beam method and unit load method
		CO3	Able to analysis proper cantilevers and fixed beams for any type of landing using consistent deformation method and can analysis conjugate beam by Clapereyon's theorem of Three moments
		CO4	Student will be able to analyze beams and frames for any type of loading using slope deflection method and moment deflection methods
18CE2203	Hydraulics and Hydraulic Machines	CO1	To understand open channel flow through Chezy's, Kutter's and Manning's formula, design economical channel sections, Rapidly Varied Flow and applications.
		CO2	To understand the mechanics of impact of jet on various types of vanes.
		CO3	To understand the components, function and uses of Pelton turbine, Francis turbine and Kaplan turbine.
		CO4	To performance of hydraulic design of turbines and pumps (C.P and R.P), To know various hydraulic aspects of components function and uses of Centrifugal Pumps and Reciprocating Pumps.
18CE2206	Soil Mechanics	CO1	Understand origin, index & engineering properties of soil
		CO2	Classify the soil according to I.S. guidelines and to know the stresses in soil
		CO3	Analyze stresses developed at various points below the ground surface using various methods and Analyze important engineering property of soil such as permeability
		CO4	Analyze important engineering properties of soil such as compaction, compressibility and consolidation of soil, Analyze important engineering property of soil such as shear strength of soil
18CE3104	Foundation Engineering	CO1	Carry out geotechnical field investigation and can prepare field reports and Thoroughly understand different geotechnical investigation methodologies and can handle individually
		CO2	Can compute stress distribution using different techniques and can carry settlement analysis in different soil types
		CO3	Compute bearing capacity of shallow and deep foundations in laboratory and field using different methods
		CO4	Can analyze stability of slopes for finite and infinite in different soil conditions and methods, carry earth pressure analysis and can design retaining walls
18CE3101	Design of Reinforced Concrete Structures	CO1	Design RC beams subjected to bending using Working Stress Method.
		CO2	Explain the concept of Limit State Design and apply it to beams
		CO3	Apply Limit state design for flanged sections subjected to shear, torsion and concept of bond
		CO4	Design one-way, two-way and continuous slabs, Design columns and isolated footings subjected to axial load, Uni-axial and bi-axial bending
18CE3102	Water Resources Engineering	CO1	Compute the components of hydrological cycle using different methods
		CO2	Estimate the ground water yield and requirement of water for the crops
		CO3	Estimate the quantity of water for canal irrigation, storage capacity and life of reservoir.
		CO4	Analyse stability of Gravity and Earth dams
18CE3202	Advanced Structural Analysis	CO1	Students will be able to draw influence line diagrams for determinate structure and able to estimate maximum bending moment and absolute maximum bending moment.
		CO2	Students will be able to analysis cable structure and three hinged arches.
		CO3	Students will be able to carry plastic analysis of structures
		CO4	Analyze beams and frames using matrix methods of analyze such as force method and displacement method
18CE3203	Design of Steel Structures	CO1	Analyse and design bolted and welded connections
		CO2	Design single and compound beams as per IS code
		CO3	Design simple and built-up columns as per IS code
		CO4	Design column base systems as per IS code, Calculate wind forces and design roof trusses
18CE3103	Transportation Engineering	CO1	Know Versatile with history - current trends of transportation and Carry engineering surveys and can decide the alignment
		CO2	Analyze and design highway geometric elements
		CO3	Analyze and design of flexible, rigid pavements, Pavement Drainage
		CO4	Handle pavement construction activities and also conduct quality control at site and Evaluate pavement condition and can identify and suggest remedial measures, understand traffic Rules, Analyze and design of traffic infrastructure
18CE3105	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
18CE3201	Quantity Surveying and Estimation	CO1	To understand the fundamentals of estimation and specification
		CO2	To provide exposure to rate analysis
		CO3	To provide hands on experience on estimation
		CO4	To study the fundamentals of evaluation, To carry out valuation by different methods
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
18CE4161	Earthquake Resistant Design of Structures	CO1	To understand the principles of vibration with regard to single degree of freedom system and multy degree of freedom system
		CO2	To understand the seismo resistant building Architecture.
		CO3	To determine the design lateral forces by means of codal provisions.
		CO4	To introduce the concept of ductility and corresponding detailing, to expose the students to earthquake resistant design of masonry buildings

18CE3231	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.
18CE4141	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
18CE32111	Prefabricated Structures	CO1	Understand the Need for prefabrication
		CO2	Understand the components of Prefabricated structure
		CO3	Understand the Joint in Structural Members
		CO4	Understand the Design Procedure for Abnormal Loads
18CE3252	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
18CE4160	Advanced Foundation Engineering	CO1	Knowledge about the different techniques for laying foundations in expansive soils.
		CO2	Understanding and design of different types of footings.
		CO3	Various factors to be considered in foundation design.
		CO4	Understanding the design criteria of Machine foundations, Understanding the design criteria of Mat and for designing and construction of foundations for reciprocating machines as per IS.
18CE4161	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.
18CE4162	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.
18CE4163	Geosynthetics and Reinforced Soil Structures	CO1	Understand the Historical background of reinforced soil
		CO2	Understand the Testing methods for geosynthetics
		CO3	Understand the Reinforced Soil retaining walls
		CO4	Understand the Reinforced soil slopes and Applications in various civil engineering purposes
18CE4144	Design of Hydraulics Structures	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
18CE3258	Advanced Water Resources Engineering	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
18CE3223	Environmental Impact Assessment & Life Cycle Analyses	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.
18CE4143	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
18CE4173	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

18CE3254	Advanced Highway Engineering	CO1	Understand about the Alignment, Geometrics, Analyze and Design of Hill Roads
		CO2	Know the Importance of Low Volume roads in Indian scenario & Analyze and design Low Volume Roads including quality control aspects
		CO3	Know the Importance of Desert Roads, and Guidelines for Design
		CO4	Know the Importance of Roads in Swampy, water-logged areas and in Black Cotton Soil, Versatile with various components of Special Roads such as Expressways, Toll Roads, Urban Roads.
18CE4145	Traffic Engineering & Management	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
18CE3225	Pavement material & 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
18CE4155	Urban Transport 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
18CE3235	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.
18CE3255	Modern Construction Materials	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
18CE3260	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
18CE4165	Advanced Surveying	CO1	Understand about Control Surveying
		CO2	Understand the Total Station Surveying
		CO3	Understand GPS Surveying
		CO4	Understand about recent Advances In Surveying
18 CE 4170	Green Buildings	CO1	Understand necessity and role of green buildings & regarding Indian green building council
		CO2	Design green buildings considering water, site, material parameters
		CO3	Carry passive solar design
		CO4	Handle construction and maintenance of green buildings
18CE4161	Construction Project Planning&Systems	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
18CE40A2	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
18CE30A3	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.

18CE40A4	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
18CE40A5	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
18NB4056	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