Department of Civil Engineering
Syllabus Regulation: R19

II YEAR-I SEM

Year & Sem	COURSE CODE	COURSE NAME	COURSE OUTCOMES
II-I	(19A54301)	COMPLEXVARIABLES, TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	After the completion of course, students will be able to CO1• Understand the analyticity of complex functions and conformal mappings. CO2• Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours CO3.• Understand the usage of Laplace Transforms. CO4• Evaluate the Fourier series expansion of periodic functions. CO5• Formulate/solve/classify the solutions of Partial differential equations and also find the solution of one dimensional wave equation and heat equation.
II-I	(19A01301T)	STRENGTH OF MATERIALS	On completion of the course, the student will be able to: CO1 • Understand the different types of couples and force systems CO2• Determine the centroid and moment of inertia for different cross-sections CO3• Understand the concepts of stress, strain, generalized Hooke's law, elastic moduli and strain energy. CO4• Develop shear force and bending moment diagrams for different load cases. CO5• Compute the flexural stresses and shear stresses for different loading cases and different cross-sections.
II-I	(19A01302T)	FLUID MECHANICS	At the end of the course, the student will be able to: CO1• Understand the principles of fluid statics, kinematics and dynamics CO2• Familiarize basic terms used in fluid mechanics CO3• Understand flow characteristics and classify the flows CO4• Apply the continuity, momentum and energy principles CO5• Estimate various losses in flow through channels
II-I	(19A01303T)	SURVEYING	At the end of the course, the student will be able

			to: CO1•Calculate angles, distances and levels 65 Page CO2•Identify data collection methods and prepare field notes CO3•Understand the working principles of survey instruments CO4•Estimate the volumes of earth work CO5• Able to use modern survey instruments
II-I	(19A01303T)	SURVEYING	At the end of the course, the student will be able to: CO1•Calculate angles, distances and levels 65 Page CO2•Identify data collection methods and prepare field notes CO3•Understand the working principles of survey instruments CO4•Estimate the volumes of earth work CO5• Able to use modern survey instruments
II-I	(19A52301)	UNIVERSAL HUMAN VALUES2:UNDERSTANDINGHARMONY	Students are expected to become more aware of themselves, and their surroundings (family, society, nature) CO1• They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. CO2• They would have better critical ability. CO3• They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society) CO4• It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life. CO5.at least a beginning would be made in this direction.
II-I	(19A01301P	STRENGTH OF MATERIALS LABORATORY	By performing the various tests in this laboratory the student will be able to know the structural behaviour various structural elements when subjected to external loads
II-I	(19A01302P)	FLUID MECHANICS LABORATORY	By performing the various tests in this laboratory the student will be able to know the principles of discharge measuring devices and head loss due to sudden contraction and expansion in pipes.
II-I	(19A01303P)	SURVEYING LABORATORY	By performing the various tests in this laboratory the student will be able to know the principles of surveying in chain surveying, compass surveying, plane table surveying, leveling, thedolite surveying and total station
II-I	(19A99301)	ENVIRONMENTAL SCIENCE	At the end of the course, the student will be able to CO1•Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources.

			CO2 •Understand flow and bio-geo- chemical cycles and ecological pyramids. CO3• Understand various causes of pollution and solid waste management and related preventive measures . CO4• About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation. CO5• Casus of population explosion, value education and welfare programmes.

II YEAR-II SEM

Year & Sem	COURSE CODE	COURSE NAME	COURSE OUTCOMES
II-II	(19A01401)	STRENGTH OF MATERIALS-II	On completion of the course, the student will be able to: CO1● Understand principal stresses and principal planes. CO2● Determine deflection at any point on a beam under simple and combined loads CO3● Analyze members under torsion, deformation in springs, CO4● Know the effect of eccentricity of load in columns; apply failure criteria to implement in design of structural members. 86 Page CO5● Know the crippling load for the columns.
II-II	(19A01402T)	HYDRAULICS AND HYDRAULIC MACHINERY	. At the end of the course, the student will be able to CO1● Understand characteristics of laminar and turbulent flows. CO2● Analyze characteristics for uniform and non-uniform flows in open channels. CO3● Design different types of turbines CO4● Design centrifugal and multi stage pumps. CO5● characteristics of laminar and turbulent flows.
II-II	(19A01403)	STRUCTURAL ANALYSIS-I	At the end of the course student will be able to CO1● Apply energy theorems for analysis of indeterminate structures CO2● Analyze indeterminate structures with yielding of supports CO3● Analyze beams using slope deflection and moment distribution methods CO4● Analyze portal frames using slope deflection CO5● moment distribution methods
II-II	(19A01404T)	CONRETE TECHNOLOGY	At the end of the course student is able to CO1●Understand various ingredients of concrete and their role.

			CO2● Examine knowledge on the fresh and hardened properties of concrete. CO3● Design concrete mixes using various methods. CO4● Perceive special concretes for accomplishing performance levels. CO5● hardened properties of concrete
II-II	(19A01405T)	TRANSPORTATION ENNGINEERING	On completion of the course, the students will be able to: CO1● Understand the importance of highways in economic development of nation. CO2● Understand the history of road development in India and various road development plans CO3● Identify the highway materials and tests related to them. CO4● Design horizontal and vertical alignment aspects. CO5● Understand the surveys required for highway planning and design.
II-II	(19A01406)	ENVIRONMENTAL ENGINEERING	At the end of the course, the student will be able to: CO1●Understand about quality of water and purification process CO2●Select appropriate technique for treatment of waste water. CO3● Assess the impact of air pollution CO4●Understand consequences of solid waste and its management. CO5● Design domestic plumbing systems.
II-II	(19A01402P) H	HYDRAULIC MACHINERY LAB	By performing the various tests in this laboratory the student will be able to know the performance of various hydraulic machinery and flow characteristics
II-II	(19A01405P)	TRANSPORTATION ENGINEERING LAB	By performing the various tests in this laboratory the student will be able to know the physical characteristics of aggregates and bitumen
II-II	(19A99302)	BIOLOGY FOR ENGINEERS	After studying the course, the student will be able to: CO1● Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms. CO2●Explain about biomolecules, their structure and function and their role in the living organisms. How biomolecules are useful in Industry. CO3● Briefly about human physiology. CO4●Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms. CO5● Know about application of biological Principles in different technologies for the

			production of medicines and Pharmaceutical molecules through transgenic microbes, plants and animals.

III YEAR-I SEM

Year & Sem	COURSECODE	COURSE NAME	COURSE OUTCOMES
III-I	(19A01501)	DESIGN OF REINFORCED CONCRETE STRUCTURES	CO1● After completing the course, the student will be able to, CO2●Understand the basic concepts of working stress and limit state design methods CO3● Design various RC elements like beams, columns, footings and slabs. CO4●Apply design concepts to complex structural CO5●systems in advanced courses.
III-I	(19A01502)	WATER RESOURCE ENGINEERING	At the end of the course the students are able to CO1● Understand of the theories and principles governing the hydrologic processes. CO2● Identify major hydrologic components and apply key concepts to several practical areas of engineering hydrology and related design aspects. CO3● Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design 112 Page hydraulic structures. CO4● Determine aquifer parameters, yield of wells and model hydrologic processes. CO5● Understand duty and delta.
III-I	(19A01503T)	ENGINEERING GEOLOGY	At the end of the course student will be able to CO1● Gain basic knowledge on characteristics of rocks and minerals. CO2● Identify and differentiate rocks using geological classification. CO3● Carry out geo physical investigations for infrastructural projects. CO4 ● Apply concepts of structural geology for civil engineering structures. CO5● Understand the seismic zones of Indi
III-I	(19A01504)	STRUCTURAL ANALYSIS-II	At the end of the course student will be able to CO1● Analyze the final moments at the ends of the members CO2● Analyze bending moment, normal thrust and radial shear in the arches CO3● Analyze the variation of shear force and

			bending moment in the members due to rolling loads CO4● Analyze the degree of indeterminacy of the structures, reactions and displacements CO5● Analyze the formation of plastic hinges in different mechanisms
III-I	(19A01505c)	ENVIRONMENTAL POLLUTION AND CONTROL PROFESSIONAL ELECTIVE-I	At the end of the course, the students will be able to: CO1● Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city. CO2● Identify the air pollutant control devices and have knowledge on the NAAQ standards and air emission standards. CO3● Differentiate the treatment techniques used for sewage and industrial wastewater treatment. CO4● Inventing the methods of environmental sanitation and the management of community facilities without spread of epidemics. CO5● Appreciate the importance of sustainable development while planning a project or executing an activity.
III-I	(19A52506a)	TECHNICAL COMMUNICATION AND PRESENTATION SKILLS (OPEN ELECTIVE)	CO1● Understand the importance of effective technical communication CO2● Apply the knowledge of basic skills to become good orators CO3● Analyze non-verbal language suitable to different situations in professional life CO4● Evaluate different kinds of methods used for effective presentations CO5● Create trust among people and develop employability skills
III-I	(19A51506a)	CHEMISTRY OF ENERGY MATERIALS	CO1● Ability to perform simultaneous material and energy balances. CO2● Student learn about various electrochemical and energy systems CO3● Knowledge of solid, liquid and gaseous fuels CO4● To know the energy demand of world, nation and available resources to fulfill the demand CO5● To know about the conventional energy resources and their effective utilization
III-I	(19A01507)	COMPUTER AIDED CIVIL ENGINEERING DRAWING	At The end of the course the student will be able to CO1● Develop drawing skills for effective demonstration of building details. CO2● Draw building plans using Computer Aided Design and Drafting software's.

			CO3● Develop engineering project drawings incorporating details and design parameters in 2D & 3D. CO4● Examine efficacy of CAD design. CO5● Drafting software's
III-I	(19A01508)	ENVIRONMENTAL ENGINEERING LAB	At the end of the course, the student will be able to CO1● Understand about quality of water and purification process CO2● Select appropriate technique for treatment of waste water CO3● Assess the impact of air pollution CO4● Understand consequences of solid waste and its management. CO5● Design domestic plumbing systems.
III-I	(19A01503P)	ENGINEERING GEOLOGY LAB	At the end of the course the students will be able to classify various types of rocks, their properties and they will be familiar with interpretation of geological maps.
III-I	(19A99501	MANDATORY COURSE: CONSTITUTION OF INDIA	At the end of the course, students will be able to CO1● Understand historical background of the constitution making and its importance for building a democratic India. CO2● Understand the functioning of three wings of the government ie., executive, legislative and judiciary. CO3● Understand the value of the fundamental rights and duties for becoming good citizen of India. CO4● Analyze the decentralization of power between central, state and local self-government CO5● Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

III YEAR-II SEM

Year&Sem	COURSE CODE	COURSE NAME	COURSE OUTCOMES
III-II	(19A01601T)	GEOTECHNICAL ENGINEERING -I	Classify various types of soils using USCS and IS classification methods CO1● Understand the behavior of coarse grained and fine grained soils. CO2● Design earth dams using different methods. CO3● Calculate the stress distribution in foundations. CO4● Know the field Compaction control. CO5● Determination of settlement of foundations
III-II	(19A01602)	DESIGN OF STEEL STRUCTURES	At the end of this course the student will be able to CO1● Explain relevant IS codes CO2● Analysis and design of flexural members and detailing CO3● Design compression members of different types with connection detailing CO4● Design Plate Girder and Gantry Girder with connection detailing CO5● Develop drawings pertaining to different components of steel structures
III-II	(19A52601T)	ENGLISH LANGUAGE SKILLS	At the end of the course, the learners will be able to CO1● Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English CO2● Apply grammatical structures to formulate sentences and correct word forms CO3● Analyze discourse markers to speak clearly on a specific topic in informal discussions CO4● Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.

			CO5●Create a coherent paragraph interpreting a figure/graph/chart/table
III-II	(19A01603d)	URBAN TRANSPORTATION PLANNING PROFESSIONAL ELECTIVE-II	CO1● Justify the need for urban transportation system planning CO2● Undertake transport surveys followed by a report. CO3● Plan the process of trip generation and distribution. CO4● Justify the need of a modal split. CO5●Prepare the transportation plans for urban mass rapid transit systems.
III-II	(19A52604a)	SOFT SKILLS (OPEN ELECTIVE-II)	CO1● Recognize the importance of verbal and non verbal skills CO2● Develop the interpersonal and intrapersonal skills CO3● Apply the knowledge in setting the SMART goals and achieve the set goals CO4● Analyze difficult situations and solve the problems in stress-free environment CO5●Create trust among people and develop employability skills
III-II	(19A52602b)	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	At the end of the course, students will be able to CO1● Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets CO2● Apply concepts of production , cost and revenues for effective business decisions CO3● Students can analyze how to invest their capital and maximize returns CO4● Evaluate the capital budgeting techniques CO5●Prepare the accounting statements and evaluate the financial performance of business entity.
III-II	(19A01601P)	GEOTECHNICAL ENGINEERING LAB	the end of the course, the student must be able to: CO1● Identify various soils

			based on their characteristics. CO2● Evaluate permeability and seepage of soils CO3● Determine plasticity characteristics of various soils. CO4● Design consolidation process by CO5● predicting settlement of soils.
III-II	(19A52601P)	ENGLISH LANGUAGE SKILLS LAB	CO1● Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills CO2● Apply communication skills through various language learning activities CO3● Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. CO4● Evaluate and exhibit acceptable etiquette essential in social and professional settings CO5● Create awareness on mother tongue influence and neutralize it in order to improve fluencyin spoken English.
III-II	(19A99601)	MANDATORY COURSE: RESEARCH METHODOLOGY	At the end of the course, students will be able to CO1● Understand basic concepts and its methodologies CO2● Demonstrate the knowledge of research processes CO3● Read. comprehend and explain research articles in their academic discipline CO4● Analyze various types of testing tools used in research CO5● Design a research paper without any ethical issues

IV YEAR-I SEM

YEAR &SEM	COURSECODE	COURSE NAME	COURSE OUTCOMES
IV-I	(19A01701)	GEOTECHNICAL ENGINEERING - II	CO1● To enable the student to analyse CO2● shallow and deep foundations CO3● when subjected to various types of loadings .CO4● To enable the student to analyse slopes CO5● Retaining walls and well foundations
IV-I	(19A01702)	ESTIMATION AND COSTING	CO1● On completion of the course, the students will be able to: CO2● Understand basics on methods and types of estimation. CO3● Formulate specifications and tender documents. CO4● Prepare contract
IV-I	(19A01703a1)	BRIDGE ENGINEERING PROFESSIONAL ELECTIVE-III	CO1● At the end of the course the student will be able to, CO2● Understand different types of bridges and loads coming over the bridge as per the I.R.C codal provisions. CO3● Understand the design procedures of the bridges as per the I.R.C recommendations CO4● Understand the different forces acting on the piers and abutments CO5● stability analysis
IV-I	(19A01703a2)	PRESTRESSED CONCRETE PROFESSIONAL ELECTIVE-III	CO1● At the end of the course the student will be able to: CO2● Understand the concepts of pre-stressing and methods of pre stressing. CO3● Compute losses of pre-stress in pre-stressed concrete members. CO4● Design PSC beams under flexure and shear. CO5● Estimate the short and long term deflections of PSC beams.
IV-I		EXPANSIVE SOILS	CO1● At the end of this

	(19a01703b1)	PROFESSIONAL ELECTIVE-III	course the student will be able to CO2● Demonstrate behavior of expansive soils. CO3● Explain need of foundation practice on expansive soils CO4● Perform methods of stabilization of expansive soils. CO5● Select additives and methodology for stabilization.
IV-I	(19A01703b2)	ROCK MECHANICS PROFESSIONAL ELECTIVE-III	CO1● Upon the successful completion of this course, the students will be able to: CO2● Know the physical properties of rocks and their classification CO3● Study various aspects of ground control problems in underground CO4● Know open cost mines with a better CO5● understandings of scope for application of various numerical methods and model studies in geo-mechanics.

IV YEAR-II SEM

YEAR&SEM	COURSECODE	COURSE NAME	COURSE OUTCOMES
IV-II	15A01801	**MOOCS – II*** 1. Urban Transportation Planning	CO1.Remembering the concept of Travel Demand and the factors affecting. CO2. Understand the different stages of Urban Transportation Planning and the mathematical models associated with each stage. CO3.plan the various levels of trip generation and trip distribution in different models. CO4. Analyze the diversion curve for mode split and traffic assignment. CO5 . Assess the economic impact of new Transportation plans
IV-II	15A01803	**MOOCS – III*** 1. Prestressed Concrete	CO1.Understand the concept of prestressing , Recognize the general principles,methods & devices of prestressing. CO2.Determine the losses of pre-stress for prestressed concrete structures. CO3 .Apply the provisions of IS-1343(2000) code to the design of pre-stressed concrete structures for flexure. CO4.Design the shear reinforcements for pre-stressed concrete beams & understand the concept of composite section . C05 Determine the stresses at end block and deflection of pre-stressed concrete members