

## B. TECH – CIVILENGINEERING

### Department Vision

To Lead Academics and Research in Civil Engineering Globally.

### Department Mission

- To provide high quality education and make the students as ethical, world class professionals.
- To improve the skills of both staff and students with opportunities to innovate and explore knowledge through research projects and consultancy.
- To inculcate the feeling of present needs in students and evoke in them a responsibility to serve the society better.

### Program Educational Objectives (PEOs):

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| <b>PEO1</b> | Graduate will be able to succeed in diversified fields of industry/higher studies by acquiring technical knowledge and contribute to the sustainable development of infrastructure. |
| <b>PEO2</b> | Graduate will be able to exhibit professionalism and ethics and show ability to accept modern trends by engaging in lifelong learning.  |
| <b>PEO3</b> | Graduate will be able to apply innovative ideas and succeed as a researcher/entrepreneur to serve societal needs.   |

### Program Specific Outcomes (PSO's):

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| <b>PSO1:</b> | Develop critical aptitude skills and become professional to address any problem of the society.                            |
| <b>PSO2:</b> | Acquire practical knowledge by field visits and function effectively with the training of software by means of curriculum. |
| <b>PSO3:</b> | Effectively communicate with the stakeholders and execute engineering projects with high proficiency.                      |

## Program Outcomes (POs):

### Engineering Graduates will be able to:

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| 1  | <b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.  |
| 2  | <b>Problem analysis:</b> Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.   |
| 3  | <b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.         |
| 4  | <b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.  |
| 5  | <b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.   |
| 6  | <b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.   |
| 7  | <b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustain able development.  |
| 8  | <b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.  |
| 9  | <b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.   |
| 10 | <b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. |
| 11 | <b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.  |
| 12 | <b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.   |

Course outcomes (Cos) of all courses of all programs offered by the institution

| <b>Course Outcomes for First Year First Semester Course</b>               |   |
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| <b>Course Code: B16 ENG 1101</b>  |   |
| <b>Course Title: ENGLISH</b>  |   |
| CO-1  | The overall performance of the students will be enhanced after the course; they will be in a position to make presentations on topics of current interests – politics, famous personalities, science and technology, tourism, work and business environment, with increased public speaking skills. |
| CO-2  | Students will be able to read, listen, speak and write effectively in both academic and non-academic environment.   |
| CO-3  | The students will be updated with certain real life situations, which they can handle when come face to face.   |
| <b>Course Code: B16 ENG 1102</b>  |   |
| <b>Course Title: MATHEMATICS – I</b>                                      |   |
| CO-1  | Find partial derivatives, expand a function of more than one variable in a Taylor series and utilize them for errors and approximations, maxima and minima.   |
| CO-2  | Solve a first order ODE and also find orthogonal trajectories and solve problems related to simple applications.  |
| CO-3  | Solve a given higher order ODE, an equation with constant coefficients, a Cauchy's equation or a Legendre's equation.   |
| CO-4  | Utilize knowledge of Fourier series for solving partial differential equations and also in understanding courses like Signals & Systems   |
| <b>Course Code: B16 ENG 1103</b>  |   |
| <b>Course Title: MATHEMATICS – II</b>                                     |   |
| CO-1  | Utilizing the knowledge of matrices for solving linear simultaneous equations, find Eigen values and Eigen vectors and handle quadratic forms   |
| CO-2  | Utilizing the knowledge of Laplace Transforms to find transforms of important functions that arise in applications and also solve ODE   |
| CO-3  | Also utilizing the knowledge of Laplace Transforms in courses like Net Works, Signals & Systems and Control Systems   |
| CO-4  | Utilizing the knowledge of difference equations and Z-transforms in understanding courses like Discrete Mathematical Structures and also Signals & Systems.   |
| <b>Course Code: B16 ENG 1104</b>  |   |
| <b>Course Title: CHEMISTRY</b>  |   |
| CO-1  | Students learn in-depth about the topics of desalination of sea water, CNG, LPG Biogas, Semiconductors, Liquid crystals, Conducting polymers, fiber reinforced plastics, building materials   |
| CO-2  | Students understand the basic and advanced applied concepts.  |
| CO-3  | Students learn to interrelate the theory and with the relevant experiment.  |
| CO-4  | Students learn experimental techniques and understand the theory about experiments  |
| <b>Course Code: B16 ENG 1106</b>  |   |
| <b>Course Title: COMPUTER PROGRAMMING USING C &amp; NUMERICAL METHODS</b> |   |
| CO-1  | Student can understand basic terminology used in C programming.   |
| CO-2  | Student can write programs by applying elementary algorithms to solve problems in C language.   |
| CO-3  | Student can write, compile and debug programs in C language   |
| CO-4  | Student can Write programs to solve numerical methods   |
| CO-5  | Student can be familiar with finite precision computation.  |

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| <b>Course Code: B16 ENG 1108</b>                       |  |
| <b>Course Title: HISTORY OF SCIENCE AND TECHNOLOGY</b> |  |
| CO-1   | By the end of this course the students should be able to understand the contribution of Scientific and Technological developments for the benefit of society at large. |
| <b>TECHNICAL ENGLISH (ADD-ON COURSE)</b>               |  |
| CO-1   | Students improve their language skills in formal/ technical contexts.  |
| CO-2   | They enhance their understanding of technical terms.   |
| CO-3   | They improve their personal skills.  |

| <b>Course Outcomes for First Year Second Semester Course</b>      |  |
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| <b>Course Code: B16 ENG 1201</b>                                  |  |
| <b>Course Title: MATHEMATICS – III</b>                            |  |
| CO-1  | Utilize knowledge of line, sphere etc. in his engineering subjects   |
| CO-2  | Utilize the knowledge of Beta and Gamma functions and multiple integrals to evaluate the integrals they come across in their applications                            |
| CO-3  | Utilize the knowledge of Fourier Transform in courses like Signals and Systems and in the solution of partial differential equations at a later stage                |
| <b>Course Code: B16 ENG 1202</b>                                  |  |
| <b>Course Title: PHYSICS</b>                                      |  |
| CO-1  | Students learn in depth about the topics of Lasers, fiber optics, quantum mechanical Theory and classical theories of thermodynamics and electromagnetism.           |
| CO-2  | Students understand the classical and modern concepts.   |
| <b>Course Code: B16 ENG 1204</b>                                  |  |
| <b>Course Title: ENGINEERING GRAPHICS</b>                         |  |
| CO-1  | Apply principles of drawing to represent dimensions of an object.  |
| CO-2  | Construct polygons and engineering curves.   |
| CO-3  | Draw projections of points, lines, planes and solids.  |
| CO-4  | Represent sectional views of solids.   |
| CO-5  | Develop the surfaces of regular solids.  |
| CO-6  | Draw the isometric views of solids and combination of solids.  |
| <b>Course Code: B16 ENG 1206</b>                                  |  |
| <b>Course Title: PROFESSIONAL ETHICS AND MORAL VALUES</b>         |  |
| CO-1  | By the end of the course student should be able to understand the importance of ethics and values in life and society.   |
| <b>Course Code: B16 CE 1208</b>                                   |  |
| <b>Course Title: BUILDING MATERIALS AND BUILDING CONSTRUCTION</b> |  |
| CO-1  | Learn and identify the relevant physical and mechanical properties pertaining to the construction industry.  |
| CO-2  | Demonstrate the relevant BIS testing procedure to be carried out to ascertain the quality of building materials.   |
| CO-3  | Develop ability to choose the modern construction material appropriate to the climate and functional aspects of the buildings.                                       |
| CO-4  | Ability to supervise the construction technique to be followed in brick, stone and hollow block masonry, concreting, flooring, roofing, plastering and painting etc. |
| CO-5  | Learn about the causes of deterioration, crack pattern, and assessment of damages.   |
| CO-6  | Learn about the construction techniques in repairing of buildings.   |

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| <b>Course Code: B16 ENG 1213</b>           |   |
| <b>Course Title: ENGLISH LANGUAGE LAB</b>  |   |
| CO-1                                       | Students will be sensitized towards recognition of English sound pattern. |
| CO-2                                       | The fluency in speech will be enhanced                                    |
| CO-3                                       |   |
| CO-4                                       |   |
| CO-5                                       |   |
| <b>Course : ADD ON COURSE</b>              |   |
| <b>Course Title: TECHNOLOGY COURSE – I</b> |   |
| CO-1                                       | Students will be able to solve a series of graduated problems             |
| CO-2                                       | Students will be able to do projects in „C“ Language.                     |

| <b>Course Outcomes for Second Year First Semester Course</b> |   |
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| <b>Course Code: B16 ENG 2101</b>                             |   |
| <b>Course Title: MATHEMATICS – IV</b>                        |   |
| CO-1   | Apply the concepts of Gradient, Divergence, Curl, Directional derivative, solenoidal and Irrotational fields                    |
| CO-2   | Determine scalar potential, circulation and work done   |
| CO-3   | Evaluate integrals using Green's, Stokes' and Divergence theorems   |
| CO-4   | Obtain the solution of 1-D wave equation and 1-D heat equation  |
| CO-5   | Determine the zeroes and poles of functions and residues at poles   |
|  | Evaluate certain real definite integrals that arise in applications by the use of Residue theorem                               |
| <b>Course Code: B16 CE 2101</b>                              |   |
| <b>Course Title: ENGINEERING MECHANICS</b>                   |   |
| CO-1   | Analyse 2-D and 3-D force systems by scalar and vector approaches.  |
| CO-2   | Analyse for forces in different types of determinate trusses by 'Method of sections' and 'Method of joints'.                    |
| CO-3   | Apply method of virtual work to statically determinate structures   |
| CO-4   | Distinguish between rectilinear, curvilinear motion of particles and plane motion of rigid bodies.                              |
| CO-5   | Utilize the principles of kinematics and kinetics for physical bodies.  |
| CO-6   | Solve engineering problems.   |
| <b>Course Code: B16 CE2102</b>                               |   |
| <b>Course Title: MECHANICS OF SOLIDS</b>                     |   |
| CO-1   | Summarise the behaviour of basic materials under the influence of different external loading conditions and support conditions. |
| CO-2   | Determine shear Force and Bending moments in statically determinate Beams and draw the Diagrams.                                |
| CO-3   | Examine the different methods to find slope and deflection of beams subjected to loads  |
| CO-4   | Estimate the principal stresses & strains and torsional stresses in structural members  |
| CO-5   | Evaluate the crippling load for columns with different end conditions.  |
| <b>Course Code: B16 CE 2103</b>                              |   |
| <b>Course Title: FLUID MECHANICS- I</b>                      |   |
| CO-1   | Define fundamental concepts of fluid mechanics as applied to civil engineering and environmental problems                       |
| CO-2   | Discuss and derive the fundamental mathematical equations of fluid mechanics  |
| CO-3   | Solve the problems of water conveyance in pipes, orifices, mouthpieces, notches and weirs                                       |
| CO-4   | Apply conservation laws to derive governing equations of fluid flows  |
| CO-5   | Compare hydrostatic and hydrodynamic forces   |
| CO-6   | Analyze and design simple pipe systems  |
| <b>Course Code: B16 CE 2104</b>                              |   |
| <b>Course Title: SURVEYING</b>                               |   |
| CO-1   | Appreciate the importance of preparation of Map and Plan for required site with suitable scale.                                 |
| CO-2   | Prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.         |
| CO-3   | Judge on which type of instrument to be used for carrying out survey for a specific work  |
| CO-4   | Describe different modern instruments used in surveying.  |

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| <b>Course Code: B16 ENG 2103</b>                      |   |
| <b>Course Title: ENVIRONMENTAL STUDIES</b>            |   |
| CO-1  | Get awareness among the students about the nature and natural ecosystems.   |
| CO-2  | Learn sustainable utilization of natural resources like water, land, minerals & air.  |
| CO-3  | Learn resource pollution and over exploitation of land, water, air and catastrophic (events) impacts of climate change, global warming, ozone layer depletion, marine, radioactive pollution etc to inculcate the students about environmental awareness and safetransfer of our mother earth and its natural resources to the next generation. |
| CO-4  | Safe guard against industrial accidents particularly nuclear accidents.   |
| CO-5  | Learn Constitutional provisions for the protection of natural resources.  |
| <b>Course Code: B16 CE2105</b>                        |   |
| <b>Course Title: STRENGTH OF MATERIALS LABORATORY</b> |   |
| CO-1  | Illustrate the stress strain relationship for Mild steel/ HYSD bars   |
| CO-2  | Inspect wood samples for compressive strength   |
| CO-3  | Determine modulus of rigidity of spring   |
| CO-4  | Measure the hardness of metals by BHN, Rockwell & Vicker's  |
| CO-5  | Relate bolts subjected to double shear  |
| CO-6  | Estimate the Impact resistance of materials by Charpy & Izod tests  |
| CO-7  | Distinguish simply supported beam and cantilever beam and determine the young's modulus of beam material  |
| CO-8  | Solve coplanar force system   |
| <b>Course Code: B16 CE 2106</b>                       |   |
| <b>Course Title: SURVEYING FIELD WORK</b>             |   |
| CO-1  | Apply the linear measurement in simple Boundary Surveys.  |
| CO-2  | Identify direction of any line using compass survey.  |
| CO-3  | Judge on which type of instrument to be used for carrying out survey for a specific work  |
| CO-4  | Prepare contour maps and estimate the quantities.   |
| <b>Course Code: B16 ENG 2104</b>                      |   |
| <b>Course Title: ENGLISH PROFICIENCY</b>              |   |
| CO-1  | Students enhance their vocabulary and use it in the relevant contexts.  |
| CO-2  | They improve speaking skills.   |
| CO-3  | They learn and practice the skills of composition writing.  |
| CO-4  | They enhance their reading and understanding of different texts.  |
| CO-5  | They enrich their communication both in formal and informal contexts.   |
| CO-6  | They strengthen their confidence in presentation skills.  |
| <b>Course Code: B16 CE 2107</b>                       |   |
| <b>Course Title: AutoCAD</b>                          |   |
| CO-1  | Student's ability to perform basic sketching techniques will improve.   |
| CO-2  | Student's ability to use architectural and engineering scales will increase.  |
| CO-3  | Student's ability to produce engineered drawings will improve.  |
| CO-4  | Student's ability to convert sketches to engineered drawings will increase.   |
| CO-5  | Students will become familiar with office practice and standards.   |
| CO-6  | Students will become familiar with AutoCAD two dimensional drawings.  |
| CO-7  | Students will develop good communication skills and teamwork.   |



| <b>Course Outcomes for Second Year Second Semester Course</b> |   |
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| <b>Course Code: B16 CE2201</b>                                |   |
| <b>Course Title: ANALYSIS OF STRUCTURES</b>                   |   |
| CO-1  | Determine deflections in determinate beams by different methods                                 |
| CO-2  | Evaluate the strain energy for structural members subjected to different loads                  |
| CO-3  | Analyse different indeterminate beams for BM and SF by different methods of analysis            |
| CO-4  | Determine reactions, BM & SF in beams subjected to moving loads.                                |
| CO-5  | Distinguish between thin and thick cylinders and understand different failure theories.         |
| <b>Course Code: B16 CE2202</b>                                |   |
| <b>Course Title: REINFORCED CONCRETE STRUCTURES</b>           |   |
| CO-1  | Student should be able to understand and Design the Super structure and sub structure elements. |
| <b>Course Code: B16 CE 2203</b>                               |   |
| <b>Course Title: FLUID MECHANICS-II</b>                       |   |
| CO-1  | Solve Turbulent Flow problems.  |
| CO-2  | Explain development of boundary layer in external and internal flows                            |
| CO-3  | Identify variation of lift and drag coefficients with variation in flow                         |
| CO-4  | Develop an expression for the discharge of uniform flow in open channels                        |
| CO-5  | Interpret the specific energy diagram for a free surface flow                                   |
| CO-6  | Analyse practical problems in varied flow   |
| <b>Course Code: B16 CE 2204</b>                               |   |
| <b>Course Title: BUILDING PLANNING &amp; DESIGN</b>           |   |
| CO-1  | Use the Conventional Signs in Design  |
| CO-2  | Design Different Types of Residential Buildings   |
| CO-3  | Appreciate influencing parameters in the design of Residential Building                         |
| CO-4  | Develop Site Plan, Dimensional Plan, Front Elevation and Cross Section Elevations.              |
| CO-5  | Use the Auto Cad in the Design of Residential Buildings   |
| <b>Course Code: B16 CE 2205</b>                               |   |
| <b>Course Title: ADVANCED SURVEYING METHODOLOGIES</b>         |   |
| CO-1  | Appreciate the importance of Theodolite in Surveying  |
| CO-2  | Apply Concepts of Tachometry in Surveying.  |
| CO-3  | Construct the Curves in Highways, road construction and canal works.                            |
| CO-4  | Use the RS and GIS in designing   |
| CO-5  | Use the Total Station in Surveying.   |
| <b>Course Code: B16 CE 2206</b>                               |   |
| <b>Course Title: ENGINEERING GEOLOGY</b>                      |   |
| CO-1  | Elucidate the macroscopic identification of rocks   |
| CO-2  | Categorize the rocks according to macroscopic description                                       |
| CO-3  | Interpret geological maps   |
| CO-4  | Estimate the types of subsurface formation by using geophysical methods                         |

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| <b>Course Code: B16 CE2207</b>                        |  |
| <b>Course Title: TOTAL STATION AND GEOMATICS LAB</b>  |  |
| CO-1  | Relate the importance of Theodolite in Surveying   |
| CO-2  | Apply Concepts of Tachometry in Surveying.   |
| CO-3  | Construct the Curves in Highways, road construction and canal works.   |
| CO-4  | Use the RS and GIS in designing  |
| CO-5  | Use the Total Station in Surveying.  |
| <b>Course Code: B16 CE2208</b>                        |  |
| <b>Course Title: ENGINEERING GEOLOGY LAB</b>          |  |
| CO-1  | Elucidate the mega-scopic identification of rocks  |
| CO-2  | Categorize the rocks according to mega-scopic description  |
| CO-3  | Interpret geological maps  |
| CO-4  | Estimate the types of subsurface formation by using geophysical methods  |
| <b>Course Code: B16 CE2209</b>                        |  |
| <b>Course Title: FLUID MECHANICS LAB-I</b>            |  |
| CO-1  | Define and Measure Fluid Properties.   |
| CO-2  | Illustrate Flow Measuring Devices used in pipes, channels and Tanks  |
| CO-3  | Analyze characteristics of broad crested weir.   |
| CO-4  | Illustrate the characteristics of surface profiles in free and forced vibrations.                              |
| CO-5  | Compare sharp crested full width and contracted weirs  |
| <b>Course Code: B16 CE 2210</b>                       |  |
| <b>Course Title: INDUSTRY ORIENTED TECHNOLOGY LAB</b> |  |
| CO-1  | Fully equipped with various surveying concepts and methods using advanced groundsurvey equipment's.            |
| CO-2  | Carry out profiling and grid levelling, for generation of profiles, contour maps, and earthworks computations. |
| CO-3  | Handle the Satellite images and interpret the satellite data.  |
| CO-4  | The interpret data can be used to prepare plan for urban development/town planning.                            |
| CO-5  | Prepare the candidates with National Global employability.   |

| <b>Course Outcomes for Third Year First Semester Course</b> |  |
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| <b>Course Code: B16 CE3101</b>                              |  |
| <b>Course Title: STRUCTURAL ANALYSIS</b>                    |  |
| CO-1  | Analyze indeterminate trusses and frames   |
| CO-2  | Evaluate indeterminate trusses and its application in the field.   |
| CO-3  | Analyze two and three hinged arches and its application.   |
| <b>Course Code: B16 CE 3102</b>                             |  |
| <b>Course Title: REINFORCED CONCRETE STRUCTURES-II</b>      |  |
| CO-1  | Distinguish between behaviour of cantilever and counter fort retaining walls and analyse for maximum bending moment and shear force. |
| CO-2  | Determine the stresses in various parts of underground and overhead water tanks including design.                                    |
| CO-3  | Analyze and design solid slab and T-beam bridges   |
| CO-4  | Importance of pile foundations and their design  |
| CO-5  | Importance of Bunker & Silos and their design.   |
| CO-6  | Apply IS 456 and bridge code provisions to RC structures.  |
| <b>Course Code: B16 CE 3103</b>                             |  |
| <b>Course Title: STEEL STRUCTURES</b>                       |  |
| CO-1  | Know the properties and fundamentals of steel sections.  |
| CO-2  | Know the connections in steel structures   |
| CO-3  | Identify the possible failure modes in compression members   |
| CO-4  | Importance of roof trusses and their design  |
| <b>Course Code: B16 CE 3104</b>                             |  |
| <b>Course Title: GEOTECHNICAL ENGINEERING-I</b>             |  |
| CO-1  | Know the fundamental relationships between different parameters of a soil mass.  |
| CO-2  | Classify different types of soils and identify their properties.   |
| CO-3  | Appreciate the processes of compaction and consolidation and apply them to field problems.   |
| CO-4  | Estimate stress distribution and settlement of different soils in different conditions.  |
| CO-5  | Identify shear strength parameters for field conditions.   |
| CO-6  | Apply the knowledge of Soil Mechanics in solving the engineering problems  |
| <b>Course Code: B16 CE 3105</b>                             |  |
| <b>Course Title: ENVIRONMENTAL ENGINEERING - I</b>          |  |
| CO-1  | Explain the quality of water.  |
| CO-2  | Analyze the water quality parameters and compare with the permissible limits.  |
| CO-3  | Summarize the working principles of conventional unit operations of a water treatment plant.   |
| CO-4  | Determine the sizes of different unit operations in a water treatment plant.   |
| CO-5  | Assess the suitability of conventional methods and latest membrane processes for different water bodies.                             |
| CO-6  | Design a conventional water treatment plant with given specifications for given capacity.  |
| <b>Course Code: B16 CE 3106</b>                             |  |
| <b>Course Title: CONCRETE TECHNOLOGY</b>                    |  |
| CO-1  | Understand the basic concepts of concrete.   |
| CO-2  | Realise the importance of quality of concrete.   |

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| CO-3   | Familiarise the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field. |
| CO-4   | Test the fresh concrete properties and the hardened concrete properties.   |
| CO-5   | Evaluate the ingredients of concrete through lab test results.   |
| CO-6   | Design the concrete mix by BIS method.   |
| CO-7   | Familiarise the basic concepts of special concrete and their production and applications.                                  |
| CO-8   | Understand the behaviour of concrete in various environments.  |
| <b>Course Code: B16 CE3107</b>                         |  |
| <b>Course Title: GIS &amp; REMOTE SENSING</b>          |  |
| CO-1   | Understand the basic concepts of GIS.  |
| CO-2   | Explain the sensor systems used in remote sensing  |
| CO-3   | Realize the importance of remote sensing in civil engineering.   |
| CO-4   | Classify the GIS analysis functions.   |
| CO-5   | Apply the knowledge in solving engineering issues by using GIS   |
| <b>Course Code: B16 CE3108</b>                         |  |
| <b>Course Title: PRESTRESSED CONCRETE</b>              |  |
| CO-1   | Understand the general mechanical behavior of prestressed concrete.  |
| CO-2   | Analyze and design prestressed concrete flexural members.  |
| CO-3   | Analyze and design for vertical and horizontal shear in prestressed concrete.  |
| CO-4   | Analyze transfer and development length as well as prestress losses.   |
| CO-5   | Analyze and design for deflection and crack control of prestressed concrete members.                                       |
| CO-6   | Analyze and design simple connections of prestressed concrete members.   |
| <b>Course Code: B16 CE3109</b>                         |  |
| <b>Course Title: BUILDING SERVICES AND MAINTENANCE</b> |  |
| CO-1   | Understand the basic issues occurring in the buildings.  |
| CO-2   | Realise the importance of maintenance of buildings.  |
| CO-3   | Apply the knowledge of repair techniques for rehabilitation of structures.   |
| <b>Course Code: B16 CE 3110</b>                        |  |
| <b>Course Title: WATERSHED MANAGEMENT</b>              |  |
| CO-1   | Calculate watershed parameters and analyse watershed characteristics to take appropriate management action.                |
| CO-2   | Quantify soil erosion and design control measures.   |
| CO-3   | Apply land grading techniques for proper land management.  |
| CO-4   | Suggest suitable harvesting techniques for better watershed management.  |
| CO-5   | Apply appropriate models for watershed management.   |
| <b>Course Code: B16 CE 3111</b>                        |  |
| <b>Course Title: ENVIRONMENTAL ENGINEERING LAB</b>     |  |
| CO-1   | Determine physical properties of water.  |
| CO-2   | Determine the turbidity and hardness of water.   |
| CO-3   | Determine COD and BOD of water.  |
| CO-4   | Estimate concentration of acidity and alkalinity.  |
| CO-5   | Estimate chloride content of water.  |

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| <b>Course Code: B16 CE 3112</b>                                   |   |
| <b>Course Title: GEOTECHNICAL ENGINEERING LAB - I</b>             |   |
| CO-1  | Determine physical properties of soil.  |
| CO-2  | Classify various types of soil.   |
| CO-3  | Determine the permeability of soil.   |
| CO-4  | Determine compaction characteristics of soils.  |
| CO-5  | Estimate in-situ density of soil.   |
| <b>Course Code: B16ENG3102</b>                                    |   |
| <b>Course Title: VERBAL &amp; QUANTITATIVE APTITUDE – I</b>       |   |
| CO-1  | Detect grammatical errors in the text/sentences and rectify them while answering their competitive/ company specific tests and frame grammatically correct sentences while writing. |
| CO-2  | Answer questions on synonyms, antonyms and other vocabulary based exercises while attempting CAT, GRE, GATE and other related tests.  |
| CO-3  | Use their logical thinking ability and solve questions related to analogy, syllogisms and other reasoning based exercises.  |
| CO-4  | Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.   |
| CO-5  | Apply soft skills in the work place and build better personal and professional relationships making informed decisions.   |
| <b>Course Title: PART-B: QUANTITATIVE APTITUDE -I</b>             |   |
| CO-1  | To familiarize students with basic problems on numbers and ratio's problems.  |
| CO-2  | To enrich the skills of solving problems on time, work, speed, distance and also measurement of units.  |
| CO-3  | To enable the students to work efficiently on percentage values related to shares, profitand loss problems.   |
| CO-4  | To inculcate logical thinking by exposing the students to reasoning related questions.  |
| CO-5  | To expose them to the practice of syllogisms and help they make right conclusions.  |
| <b>Course Code: B16 CE 3113A</b>                                  |   |
| <b>Course Title: GEO ENVIRONMENTAL ENGINEERING</b>                |   |
| CO-1  | Understand the concepts of Integrated SWM & Geo environmental Engineering   |
| CO-2  | Learn the Principles and Planning of Landfills  |
| CO-3  | Explain Geotechnical Properties of Slurry Deposited Waste   |
| CO-4  | Learn Environmental Control Measures at Slurry Ponds, Geotechnical Reuse of Waste   |
| <b>Course Code: B16 CE 3113B</b>                                  |   |
| <b>Course Title: HIGHER SURVEYING</b>                             |   |
| CO-1  | Understand Need and pre-requisites for Higher Surveying   |
| CO-2  | Be aware of Coordinate and datum transformations for 3D coordinates on Earth surface  |
| CO-3  | Recognize Geolocation process   |
| CO-4  | Learn Mapping with RADAR technique  |
| CO-5  | Know about the Applications of Higher Surveying techniques for Archeological Surveys,forestry, etc.   |
| <b>Course Code: B16 CE 3113C</b>                                  |   |
| <b>Course Title: INTEGRATED WASTE MANAGEMENT FOR A SMART CITY</b> |   |
| CO-1  | Understand The environmental impact of waste management and its relationship on the sustainable development and smart city development  |
| CO-2  | Familiarize the role of MSW management within the various initiatives of the Govt. of India   |
| CO-3  | Recognize the challenges of waste management for smart cities   |

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| CO-4   | Make acquainted with the Construction and Demolition (C&D) Waste and Electronic Waste (E-Waste) management issues in India in general and for the smart cities in particular. |
| <b>Course Code: B16 CE 3113D</b>   |   |
| <b>Course Title: INTRODUCTION TO ACCOUNTING AND FINANCE FOR CIVIL ENGINEERS</b>        |   |
| CO-1   | Learn the Basics of accounting and terminology related to financing   |
| CO-2   | Understand the Concepts of finance and general Principles of accounting   |
| CO-3   | Know the Concepts of Balancing sheet, ledgers, journal  |
| CO-4   | Analyze the financial statements-financial ratios   |
| <b>Course Code: B16 CE 3114A</b>   |   |
| <b>Course Title: FIRE PROTECTION, SERVICES AND MAINTENANCE MANAGEMENT FOR BUILDING</b> |   |
| CO-1   | Understand the Concepts of fire resistant and severity, Effect of fire on materials   |
| CO-2   | Be aware of Building Services as a system and HVAC System   |
| CO-3   | Recognize role of building maintenance in construction process Maintenance generators   |
| CO-4   | Know the effect of design on maintenance, Diagnosis, appraisal, structural defects&various methods of repair.   |
| <b>Course Code: B16 CE 3114B</b>   |   |
| <b>Course Title: MODERN CONSTRUCTION MATERIALS</b>                                     |   |
| CO-1   | Learn about atomic bonding and structure of solids  |
| CO-2   | Understand about the Movement of Atoms, Development of Microstructure   |
| CO-3   | Study the Failure Theories, Fracture Mechanics  |
| CO-4   | Familiarize with wood products, metals, bituminous materials, concrete and polymers.  |
| <b>Course Code: B16 CE 3114C</b>   |   |
| <b>Course Title: PRINCIPLES OF CONSTRUCTION MANAGEMENT</b>                             |   |
| CO-1   | Learn about the Estimation of project cost and construction economics.  |
| CO-2   | Understand about the Planning scheduling and Execution phases of a project.   |
| CO-3   | Study the Safety management and Quality management aspects.   |
| CO-4   | Learn various legal aspects of a construction project.  |
| <b>Course Code: B16 CE 3114D</b>   |   |
| <b>Course Title: REINFORCED CONCRETE ROAD BRIDGES</b>                                  |   |
| CO-1   | Familiarize with design considerations, loads and IRC codes   |
| CO-2   | Design Solid slab bridge  |
| CO-3   | Design T-beam bridge  |

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| <b>Course Outcomes for Third Year First Semester Course</b> |  |
| <b>Course Code: B16 CE 3201</b>                             |  |
| <b>Course Title: ADVANCED STEEL STRUCTURES</b>              |  |
| CO-1  | Understand the behavior of steel structures, in particular the various forms of failure formembers and connections under tension, compression, bending and combined actions. |
| CO-2  | Apply the principles, procedures and current code requirements to the analysis and designof steel tension members, beams, plate girders and water tanks                      |
| CO-3  | Understand eccentric shear connections.  |
| <b>Course Code: B16 CE3202</b>                              |  |
| <b>Course Title: GEOTECHNICAL ENGINEERING-II</b>            |  |
| CO-1  | Plan a detailed soil exploration programme.  |
| CO-2  | Apply various methods for estimating bearing capacity of different types of foundations.   |
| CO-3  | Perform the settlement analysis of footings.   |
| CO-4  | Estimate load capacity of single piles and groups of piles.  |
| CO-5  | Know the theory aspects of well foundations.   |
| CO-6  | Analyze stability of finite and infinite slopes.   |
| CO-7  | Calculate earth pressures on retaining walls following Rankine's and Coulomb's theories  |
| <b>Course Code: B16 CE3203</b>                              |  |
| <b>Course Title: FLUID MECHANICS - III</b>                  |  |
| CO-1  | Apply the concepts of Gradient, Divergence, Curl, Directional derivative, solenoidal and Irrotational fields   |
| CO-2  | Determine scalar potential, circulation and work done  |
| CO-3  | Evaluate integrals using Green's, Stokes' and Divergence theorems  |
| CO-4  | Obtain the solution of 1-D wave equation and 1-D heat equation   |
| CO-5  | Determine the zeroes and poles of functions and residues at poles  |
| CO-6  | Evaluate certain real definite integrals that arise in applications by the use of Residuethorem  |
| <b>Course Code: B16 CE 3204</b>                             |  |
| <b>Course Title: ESTIMATION AND QUANTITY SURVEYING</b>      |  |
| CO-1  | List out the various components and units of measurements of different works.  |
| CO-2  | Explain various types of estimates and general, detailed specifications of various items ofwork  |
| CO-3  | Apply the method of building estimate to find out the quantities of various items of work  |
| CO-4  | Determine the rate per unit of various items of work   |
| CO-5  | Select various methods to find out the valuation of a property   |
| <b>Course Code: B16 CE 3205</b>                             |  |
| <b>Course Title: ENVIRONMENTAL ENGINEERING - II</b>         |  |
| CO-1  | Compare water and waste water  |
| CO-2  | Explain principles of conventional treatment process and miscellaneous treatmenttechniques   |
| CO-3  | Examine the operational differences of each unit process   |
| CO-4  | Interpret the feasible technique required for particular waste water   |
| CO-5  | Determine the size of unit operations using working principles of each   |
| CO-6  | Design a sewage treatment plant assuming whatever data is required   |

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| <b>Course Code: B16 CE 3206</b>                          |   |
| <b>Course Title: GROUND IMPROVEMENT TECHNIQUES</b>       |   |
| CO-1   | Apply in-situ densification methods for improving cohesive and cohesion less soil deposits. Design stone column for improving soft clays. |
| CO-2   | Apply grouting technique for improving soils.   |
| CO-3   | Understand the concepts of reinforced earth.  |
| CO-4   | Understand various soil stabilization techniques.   |
| <b>Course Code: B16 CE 3207</b>                          |   |
| <b>Course Title: ENVIRONMENTAL IMPACT ASSESMENT</b>      |   |
| CO-1   | Define the terms related to EIA   |
| CO-2   | List out the elements of EIA and guidelines to prepare EIS  |
| CO-3   | Identify the environmental attributes to be considered for the study  |
| CO-4   | Explain the methodologies for EIA and review the relief and rehabilitation works  |
| CO-5   | Discuss the case studies of EIA   |
| CO-6   | Adapt the suitable measures to control the environmental impact   |
| <b>Course Code: B16 CE 3208</b>                          |   |
| <b>Course Title: MARINE STRUCTURES</b>                   |   |
| CO-1   | Design of break waters and jetties.   |
| CO-2   | Understand the principles of rubble mound and composite breakwaters.  |
| CO-3   | Evaluate various loads on offshore structures.  |
| <b>Course Code: B16 CE 3209</b>                          |   |
| <b>Course Title: URBAN HYDROLOGY</b>                     |   |
| CO-1   | Develop intensity duration frequency curves for urban drainage systems.   |
| CO-2   | Develop design storms to size the various components of drainage systems.   |
| CO-3   | Apply best management practices to manage urban flooding.   |
| CO-4   | Prepare master drainage plan for an urbanized area.   |
| <b>Course Code: B16 CE 3210</b>                          |   |
| <b>Course Title: FINITE ELEMENTS METHODS OF ANALYSIS</b> |   |
| CO-1   | Understand the concepts behind variational methods and weighted residual methods in FEM.  |
| CO-2   | Identify the application and characteristics of FEA elements such as bars, beams, 2-Delement and axis symmetric element.                  |
| CO-3   | Develop element characteristic equation procedure and generation of global stiffness equation will be applied.                            |
| CO-4   | Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form                              |
| <b>Course Code: B16 CE 3211</b>                          |   |
| <b>Course Title: GEOTECHNICAL ENGINEERING LAB - II</b>   |   |
| CO-1   | Classify the types of soil deposits.  |
| CO-2   | Determine the shear strength parameters of soils by various methods.  |
| CO-3   | Estimate the California Bearing Ratio (CBR) of a soil.  |
| CO-4   | Determine the relative density of a coarse-grained soil.  |
| CO-5   | Determine the swelling characteristics of expansive soils.  |



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| <b>Course Code: B16 CE 3212</b>                              |  |
| <b>Course Title: CONCRETE LAB</b>                            |  |
| CO-1   | Determine physical properties of cement, sand and aggregate.   |
| CO-2   | Classify fine aggregate and coarse aggregate as per IS 383   |
| CO-3   | Determine workability of concrete.   |
| CO-4   | Determine mechanical properties of concrete.   |
| <b>Course Code: B16 CE 3213</b>                              |  |
| <b>Course Title: FLUID MECHANICS LAB - II</b>                |  |
| CO-1   | Analyze the flow through a pipe with friction and determine the friction factor in Darcy-Weisbach equation.  |
| CO-2   | Determine the coefficient of impact on a flat plate and curved vane by comparing the theoretical and actual forces by impact.  |
| CO-3   | Analyze the working of the centrifugal pump and develop the characteristics of power input, head and efficiency under various discharges and plot the characteristic curves.   |
| CO-4   | Analyze the working of the reciprocating pump and develop the characteristics of power input and discharge and efficiency under various heads and plot the characteristic curves.  |
| CO-5   | Determine the performance characteristics of pelton wheel turbine and develop the characteristic curves of unit discharge, unit power and unit head under varying unit speed.  |
| CO-6   | Determine the performance characteristics of Francis turbine and develop the characteristic curves of unit discharge, unit power and unit head under varying unit speed.   |
| <b>Course Code: B16ENG3202</b>                               |  |
| <b>Course Title: VERBAL &amp; QUANTITATIVE APTITUDE – II</b> |  |
| <b>Part-A: Verbal Aptitude and Soft Skills-II</b>            |  |
| CO-1   | Construct coherent, cohesive and unambiguous verbal expressions in both oral and written discourses.   |
| CO-2   | Analyze the given data/text and find out the correct responses to the questions asked based on the reading exercises; identify relationships or patterns within groups of words or sentences   |
| CO-3   | Write paragraphs on a particular topic, essays (issues and arguments), e mails, summaries of group discussions, reports, make notes, statement of purpose (for admission into foreign universities), letters of recommendation (for professional and educational purposes).  |
| CO-4   | Converse with ease during interactive sessions/seminars in their classrooms, compete in literary activities like elocution, debates etc., raise doubts in class, participate in JAM sessions/versant tests with confidence and convey oral information in a professional manner.   |
| CO-5   | Participate in group discussions/group activities, exhibit team spirit, use language effectively according to the situation, respond to their interviewer/employer with a positive mind, tailor make answers to the questions asked during their technical/personal interviews, exhibit skills required for the different kinds of interviews (stress, technical, HR) that they would face during the course of their recruitment process. |
| <b>Part-B: Quantitative Aptitude-II</b>                      |  |
| CO-1   | The students will be able to perform well in calculating different types of data interpretation problems.  |
| CO-2   | The students will perform efficaciously on analytical and logical problems using various methods.  |
| CO-3   | Students will find the angle measurements of clock problems with the knowledge of calendars and clock.   |
| CO-4   | The students will skillfully solve the puzzle problems like arrangement of different positions.  |
| CO-5   | The students will become good at solving the problems of lines, triangles and volume of cone, cylinder and so on.  |

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| <b>Course Code: B16 CE 3214</b>   |   |
| <b>Course Title: MINI PROJECT</b>   |   |
| CO-1  | Examine classical theories of civil engineering and their practical applications.   |
| CO-2  | Interpret their knowledge on the latest developments in civil engineering.  |
| CO-3  | Develop concepts related to environmental, societal, economical and sustainable aspects of any civil engineering structure. |
| CO-4  | Develop teamwork and lifelong learning skills   |
| <b>Course Code: B16ENG3203</b>  |   |
| <b>Course Title: BASIC CODING</b>   |   |
| CO-1  | Know about Control Structures, Loop Structures and branching in programming.  |
| CO-2  | Know about various searching and sorting methods.   |
| CO-3  | Know about Functions, Recursions and Storage Classes.   |
| CO-4  | Know about Structures and Unions.   |
| CO-5  | Know different Operating System concepts.   |
| CO-6  | Differentiate OSI Model Vs. TCP/IP suite.   |
| <b>Course Code: B16 CE 3215A</b>  |   |
| <b>Course Title: ENERGY EFFICIENCY, ACOUSTICS AND DAYLIGHTING IN BUILDING</b> |   |
| CO-1  | Understand Various Environmental factors and human response to the Environment  |
| CO-2  | Know the thermal comforts and strategies pertaining to it.  |
| CO-3  | Design the lightening, noise, acoustics and various aspects of a building   |
| <b>Course Code: B16 CE 3215B</b>  |   |
| <b>Course Title: ELECTRONIC WASTE MANAGEMENT-ISSUES AND CHALLENGES</b>        |   |
| CO-1  | Know the sources of E-waste and their impact on environment   |
| CO-2  | Know the Rules pertaining to E-waste management   |
| CO-3  | Understand Various Environmental hazards of E-waste   |
| <b>Course Code: B16 CE 3215C</b>  |   |
| <b>Course Title: PRINCIPLES AND APPLICATIONS OF BUILDING SCIENCE</b>          |   |
| CO-1  | Apply the concept of climatology for housing layouts and principles of planning   |
| CO-2  | Know the acoustics, acoustic materials and quality indicators   |
| CO-3  | Design of day-lighting in buildings and integrated design approach  |

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| <b>Course Outcomes for Fourth Year First Semester Course</b>        |   |
| <b>Course Code: B16 CE4101</b>                                      |   |
| <b>Course Title: WATER RESOURCES ENGINEERING-I</b>                  |   |
| CO-1  | Choose major hydrologic components & apply key concepts to several practical areas of engineering hydrology & related design aspects        |
| CO-2  | Determine aquifer parameters & yield of wells   |
| CO-3  | Carry out surface & subsurface investigation to locate ground water   |
| CO-4  | Determine storage capacity & life of reservoirs   |
| CO-5  | Assess the irrigation needs of crops  |
| CO-6  | Design of unlined & lined irrigation canals   |
| <b>Course Code: B16 CE4102</b>                                      |   |
| <b>Course Title: TRANSPORTATION ENGINEERING - I</b>                 |   |
| CO-1  | Selecting the appropriate materials for use in different road layers  |
| CO-2  | Perform road pavement design and analysis   |
| CO-3  | Interpret geometric design fundamentals, in relation to safety and driver comfort, focusing on horizontal and vertical alignment            |
| CO-4  | Design the geometric curves of a road pavement  |
| CO-5  | Design the Traffic Management System  |
| CO-6  | Design the Components of Airport  |
| <b>Course Code: B16 CE4103</b>                                      |   |
| <b>Course Title: PROJECT PLANNING AND MANAGEMENT</b>                |   |
| CO-1  | Define planning, controlling and scheduling to find the time estimates of a project   |
| CO-2  | Classify the contracts and contract laws applicable to construction industry  |
| CO-3  | Explain the Importance of project management and the role of project managers in various organizations                                      |
| CO-4  | Identify and apply various networking techniques of project management  |
| <b>Course Code: B16 CE 4104</b>                                     |   |
| <b>Course Title: COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB</b> |   |
| CO-1  | Create a program which is necessary to classify and evaluate the values.  |
| CO-2  | Create an excel sheet for the design of slabs.  |
| CO-3  | Model and analyze the beams and plane frames using STAAD.   |
| <b>Course Code: B16 CE 4105</b>                                     |   |
| <b>Course Title: TRANSPORTATION ENGINEERING LAB</b>                 |   |
| CO-1  | Differentiate the Different types of materials used for Road Construction   |
| CO-2  | Identify the quality of road aggregates   |
| CO-3  | Identify the quality of Binder  |
| CO-4  | Determine the strength of the Subgrade material   |
| <b>Course Code: B16CE4106</b>                                       |   |
| <b>Course Title: PROJECT PHASE-I</b>                                |   |
| CO-1  | Identify a current problem through literature/field/case studies and define the background objectives and methodology for solving the same. |
| CO-2  | Write report and present it effectively.  |

| <b>Course Outcomes for Fourth Year Second Semester Course</b>   |   |
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| <b>Course Code: B16 CE4201</b>                                  |   |
| <b>Course Title: WATER RESOURCE ENGINEERING-II</b>              |   |
| CO-1  | Analyze gravity and earth dams  |
| CO-2  | Design Spillways and energy dissipation works   |
| CO-3  | Design diversion head works   |
| CO-4  | Classify river training works   |
| CO-5  | Use the principal components of hydroelectric scheme  |
| <b>Course Code: B16 CE4202</b>                                  |   |
| <b>Course Title: TRANSPORTATION ENGINEERING - II</b>            |   |
| CO-1  | Explain railway track components, its importance and requirements.  |
| CO-2  | Design elements of track geometry, points and crossings and concepts of railway signaling   |
| CO-3  | Predict the importance and necessity of harbours and docks in transportation.   |
| CO-4  | Evaluate the components of Tunnel Engineering.  |
| <b>Course Code: B16 CE4203</b>                                  |   |
| <b>Course Title: IRRIGATION STRUCTURES DESIGN &amp; DRAWING</b> |   |
| CO-1  | Understand the paper - space environment thoroughly   |
| CO-2  | Develop the components using 2D & 3D wire frame models through various editing commands   |
| CO-3  | Explain assemble of various components of compound solids   |
| CO-4  | Design irrigation canal structures  |
| <b>Course Code: B16 CE 4204</b>                                 |   |
| <b>Course Title: PROJECT PHASE-II</b>                           |   |
| CO-1  | Identify a current problem through literature/field/case studies and define the background objectives and methodology for solving the same. |
| CO-2  | Analyze, design and develop a technology/ process.  |
| CO-3  | Implement and evaluate the technology at the laboratory level.  |
| CO-4  | Write report and present it effectively.  |

## M. TECH – CIVILENGINEERING

| <b>Course Outcomes for First Year First Semester Course</b>      |   |
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| <b>Course Code: M16 ST 21</b>                                    |   |
| <b>Course Title: THEORY OF ELASTICITY</b>                        |   |
| CO-1   | Analyze the stresses and strains for two dimensional and three-dimensional elements.                        |
| CO-2   | Understand the equilibrium and compatibility conditions.  |
| CO-3   | Solve the problems on Torsion for different shaped bars.  |
| <b>Course Code: M16 ST 11</b>                                    |   |
| <b>Course Title: ADVANCED REINFORCED CONCRETE DESIGN</b>         |   |
| CO-1   | Estimate the crack width and deflection with regard to the serviceability.                                  |
| CO-2   | Analyze and design a grid floor system.   |
| CO-3   | Analyze and design a flat slab system.  |
| CO-4   | Analyze and design bunkers, silos and chimneys.   |
| CO-5   | Analyze and design of concrete structures against fire resistance, according to ISO 834 standards.          |
| <b>Course Code: M16 ST 1103</b>                                  |   |
| <b>Course Title: MATRIX METHODS OF STRUCTURAL ANALYSIS</b>       |   |
| CO-1   | Analyze various beams by the matrix methods at different loading conditions.                                |
| CO-2   | Analyze various Plane truss problems by the matrix methods.   |
| CO-3   | Analyze Plane Frames by the matrix methods at different loading conditions.                                 |
| <b>Course Code: M16 ST 1104</b>                                  |   |
| <b>Course Title: STRUCTURAL DYNAMICS</b>                         |   |
| CO-1   | Solve the problems on Single degree of freedom.   |
| CO-2   | Understand the difference between harmonic loading and impulse loading and the related analysis procedures. |
| CO-3   | Evaluate the structural properties, mode shapes for different structures.                                   |
| <b>Course Code: M16 ST 1105</b>                                  |   |
| <b>Course Title: ADVANCED FOUNDATION ENGINEERING</b>             |   |
| CO-1   | The design of shallow and deep foundations to carry ultimate loads.   |
| CO-2   | Interpretation and selection of appropriate soil parameters from site investigation data.                   |
| CO-3   | Field monitoring in geotechnical design.  |
| CO-4   | Select the most appropriate foundation solution for a given situation; derive appropriate soil parameters.  |
| CO-5   | Distinguish between different foundation types and their appropriate use.                                   |
| CO-6   | Synthesize foundation performance measurements from a range of test data reported in the literature.        |
| <b>Course Code: M16 ST 1106</b>                                  |   |
| <b>Course Title: WIND ANALYSIS AND DESIGN OF TALL STRUCTURES</b> |   |
| CO-1   | Know the types of tall buildings.   |
| CO-2   | Analyze the plane frame systems by different methods.   |
| CO-3   | Design the shear wall system and in filled frame systems.   |
| CO-4   | Design the RC chimney and Bunkers and Silos.  |

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| <b>Course Code: M16 ST 1107</b>                                      |  |
| <b>Course Title: EXPERIMENTAL STRESS ANALYSIS</b>                    |  |
| CO-1   | Know the working principle of strain gauges.   |
| CO-2   | Do the model analysis using different theorems.  |
| CO-3   | Know the concepts of photo elasticity and its applications.  |
| CO-4   | Analysis of Stress, strain, Stress- Strain relation and theories of failure  |
| <b>Course Code: M16 ST 1108</b>                                      |  |
| <b>Course Title: ADVANCED CONCRETE TECHNOLOGY</b>                    |  |
| CO-1   | Know the various materials in concrete and admixtures.   |
| CO-2   | Do the Mix design by different methods.  |
| CO-3   | Get a thorough knowledge of various types of cement, aggregates and properties of specialconcrete.   |
| CO-4   | Know the different procedures for testing concrete   |
| <b>Course Code: M16 ST 1109</b>                                      |  |
| <b>Course Title: BRIDGE ENGINEERING</b>                              |  |
| CO-1   | Understood the load distribution and IRC standards.  |
| CO-2   | Design the slab bridges.   |
| CO-3   | Design the Arch bridges  |
| CO-4   | Design the bridge bearings, hinges and expansion joints.   |
| <b>Course Code: M16 ST 1110</b>                                      |  |
| <b>Course Title: OPTIMIZATION TECHNIQUES</b>                         |  |
| CO-1   | Derive optimized structure using classical and modern methods of optimization.   |
| CO-2   | Gain the knowledge on Formulation of Structural Optimization problems.   |
| CO-3   | Gain the knowledge on the concept of classical methods of optimization for multivariable   |
| CO-4   | With equality or inequality constraints: solution by method of Lagrange Multiplier<br>-Applications in structural engineering, Kuhn-Tucker conditions.                         |
| <b>Course Code: M16 ST 23</b>  |  |
| <b>Course Title: COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING</b> |  |
| CO-1   | Analyze the structural elements using software designs.  |
| CO-2   | Design the structures fir the dynamic loads using software's.  |
| CO-3   | Solve the finite elements application problems of structural engineering by software's.  |
| <b>Course Code: M16 ST 24</b>  |  |
| <b>Course Title: DESIGN OF STRUCTURES</b>                            |  |
| CO-1   | Design of Folded Plates, Elevated Service Reservoirs, Analysis and design Retaining walls, Design Grid floor, Design Flat slab, Design Pressed steel tank, Design Buried pipes |

| <b>Course Outcomes for First Year Second Semester Course</b> |  |
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| <b>Course Code: M16 ST 26</b>                                |  |
| <b>Course Title: THEORY OF PLATES AND SHELLS</b>             |  |
| CO-1   | Analyze and design for plates for different loadings.  |
| CO-2   | Analyze and design of shells.  |
| CO-3   | Explain the concept of curvature in shells.  |
| CO-4   | Gain knowledge on beams, theory of cylindrical shells.   |
| <b>Course Code: M16 ST 27</b>                                |  |
| <b>Course Title: STRUCTURAL STABILITY</b>                    |  |
| CO-1   | Analyze structures with linear and nonlinear behaviour.  |
| CO-2   | Gain the knowledge on Stability of Continuous systems.   |
| CO-3   | Distinguish elastic buckling and in elastic buckling.  |
| <b>Course Code: M16 ST 28</b>                                |  |
| <b>Course Title: FINITE ELEMENT METHODS OF ANALYSIS</b>      |  |
| CO-1   | Understand the fundamentals of Finite element method.  |
| CO-2   | Derive the solution of the problems of 1D and 2D by FEM.                                       |
| CO-3   | Apply the concept of iso-parametric formulation for solving problems.                          |
| CO-4   | Derive the shape functions for higher order elements.  |
| CO-5   | Determine solution for higher order elements problems by numerical techniques.                 |
| <b>Course Code: M16 ST 1204</b>                              |  |
| <b>Course Title: EARTHQUAKE ENGINEERING</b>                  |  |
| CO-1   | Describe various terms of engineering seismology.  |
| CO-2   | Design earthquake-resistant structures.  |
| CO-3   | Gain the knowledge on seismic codal provisions and detailing.                                  |
| CO-4   | Acquire the knowledge in structural irregularities in seismic planning and shear wall concept. |
| <b>Course Code: M16 ST 1205</b>                              |  |
| <b>Course Title: RELIABILITY ANALYSIS AND DESIGN</b>         |  |
| CO-1   | Understand the importance of reliability in Civil engineering.                                 |
| CO-2   | Apply the concepts of computation of structural reliability for solving engineering problems.  |
| CO-3   | Gain the knowledge of reliability based structural design.                                     |
| <b>Course Code: M16 ST 1206</b>                              |  |
| <b>Course Title: PRESTRESSED CONCRETE</b>                    |  |
| CO-1   | Analyze and design pre-stressed concrete members.  |
| CO-2   | Gain the knowledge on materials, prestressing Systems, end anchorages.                         |
| CO-3   | Gain the knowledge on losses of pre-stress.  |
| CO-4   | Analyze and design of sections for flexure.  |
| CO-5   | Apply the concept of prestress for designing of slabs  |
| <b>Course Code: M16 ST 1207</b>                              |  |
| <b>Course Title: GROUND IMPROVEMENT TECHNIQUES</b>           |  |
| CO-1   | Implement the stabilization methods  |
| CO-2   | Apply grouting and dewatering techniques   |
| CO-3   | Understand the concept of in-situ reinforcement  |

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| <b>Course Code: M16 ST 1208</b>                              |  |
| <b>Course Title: INDUSTRIAL STRUCTURES</b>                   |  |
| CO-1   | Know the requirements of various industries.   |
| CO-2   | Get an idea about the materials used and planning.   |
| CO-3   | Know the construction techniques.  |
| CO-4   | Understood the functional requirements.  |
| <b>Course Code: M16 ST 1209</b>                              |  |
| <b>Course Title: DESIGN OF STEEL BRIDGES</b>                 |  |
| CO-1   | Apply the IS code of practice for the design of steel bridges.   |
| CO-2   | Analyze and design of Plate girder Bridges.  |
| CO-3   | Analyze and design of truss girder Bridges.  |
| <b>Course Code: M16 ST 1210</b>                              |  |
| <b>Course Title: INELASTIC DESIGN OF SLABS</b>               |  |
| CO-1   | Understand the elastic theory analysis.  |
| CO-2   | Understand the yield line theory.  |
| CO-3   | Analyze the slabs by principle of virtual work.  |
| CO-4   | Analyze the slabs by using equilibrium method.   |
| CO-5   | Design the slabs for different edge conditions.  |
| <b>Course Code: M16 ST 39</b>                                |  |
| <b>Course Title: REPAIR AND REHABILITATION OF STRUCTURES</b> |  |
| CO-1   | Assess the damage intensity  |
| CO-2   | Select proper rehabilitation and repair measures for different types of deteriorations.  |
| CO-3   | Apply the Seismic Retrofitting techniques on reinforced concrete building.   |
| <b>Course Code: M16 ST 1206</b>                              |  |
| <b>Course Title: ADVANCED DESIGN OF STRUCTURES</b>           |  |
| CO-1   | Design of blast resistant structures, Design of berth structures, Design of Quay Walls, Analyze & design of Pre-engineered buildings, Analyze & design Bow string Girder Bridge, Analyze & design balanced cantilever bridge, Analyze & design Raft design, Design of Piles and pile caps. |

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| <b>Course Outcomes for Second Year First Semester Course</b> |  |
| <b>Course Code: M16 ST 2101</b>                              |  |
| <b>Course Title: THESIS WORK-PRELIMINARY</b>                 |  |
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| <b>Course Outcomes for Second Year Second Semester Course</b> |  |
| <b>Course Code: M16 ST 2201</b>                               |  |
| <b>Course Title: THESIS WORK-FINAL</b>                        |  |