

## 2018-Scheme Course Outcome Across all programmes

### VISION

To be a Premier globally recognized Institute with ensuring academic excellence, Innovation and fostering Research in the field of Engineering

### MISSION

- To consistently strive for Academic Excellence
- To promote collaborative Research & Innovation
- To create holistic teaching learning environment that build ethically sound manpower who contribute to the stake holders operating at Global environment

### Programme Outcome

<b>Program Outcomes (PO's)</b>	
PO 1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO 2	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 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.
PO 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
PO 5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 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 sustainable development.
PO 8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 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.
PO 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.
PO 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 multidisciplinary environments.
PO 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.

## 1<sup>st</sup> Course outcome -common to all programmes

<b>Course Code : 18MAT11 Course Name :CALCULUS AND LINEAR ALGEBRA</b>	
<b>CO</b>	<b>Course Outcome</b>
C101.1	Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.
C101.2	Learn the notion of partial differentiation to calculate rates of change of multivariate functions and solve problems related to composite functions and jacobians.
C101.3	Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volume.
C101.4	Solve first order linear/nonlinear differential equation analytically using standard methods.
C101.5	Make use of matrix theory for solving system of linear equations and compute eigen values and eigenvectors required for matrix diagonalization process.

<b>Course Code : 18CHE12 Course Name : Engineering Chemistry</b>	
<b>CO</b>	<b>Course Outcome</b>
C102.1	Use of free energy in equilibria, rationalize bulk properties and process using thermodynamic consideration electrochemical energy system.
C102.2	Causes and effects of corrosion of metal and control of corrosion. Modification of surface properties of metal to develop .
C102.3	Production and consumption of energy for industrialization of country and living standards of people. Production and use of electrochemical cells, concentration cells fuel cells, classical batteries and modern batteries .
C102.4	Environmental pollution waste management and water chemistry .
C102.5	Different techniques of instrumental analysis of materials and synthesis , properties and applications of Nano materials .

<b>Course Code : 18CPS13 Course Name : C Programming For Problem Solving</b>	
<b>CO</b>	<b>Course Outcome</b>
C103.1	CO1: Illustrate simple algorithms from the different domains such as mathematics, physics, etc.
C103.2	CO2: Construct a programming solution to the given problem using C
C103.3	CO3: Identify and correct the syntax and logical errors in C programs.
C103.4	CO4: Modularize the given problem using functions and structure.

<b>Course Code : 18ELN14 Course Name : BASic Electronics</b>	
<b>CO</b>	<b>Course Outcome</b>
C104.1	Describe the Operation of diodes, BJT, FET and Operational Amplifiers
C104.2	Design and Explain the Construction of rectifiers, regulators, amplifiers and oscillators
C104.3	describe general operating Principals of SCRs and its applications

C104.4	Explain the working and design of fixed voltage IC regulator using 7805 and Astable oscillator using timer IC 555
C104.5	Explain the Different number system and their conversions and construct simple combinational and sequential logic circuits using Flips -Flops
C104.6	Describe the /basic principle of operation of communication system and mobile phones

<b>Course Code :I8ME15 Course Name : ELEMENTS OF MECHANICAL ENGINEERING</b>	
<b>CO</b>	<b>Course Outcome</b>
C105.1	Identify different sources of energy and their conversion process.
C105.2	Explain the working principle of hydraulic turbines, pumps, IC engines and refrigeration
C105.3	Recognize various metal joining processes and power transmission elements.
C105.4	Understand the properties of common engineering materials and their applications in engineering industry.
C105.5	Discuss the working of conventional machine tools, machining processes, tools and accessories and describe the advanced manufacturing systems.

<b>Course Code :18CHEL16 Course Name : ENGINEERING CHEMISTRY LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C106.1	Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.
C106.2	Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.

<b>Course Code : 18MAT21 Course Name :ADVANCED CALCULUS &amp; NUMERICAL METHODS</b>	
<b>CO</b>	<b>Course Outcome</b>
C201.1	Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.
C201.2	Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations.
C201.3	Construct a variety of partial differential equations and solution by exact methods/method of separation of variables.
C201.4	Explain the applications of infinite series and obtain series solution of ordinary differential equations.
C201.5	Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.

<b>Course Code : 18PHY22 Course Name : Engineering Physics</b>	
<b>CO</b>	<b>Course Outcome</b>
C202.1	Understand various types of oscillations and their implications, the role of Shock waves in various fields and recognize the elastic properties of materials for engineering applications.

C202.2	Realize the interrelation between time varying electric and magnetic field, the transverse nature of the EM waves and their role in optical fiber communication.
C202.3	Compute Eigen values, Eigen functions, momentum of atomic and subatomic particles using Time independent 1-D Schrodinger's wave equation
C202.4	Apprehend theoretical background of Laser, construction and working of different types of Laser and its application in different fields
C202.5	Understand various electrical and thermal properties of materials like conductors, semiconductors and dielectrics using different theoretical models

<b>Course Code : 18ELE23 Basic electrical Engineering</b>	
<b>CO</b>	<b>Course Outcome</b>
C203.1	CO1: Analyse D.C and A.C circuits.
C203.2	CO2: Explain the principle of operation and construction of single phase transformer.
C203.3	CO3: Explain the principle of operation and construction of DC machines and synchronous machines.
C203.4	CO4: Explain the principle of operation and construction of three phase induction motors
C203.5	CO5: Discuss concepts of electrical wiring, circuit protecting devices and earthing.

<b>Course Code : 18 CIV24 Course Name : ELEMENTS OF CIVIL ENGINEERING AND MECHANICS</b>	
<b>CO</b>	<b>Course Outcome</b>
C204.1	Mention the applications of various fields of civil engineering
C204.2	Compute the resultant of given force system subjected to various loads
C204.3	Comprehend the action of forces, moments and other loads on systems of rigid bodies and compute the reactive forces that develop as a result of the external loads
C204.4	Locate the centroid and compute the moment of inertia of regular and built up sections
C204.5	Express the relationship between the motion of bodies and analyze the bodies in motion

<b>Course Code : 18EGDL25 Course Name : Engineering Graphics</b>	
<b>CO</b>	<b>Course Outcome</b>
C205.1	Prepare engineering drawings as per BIS conventions mentioned in the relevant codes.
C205.2	Produce computer generated drawings using CAD software.
C205.3	Use the knowledge of orthographic projections to represent engineering information / concepts and present the same in the form of drawings.
C205.4	Develop isometric drawings of simple objects reading the orthographic projections
C205.5	Convert pictorial and isometric views of simple objects to orthographic views.

<b>Course Code : 18PHYL26 Course Name : Engineering Physics Labrotary</b>	
<b>CO</b>	<b>Course Outcome</b>
C206.1	Apprehend the concepts of interference of light, diffraction of light, Fermi energy and magnetic effect of current
C206.2	Understand the principles of operations of optical fibres and semiconductor devices such as photo diode and NPN transistor using simple circuits.

C206.3	Determine elastic moduli and moment of inertia of given materials with the help of suggested procedures.
C206.4	Recognize the resonance concept and its practical applications
C206.5	Understand the importance of measurement procedure, honest recording and representing the data, reproduction of final results.

## CSE Department

### Course Code :18MAT31 Course Name : Engineering Mathematics

CO	Course Outcome
C301.1	Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.
C301.2	Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
C301.3	Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.
C301.4	Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
C301.5	Determine the externals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

### Course Code :18CS32 Course Name :Data Structures and Applications

CO	Course Outcome
C302.1	Use different types of data structures, operations and algorithms
C302.2	Apply searching and sorting operations on files
C302.3	Use stack, Queue, Lists, Trees and Graphs in problem solving
C302.4	Implement all data structures in a high-level language for problem solving

### Course Code : 18CS33 Course Name :Analog And Digital Electronics

CO	Course Outcome
C303.1	Design and analyse application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.
C303.2	Explain the basic principles of A/D and D/A conversion circuits and develop the same
C303.3	Simplify digital circuits using Karnaugh Map , and Quine-McClusky Methods
C303.4	Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types
C303.5	Develop simple HDL programs

<b>Course Code : 18CS34</b> Course Name : Computer Organization	
<b>CO</b>	<b>Course Outcome</b>
C304.1	Explain the basic organization of a computer system.
C304.2	Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.
C304.3	Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.
C304.4	Design and analyse simple arithmetic and logical units

<b>Course Code : 18CS35</b> Course Name : Software Engineering	
<b>CO</b>	<b>Course Outcome</b>
C305.1	Design a software system, component, or process to meet desired needs within realistic constraints.
C305.2	Assess professional and ethical responsibility
C305.3	Function on multi-disciplinary teams
C305.4	Use the techniques, skills, and modern engineering tools necessary for engineering practice
C305.5	Analyze, design, implement, verify, validate, implement, apply, and maintain software systems orparts of software systems

<b>Course Code :18CS36</b> Course Name : Discrete Mathematical Structures	
<b>CO</b>	<b>Course Outcome</b>
C306.1	Use of propositional and predicate logic in knowledge representation and truth verification.
C306.2	Demonstrate the application of discrete structures in different fields of computer science.
C306.3	Solve problems using recurrence relations and generating functions
C306.4	Apply different mathematical proofs, techniques in proving theorems.
C306.5	Compare graphs, trees and their applications.

<b>Course Code :18CSL37</b> Course Name :ANALOG AND DIGITAL ELECTRONICS LABORATORY	
<b>CO</b>	<b>Course Outcome</b>
C307.1	Use appropriate design equations / methods to design the given circuit.
C307.2	Examine and verify the design of both analog and digital circuits using simulators.
C307.3	Make us of electronic components, ICs, instruments and tools for design and testing of circuits for the given the appropriate inputs.
C307.4	Compile a laboratory journal which includes; aim, tool/instruments/software/components used, design equations used and designs, schematics, program listing, procedure followed, relevant theory, results as graphs and tables, interpreting and concluding the findings.

<b>Course Code :18CSL38</b> Course Name :DATA STRUCTURES LABORATORY	
<b>CO</b>	<b>Course Outcome</b>
C308.1	Analyze and Compare various linear and non-linear data structures

C308.2	Code, debug and demonstrate the working nature of different types of data structures and their applications
C308.3	Implement, analyze and evaluate the searching and sorting algorithms
C308.4	Choose the appropriate data structure for solving real world problems

**Course Code : 18MAT41 Course Name : Engineering Mathematics - IV**

<b>CO</b>	<b>Course Outcome</b>
C401.1	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
C401.2	Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
C401.3	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
C401.4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
C401.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis

**Course Code :18CS42 Course Name : Design And Analysis Of Algorithms**

<b>CO</b>	<b>Course Outcome</b>
C402.1	Describe computational solution to well-known problems like searching, sorting etc.
C402.2	Estimate the computational complexity of different algorithms.
C402.3	Devise an algorithm using appropriate design strategies for problem solving.

**Course Code :18CS43 Course Name :Operating Systems**

<b>CO</b>	<b>Course Outcome</b>
C403.1	Demonstrate need for OS and different types of OS
C403.2	Apply suitable techniques for management of different resources
C403.3	Use processor, memory, storage and file system commands
C403.4	Realize the different concepts of OS in platform of usage through case studies

**Course Code : 18CS44 Course Name :Microcontroller And Embedded Systems**

<b>CO</b>	<b>Course Outcome</b>
C404.1	Describe the architectural features and instructions of ARM microcontroller
C404.2	Apply the knowledge gained for Programming ARM for different applications.
C404.3	Interface external devices and I/O with ARM microcontroller.
C404.4	Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
C404.5	Develop the hardware /software co-design and firmware design approaches.
C404.6	Demonstrate the need of real time operating system for embedded system applications

**Course Code : 18CS45 Course Name :Object Oriented Concepts**

CO	Course Outcome
C405.1	Explain the object-oriented concepts and JAVA.
C405.2	Develop computer programs to solve real world problems in Java
C405.3	Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings.

**Course Code :18CS46** Course Name :Data Communication

CO	Course Outcome
C406.1	Explain the various components of data communication.
C406.2	Explain the fundamentals of digital communication and switching
C406.3	Compare and contrast data link layer protocols
C406.4	Summarize IEEE 802.xx standards

**Course Code : 18CSL47** Course Name : Design And Analysis Of Algorithms Laboratory

CO	Course Outcome
C407.1	Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
C407.2	Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high level language.
C407.3	Analyze and compare the performance of algorithms using language features.
C407.4	Apply and implement learned algorithm design techniques and data structures to solve real-world problems.

**Course Code : 18CSL48** Course Name : Microcontroller And Embedded Systems Laboratory

CO	Course Outcome
C408.1	Develop and test program using ARM7TDMI/LPC2148
C408.2	Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.

**Course Code : 18CS51** Course Name :Management and Entrepreneurship for IT Industry

CO	Course Outcome
C501.1	Define management, organization, entrepreneur, planning, staffing, ERP and outline their importance in entrepreneurship
C501.2	Utilize the resources available effectively through ERP
C501.3	Make use of IPRs and institutional support in entrepreneurship

**Course Code : 18CS52** Course Name :Computer Networks & Security

CO	Course Outcome
C502.1	Explain principles of application layer protocols
C502.2	Outline transport layer services and infer UDP and TCP protocols
C502.3	Classify routers, IP and Routing Algorithms in network layer

C502.4	Explain the Wireless and Mobile Networks covering IEEE 802.11 Standard
C502.5	Define Multimedia Networking and Network Management

<b>Course Code : 18CS53</b> Course Name : Database Management System	
<b>CO</b>	<b>Course Outcome</b>
C503.1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
C503.2	Use Structured Query Language (SQL) for database manipulation
C503.3	Design and build simple database systems
C503.4	Develop application to interact with databases.

<b>Course Code : 17CS54</b> Course Name : Automata Theory and Computability	
<b>CO</b>	<b>Course Outcome</b>
C504.1	Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation
C504.2	Learn how to translate between different models of Computation (e.g., Deterministic and Non-deterministic and Software models).
C504.3	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers
C504.4	Develop skills in formal reasoning and reduction of a problem to a formal model, with an emphasis on semantic precision and conciseness.
C504.5	Classify a problem with respect to different models of Computation.

<b>Course Code : 18CS55</b> Course Name : Application Development Using Python	
<b>CO</b>	<b>Course Outcome</b>
C505.1	Demonstrate proficiency in handling of loops and creation of functions.
C505.2	Identify the methods to create and manipulate lists, tuples and dictionaries
C505.3	Discover the commonly used operations involving regular expressions and file system
C505.4	Interpret the concepts of Object-Oriented Programming as used in Python
C505.5	Determine the need for scraping websites and working with CSV, JSON and other file formats.

<b>Course Code : 18CS56</b> Course Name : Unix Programming	
<b>CO</b>	<b>Course Outcome</b>
C506.1	Explain Unix Architecture, File system and use of Basic Commands
C506.2	Illustrate Shell Programming and to write Shell Scripts
C506.3	Categorize, compare and make use of Unix System Calls
C506.4	Build an application/service over a Unix system.

<b>Course Code : 18CSL57</b> Course Name : Computer Network Laboratory	
<b>CO</b>	<b>Course Outcome</b>

C507.1	Analyze and Compare various networking protocols.
C507.2	Demonstrate the working of different concepts of networking.
C507.3	Implement, analyze and evaluate networking protocols in NS2 / NS3 and JAVA programming language

<b>Course Code :18CS62</b> Course Name : DBMS Laboratory With Mini Project	
<b>CO</b>	<b>Course Outcome</b>
C508.1	Create, Update and query on the database.
C508.2	Demonstrate the working of different concepts of DBMS
C508.3	Implement, analyze and evaluate the project developed for an application

<b>Course Code :18CS61</b> Course Name :: System Software And Compilers	
<b>CO</b>	<b>Course Outcome</b>
C601.1	Explain system software
C601.2	Design and develop lexical analyzers, parsers and code generators
C601.3	Utilize lex and yacc tools for implementing different concepts of system software

<b>Course Code :18CS62</b> Course Name :Computer Graphics And Visualization	
<b>CO</b>	<b>Course Outcome</b>
C602.1	Design and implement algorithms for 2D graphics primitives and attributes.
C602.2	Illustrate Geometric transformations on both 2D and 3D objects
C602.3	Apply concepts of clipping and visible surface detection in 2D and 3D viewing, and Illumination Models.
C602.4	Decide suitable hardware and software for developing graphics packages using OpenGL.

<b>Course Code :18CS63</b> Course Name :Web Technology And Its Applications	
<b>CO</b>	<b>Course Outcome</b>
C603.1	Adapt HTML and CSS syntax and semantics to build web pages.
C603.2	Construct and visually format tables and forms using HTML and CSS
C603.3	Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
C603.4	Appraise the principles of object oriented development using PHP
C603.5	Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.

<b>Course Code :18CS641 Course Name : Data Mining And Data Warehousing</b>	
<b>CO</b>	<b>Course Outcome</b>
C604.1	Identify data mining problems and implement the data warehouse
C604.2	Write association rules for a given data pattern.
C604.3	Choose between classification and clustering solution

<b>Course Code :18CS651 Course Name : Data Mining and Data Warehousing</b>	
<b>CO</b>	<b>Course Outcome</b>
C605.1	Understand data mining problems and implement the data warehouse
C605.2	Demonstrate association rules for a given data pattern.
C605.3	Discuss between classification and clustering solution.

<b>Course Code :18CS643 Course Name :Cloud Computing And Its Applications</b>	
<b>CO</b>	<b>Course Outcome</b>
C606.1	Explain cloud computing, virtualization and classify services of cloud computing
C606.2	Illustrate architecture and programming in cloud
C606.3	Describe the platforms for development of cloud applications and List the application of cloud.

<b>Course Code :18CS651 Course Name : Mobile Application Development</b>	
<b>CO</b>	<b>Course Outcome</b>
C607.1	Create, test and debug Android application by setting up Android development environment
C607.2	Implement adaptive, responsive user interfaces that work across a wide range of devices.
C607.3	Infer long running tasks and background work in Android applications
C607.4	Demonstrate methods in storing, sharing and retrieving data in Android applications
C607.5	Analyze performance of android applications and understand the role of permissions and security
C607.6	Describe the steps involved in publishing Android application to share with the world

<b>Course Code : 18CSL67 Course Name :SYSTEM SOFTWARE LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	Implement and demonstrate Lexer's and Parser's
C608.2	Evaluate different algorithms required for management, scheduling, allocation and communication used in operating system.

<b>Course Code : 18CSL67 Course Name :Computer Graphics Laboratory With Mini Project</b>	
<b>CO</b>	<b>Course Outcome</b>
C609.1	Apply the concepts of computer graphics
C609.2	Implement computer graphics applications using OpenGL
C609.3	Animate real world problems using OpenGL

**Course Code : 18CS71** Course Name : Artificial Intelligence And Machine Learning

CO	Course Outcome
C701.1	Appraise the theory of Artificial intelligence and Machine Learning.
C701.2	Illustrate the working of AI and ML Algorithms.
C701.3	Demonstrate the applications of AI and ML.

**Course Code :18CS72** Course Name :Big Data And Analytics

CO	Course Outcome
C702.1	Understand fundamentals of Big Data analytics.
C702.2	Investigate Hadoop framework and Hadoop Distributed File system.
C702.3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
C702.4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
C702.5	Use Machine Learning algorithms for real world big data.
C702.6	Analyze web contents and Social Networks to provide analytics with relevant visualization tools.

**Course Code :18CS734** Course Name :User Interface Design

CO	Course Outcome
C703.1	Design the User Interface, design, menu creation, windows creation and connection between menus and windows

**Course Code :18CS742** Course Name :Network Management

CO	Course Outcome
C704.1	Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets
C704.2	Apply network management standards to manage practical networks
C704.3	Formulate possible approaches for managing OSI network model.
C704.4	Use on SNMP for managing the network
C704.5	Use RMON for monitoring the behavior of the network
C704.6	Identify the various components of network and formulate the scheme for the managing them

**Course Code : 18CSL76** Course Name :Artificial Intelligence And Machine Learning Laboratory

CO	Course Outcome
C705.1	Implement and demonstrate AI and ML algorithms
C705.2	Evaluate different algorithms.

**Course Code :18CS81** Course Name Internet of Things

CO	Course Outcome
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C801.1	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
C801.2	Compare and contrast the deployment of smart objects and the technologies to connect them to network.
C801.3	Appraise the role of IoT protocols for efficient network communication.
C801.4	Elaborate the need for Data Analytics and Security in IoT.
C801.5	Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry

**Course Name :Storage Area Networks**

CO	Course Outcome
C802.1	identify key challenges in managing information and analyze different storage networking technologies and virtualization
C802.2	Explain components and the implementation of NAS
C802.3	Describe CAS architecture and types of archives and forms of virtualization
C802.4	Illustrate the storage infrastructure and management activities

**Course Name :Project**

CO	Course Outcome
C803.1	Identify an engineering problem, devise a means of solving and exhibit the ability to execute the solution.
C803.2	Demonstrate knowledge of professional and ethical responsibilities.
C803.3	Show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues
C803.4	Communicate effectively in both verbal and written form
C803.5	Develop confidence for self-education and ability for lifelong learning

**Course Name : Seminar**

CO	Course Outcome
C804.1	Select a technical topic related to mechanical engineering, study, analyse and summarize the topic
C804.2	Prepare a report and make a presentation on the selected topic.
C804.3	Improve the communication skills
C804.4	Demonstrate the understanding of impact of engineering solutions on the society
C804.5	Demonstrate the knowledge of professional and ethical responsibilities.

**Course Name :Internship**

CO	Course Outcome
C805.1	Demonstrate the application of knowledge and skill sets acquired from the course and workplace in the assigned job functions.
C805.2	Solve real life challenges in the workplace by analysing work environment and conditions, and selecting appropriate skill sets acquired from the course

C805.3	Articulate career options by considering opportunities in company, sector, industry, professional and educational advancement
C805.4	Communicate and collaborate effectively and appropriately with different professionals in the work environment through written and oral means
C805.5	Exhibit critical thinking and problem solving skills by analysing underlying issue/s to challenges
C805.6	Exhibit professional ethics by displaying positive disposition during internship

## Civil Department

<b>Course code 18MAT31 Course Name :TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES</b>	
<b>CO</b>	<b>Course Outcome</b>
C301.1	Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering
C301.2	Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory
C301.3	Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.
C301.4	Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods
C301.5	Determine the externals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis
<b>Course Code :18CV32 Course Name :STRENGTH OF MATERIALS</b>	
<b>CO</b>	<b>Course Outcome</b>
C302.1	To evaluate the basic concepts of the stresses and strains for different materials and strength of structural elements.
C302.2	To evaluate the development of internal forces and resistance mechanism for one dimensional and twodimensional structural elements
C302.3	To analyse different internal forces and stresses induced due to representative loads on structural elements
C302.4	To evaluate slope and deflections of beams
C302.5	To evaluate the behaviour of torsion members, columns and struts.
<b>Course Code :18CV33 Course Name :FLUIDS MECHANICS</b>	
<b>CO</b>	<b>Course Outcome</b>
C303.1	Possess a sound knowledge of fundamental properties of fluids and fluid Continuum
C303.2	Compute and solve problems on hydrostatics, including practical applications
C303.3	Apply principles of mathematics to represent kinematic concepts related to fluid flow
C303.4	Apply fundamental laws of fluid mechanics and the Bernoulli's principle for practical applications
C303.5	Compute the discharge through pipes and over notches and weirs

<b>Course Code :18CV34 Course Name :BUILDING MATERIALS AND CONSTRUCTION</b>	
<b>CO</b>	<b>Course Outcome</b>
C304.1	Select suitable materials for buildings and adopt suitable construction techniques
C304.2	Decide suitable type of foundation based on soil parameters
C304.3	Supervise the construction of different building elements based on suitability
C304.4	Exhibit the knowledge of building finishes and form work requirements
<b>Course Code :18CV35 Course Name :BASIC SURVEYING</b>	
<b>CO</b>	<b>Course Outcome</b>
C305.1	Posses a sound knowledge of fundamental principles Geodetics
C305.2	Measurement of vertical and horizontal plane, linear and angular dimensions to arrive at solutions to basic surveying problems.
C305.3	Capture geodetic data to process and perform analysis for survey problems
C305.4	Analyse the obtained spatial data and compute areas and volumes. Represent 3D data on plane figures as contours
<b>Course Code :18CV36 Course Name :ENGINEERING GEOLOGY</b>	
<b>CO</b>	<b>Course Outcome</b>
C306.1	Apply geological knowledge in different civil engineering practice.
C306.2	Students will acquire knowledge on durability and competence of foundation rocks, and confidence enough to use the best building materials
C306.3	Civil Engineers are competent enough for the safety, stability, economy and life of the structures that they construct
C306.4	Able to solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems
C306.5	Intelligent enough to apply GIS, GPS and remote sensing as a latest tool in different civil engineering construction
<b>Course Code :18CVL37 Course Name :COMPUTER AIDED BUILDING PLANNING AND DRAWING</b>	
<b>CO</b>	<b>Course Outcome</b>
C307.1	Prepare, read and interpret the drawings in a professional set up.
C307.2	Know the procedures of submission of drawings and Develop working and submission drawings for building.
C307.3	Plan and design residential or public building as per the given requirements.
<b>Course Code :18CVL38 Course Name :BUILDING MATERIALS TESTING LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C308.1	Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear and torsion.
C308.2	Identify, formulate and solve engineering problems of structural elements subjected to flexure
C308.3	Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to unsuitable materials.
<b>Course Code :18KAK28/39/49 Course Name :Aadalitha Kannada</b>	
<b>CO</b>	

<b>Course Outcome</b>	
C309.1	• ಆಡಳಿತ ಭಾಷೆ ಕನ್ನಡದ ಪರಿಚಯವಾಗುತ್ತದೆ.
C309.2	• ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ಪ್ರಾಕರಣದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡುತ್ತದೆ.
C309.3	• ಕನ್ನಡ ಭಾಷಾ ರಚನೆಯಲ್ಲಿನ ನಿಯಮಗಳು ಮತ್ತು ಲೇಖನ ಚಿಹ್ನೆಗಳು ಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ.
C309.4	• ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡುತ್ತದೆ.
C309.5	• ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಅಸಕ್ತಿ ಮೂಡುತ್ತದೆ.
C309.6	• ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ ಮತ್ತು ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳು ಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ.

<b>Course Code :18KVK28/39/49 Course Name :Vyavaharika Kannada</b>	
CO	Course Outcome
C310.1	At the end of the course, the student will be able to understand Kannada and communicate in Kannada

<b>Course Code :18CPC39/49 Course Name :CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW (CPC)</b>	
CO	Course Outcome
C311.1	Have constitutional knowledge and legal literacy
C311.2	Understand Engineering and Professional ethics and responsibilities of Engineers.
C311.3	Understand the the cybercrimes and cyber laws for cyber safety measures.

<b>Course Code :18MATDIP31 Course Name : ADDITIONAL MATHEMATICS – I</b>	
CO	Course Outcome
C312.1	Apply concepts of complex numbers and vector algebra to analyze the problems arising in related area.
C312.2	Use derivatives and partial derivatives to calculate rate of change of multivariate functions.
C312.3	Analyze position, velocity and acceleration in two and three dimensions of vector valued functions
C312.4	Learn techniques of integration including the evaluation of double and triple integrals

<b>Course Code :18MAT41 Course Name: COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS</b>	
CO	Course Outcome
C401.1	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
C401.2	Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing
C401.3	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
C401.4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
C401.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis.

<b>Course Code :18CV42 Course Name :ANALYSIS OF DETERMINATE STRUCTURES</b>	
CO	Course Outcome
C402.1	Identify different forms of structural systems.
C402.2	Construct ILD and analyse the beams and trusses subjected to moving loads
C402.3	Understand the energy principles and energy theorems and its applications to determine the deflections of trusses and beams

C402.4	Determine the stress resultants in arches and cables.
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<b>Course Code :18CV43 Course Name :APPLIED HYDRAULICS</b>	
<b>CO</b>	<b>Course Outcome</b>
C403.1	Apply dimensional analysis to develop mathematical modeling and compute the parametric values in prototype by analyzing the corresponding model parameters
C403.2	Design the open channels of various cross sections including economical channel sections
C403.3	Apply Energy concepts to flow in open channel sections, Calculate Energy dissipation
C403.4	Compute water surface profiles at different conditions
C403.5	Design turbines for the given data, and to know their operation characteristics under different operating conditions

<b>Course Code :18CV44 Course Name :CONCRETE TECHNOLOGY</b>	
<b>CO</b>	<b>Course Outcome</b>
C404.1	Relate material characteristics and their influence on microstructure of concrete
C404.2	Distinguish concrete behavior based on its fresh and hardened properties
C404.3	Illustrate proportioning of different types of concrete mixes for required fresh and hardened properties using professional codes
C404.4	Adopt suitable concreting methods to place the concrete based on requirement
C404.5	Select a suitable type of concrete based on specific application

<b>Course Code :18CV45 Course Name :ADVANCED SURVEYING</b>	
<b>CO</b>	<b>Course Outcome</b>
C405.1	Apply the knowledge of geometric principles to arrive at surveying problems
C405.2	Use modern instruments to obtain geo-spatial data and analyse the same to appropriate engineering problems
C405.3	Capture geodetic data to process and perform analysis for survey problems with the use of electronic instruments
C405.4	Design and implement the different types of curves for deviating type of alignments

<b>Course Code :18CV46 Course Name :WATER SUPPLY AND TREATMENT ENGINEERING</b>	
<b>CO</b>	<b>Course Outcome</b>
C406.1	Estimate average and peak water demand for a community.
C406.2	Evaluate available sources of water, quantitatively and qualitatively and make appropriate choice for a community.
C406.3	Evaluate water quality and environmental significance of various parameters and plan suitable treatment system
C406.4	Design a comprehensive water treatment and distribution system to purify and distribute water to the required quality standards.

<b>Course Code :18CVL47 Course Name :ENGINEERING GEOLOGY LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C407.1	The students able to identify the minerals, rocks and utilize them effectively in civil engineering practices
C407.2	The students will interpret and understand the geological conditions of the area for implementation of civil engineering projects.

C407.3	The students will interpret subsurface information such as thickness of soil, weathered zone, depth of hard rock and saturated zone by using geophysical methods.
C407.4	The students will learn the techniques in the interpretation of LANDSAT Imageries to find out the lineaments and other structural features for the given area
C407.5	The students will be able to identify the different structures in the field.

<b>Course Code :18CVL48 Course Name :FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C408.1	Properties of fluids and the use of various instruments for fluid flow measurement
C408.2	Working of hydraulic machines under various conditions of working and their characteristics.

<b>Course Code :18MATDIP41 Course Name :ADDITIONAL MATHEMATICS – II</b>	
<b>CO</b>	<b>Course Outcome</b>
C409.1	Solve systems of linear equations using matrix algebra
C409.2	Apply the knowledge of numerical methods in modelling and solving of engineering problems
C409.3	Apply the knowledge of numerical methods in modelling and solving of engineering problems
C409.4	Classify partial differential equations and solve them by exact methods
C409.5	Apply elementary probability theory and solve related problems

<b>Course Code :18CV51 Course Name : CONSTRUCTION MANAGEMENT AND ENTREPRENEURSHIP</b>	
<b>CO</b>	<b>Course Outcome</b>
C501.1	Prepare a project plan based on requirements and prepare schedule of a project by understanding the activities and their sequence.
C501.2	Understand labour output, equipment efficiency to allocate resources required for an activity / project to achieve desired quality and safety
C501.3	Analyze the economics of alternatives and evaluate benefits and profits of a construction activity based on monetary value and time value
C501.4	Establish as an ethical entrepreneur and establish an enterprise utilizing the provisions offered by the federal agencies

<b>Course Code :18CV52 Course Name :ANALYSIS OF INDETERMINATE STRUCTURES</b>	
<b>CO</b>	<b>Course Outcome</b>
C502.1	Determine the moment in indeterminate beams and frames having variable moment of inertia and subsidence using slope deflection method
C502.2	Determine the moment in indeterminate beams and frames of no sway and sway using moment distribution method
C502.3	Construct the bending moment diagram for beams and frames by Kani's method
C502.4	Construct the bending moment diagram for beams and frames using flexibility method
C502.5	Analyze the beams and indeterminate frames by system stiffness method.

<b>Course Code :18CV53 Course Name : DESIGN OF RC STRUCTURAL ELEMENTS</b>	
<b>CO</b>	<b>Course Outcome</b>
C503.1	Understand the design philosophy and principles
C503.2	Solve engineering problems of RC elements subjected to flexure, shear and torsion

C503.3	Demonstrate the procedural knowledge in designs of RC structural elements such as slabs, columns and footings
C503.4	Owns professional and ethical responsibility
<b>Course Name : BASIC GEOTECHNICAL ENGINEERING</b>	
<b>CO</b>	<b>Course Outcome</b>
C504.1	Ability to plan and execute geotechnical site investigation program for different civil engineering projects
C504.2	Understanding of stress distribution and resulting settlement beneath the loaded footings on sand and clayey soils
C504.3	Ability to estimate factor of safety against failure of slopes and to compute lateral pressure distribution behind earth retaining structures
C504.4	Ability to determine bearing capacity of soil and achieve proficiency in proportioning shallow isolated and combined footings for uniform bearing pressure
C504.5	Capable of estimating load carrying capacity of single and group of piles
<b>Course Code :18CV55 Course Name : MUNICIPAL WASTEWATER ENGINEERING</b>	
<b>CO</b>	<b>Course Outcome</b>
C505.1	Select the appropriate sewer appurtenances and materials in sewer network.
C505.2	Design the sewers network and understand the self-purification process in flowing water
C505.3	Design the varies physic- chemical treatment units
C505.4	Design the various biological treatment units
C505.5	Design various AOPs and low cost treatment units
<b>Course Code :18CV56 Course Name : HIGHWAY ENGINEERING</b>	
<b>CO</b>	<b>Course Outcome</b>
C506.1	Acquire the capability of proposing a new alignment or re-alignment of existing roads, conduct necessary field investigation for generation of required data.
C506.2	Evaluate the engineering properties of the materials and suggest the suitability of the same for pavement construction
C506.3	Design road geometrics, structural components of pavement and drainage
C506.4	Evaluate the highway economics by few select methods and also will have a basic knowledge of various highway financing concepts
<b>Course Code :18CVL57 Course Name : SURVEYING PRACTICE</b>	
<b>CO</b>	<b>Course Outcome</b>
C507.1	Apply the basic principles of engineering surveying and for linear and angular measurements
C507.2	Comprehend effectively field procedures required for a professional surveyor
C507.3	Use techniques, skills and conventional surveying instruments necessary for
C507.4	engineering practice.
<b>Course Code :18CVL58 Course Name : CONCRETE AND HIGHWAY MATERIALS LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C507.1	Able to interpret the experimental results of concrete and highway materials based on laboratory tests
C507.2	Determine the quality and suitability of cement.

C507.3	Design appropriate concrete mix Using Professional codes.
C507.4	Determine strength and quality of concrete
C507.5	Evaluate the strength of structural elements using NDT techniques.
C507.6	Test the soil for its suitability as sub grade soil for pavements

**Course Code :18CIV59 Course Name : ENVIRONMENTAL STUDIES**

<b>CO</b>	<b>Course Outcome</b>
C508.1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
C508.2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment
C508.3	Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components
C508.4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

**Course Code :18CV61 Course Name DESIGN OF STEEL STRUCTURAL ELEMENTS**

<b>CO</b>	<b>Course Outcome</b>
C601.1	Possess knowledge of Steel Structures Advantages and Disadvantages of Steel structures, steel code provisions and plastic behaviour of structural steel
C601.2	Understand the Concept of Bolted and Welded connections
C601.3	Understand the Concept of Design of compression members, built-up columns and columns splices
C601.4	Understand the Concept of Design of tension members, simple slab base and gusseted base.
C601.5	Understand the Concept of Design of laterally supported and un-supported steel beams

**Course Code :18CV62 Course Name : APPLIED GEOTECHNICAL ENGINEERING**

<b>CO</b>	<b>Course Outcome</b>
C602.1	Ability to plan and execute geotechnical site investigation program for different civil engineering pr
C602.2	Understanding of stress distribution and resulting settlement beneath the loaded footings on sand and clayey soils
C602.3	Ability to estimate factor of safety against failure of slopes and to compute lateral pressure distribution behind earth retaining structures
C602.4	Ability to determine bearing capacity of soil and achieve proficiency in proportioning shallow isolated and combined footings for uniform bearing pressure
C602.5	Capable of estimating load carrying capacity of single and group of piles

**Course Code :18CV63 Course Name : HYDROLOGY AND IRRIGATION ENGINEERING**

<b>CO</b>	<b>Course Outcome</b>
C603.1	Understand the importance of hydrology and its components
C603.2	Measure precipitation and analyze the data and analyze the losses in precipitation
C603.3	Estimate runoff and develop unit hydrographs
C603.4	Find the benefits and ill-effects of irrigation
C603.5	Find the quantity of irrigation water and frequency of irrigation for various crops.

C603.6	Find the canal capacity, design the canal and compute the reservoir capacity
<b>Course Code :18CV641 Course Name : MATRIX METHOD OF STRUCTURAL ANALYSIS</b>	
<b>CO</b>	<b>Course Outcome</b>
C604.1	Evaluate the structural systems to application of concepts of flexibility and stiffness matrices for simple problems
C604.2	Identify, formulate and solve engineering problems with respect to flexibility and stiffness matrices as applied to continuous beams, rigid frames and trusses
C604.3	Identify, formulate and solve engineering problems by application of concepts of direct stiffness method as applied to continuous beams and trusses
C604.4	Evaluate secondary stresses
<b>Course Code :18CV642 Course Name : SOLID WASTE MANAGEMENT</b>	
<b>CO</b>	<b>Course Outcome</b>
C605.1	Analyse existing solid waste management system and to identify their drawbacks
C605.2	Evaluate different elements of solid waste management system
C605.3	Suggest suitable scientific methods for solid waste management elements.
C605.4	Design suitable processing system and evaluate disposal sites
<b>Course Code :18CV643 Course Name : ALTERNATE BUILDING MATERIALS</b>	
<b>CO</b>	<b>Course Outcome</b>
C606.1	Solve the problems of Environmental issues concerned to building materials and cost effective building technologies
C606.2	Select appropriate type of masonry unit and mortar for civil engineering constructions; also they are able to Design Structural Masonry Elements under Axial Compression
C606.3	Analyse different alternative building materials which will be suitable for specific climate and in an environmentally sustainable manner. Also capable of suggesting suitable agro and industrial wastes as a building material
C606.4	Recommend various types of alternative building materials and technologies and design a energy efficient building by considering local climatic condition and building material
<b>Course Code :18CV644 Course Name : GROUND IMPROVEMENT TECHNIQUES</b>	
<b>CO</b>	<b>Course Outcome</b>
C607.1	Give solutions to solve various problems associated with soil formations having less strength.
C607.2	Use effectively the various methods of ground improvement techniques depending upon the requirements
C607.3	utilize properly the locally available materials and techniques for ground improvement so that economy in the design of foundations of various civil engineering structures
<b>Course Code :18CV645 Course Name : RAILWAYS, HARBOUR, TUNNELING AND AIRPORTS</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	Acquires capability of choosing alignment and also design geometric aspects of railway system, runway and taxiway
C608.2	Suggest and estimate the material quantity required for laying a railway track and also will be able to determine the hauling capacity of a locomotive

C608.3	Develop layout plan of airport, harbor, dock and will be able relate the gained knowledge to identify required type of visual and/or navigational aids for the same
C608.4	Apply the knowledge gained to conduct surveying, understand the tunneling activities
<b>Course Code :18CV651 Course Name : REMOTE SENSING AND GIS</b>	
<b>CO</b>	<b>Course Outcome</b>
C609.1	Collect data and delineate various elements from the satellite imagery using their spectral signature.
C609.2	Analyze different features of ground information to create raster or vector data.
C609.3	Perform digital classification and create different thematic maps for solving specific problems
C609.4	Make decision based on the GIS analysis on thematic maps
<b>Course Code :18CV652 Course Name : TRAFFIC ENGINEERING</b>	
<b>CO</b>	<b>Course Outcome</b>
C610.1	Understand the human factors and vehicular factors in traffic engineering design.
C610.2	Conduct different types of traffic surveys and analysis of collected data using statistical concepts.
C610.3	Use an appropriate traffic flow theory and to comprehend the capacity & signalized intersection analysis
C610.4	Understand the basic knowledge of Intelligent Transportation System
<b>Course Code :18CV653 Course Name : OCCUPATIONAL HEALTH AND SAFETY</b>	
<b>CO</b>	<b>Course Outcome</b>
C611.1	Identify hazards in the workplace that pose a danger or threat to their safety or health, or that of others.
C611.2	Control unsafe or unhealthy hazards and propose methods to eliminate the hazard.
C611.3	Present a coherent analysis of a potential safety or health hazard both verbally and in writing, citing the occupational Health and Safety Regulations as well as supported legislation
C611.4	Discuss the role of health and safety in the workplace pertaining to the responsibilities of workers, managers, supervisors
C611.5	Identify the decisions required to maintain protection of the environment, workplace as well as personal health and safety
<b>Course Code :18CV654 Course Name : SUSTAINABILITY CONCEPTS IN CIVIL ENGINEERING</b>	
<b>CO</b>	<b>Course Outcome</b>
C612.1	Learn the sustainability concepts; understand the role and responsibility of engineers in sustainable development
C612.2	Quantify sustainability, and resource availability, Rationalize the sustainability based on scientific merits
C612.3	Understand and apply sustainability concepts in construction practices, designs, product developments and processes across various engineering disciplines
C612.4	Make a decision in applying green engineering concepts and become a lifelong advocate of sustainability in society
<b>Course Code :18CVL66 Course Name : SOFTWARE APPLICATION LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C613.1	use software skills in a professional set up to automate the work and thereby reduce cycle time for completion of the work

**Course Code :18CVL67 Course Name : ENVIRONMENTAL ENGINEERING LABORATORY**

<b>CO</b>	<b>Course Outcome</b>
C614.1	Acquire capability to conduct experiments and estimate the concentration of different parameters
C614.2	Compare the result with standards and discuss based on the purpose of analysis.
C614.3	Determine type of treatment, degree of treatment for water and waste water
C614.4	Identify the parameter to be analyzed for the student project work in environmental stream

**Course Code : 18CVEP68 Course Name :EXTENSIVE SURVEY PROJECT**

<b>CO</b>	<b>Course Outcome</b>
C615.1	Apply Surveying knowledge and tools effectively for the projects
C615.2	Understanding Task environment, Goals, responsibilities, Task focus, working in Teams towards common goals, Organizational performance expectations, technical and behavioral competencies
C615.3	Application of individual effectiveness skills in team and organizational context, goal setting, time management, communication and presentation skills
C615.4	Professional etiquettes at workplace, meeting and general
C615.5	Establishing trust based relationships in teams & organizational environment
C615.6	Orientation towards conflicts in team and organizational environment, Understanding sources of conflicts, Conflict resolution styles and techniques

**Course Code :18CV71 Course Name: QUANTITY SURVEYING AND CONTRACT MANAGEMENT**

<b>CO</b>	<b>Course Outcome</b>
C701.1	Taking out quantities and work out the cost and preparation of abstract for the estimated cost for various civil engineering works.
C701.2	Prepare detailed and abstract estimates for various road works, structural works and water supply and sanitary works.
C701.3	Prepare the specifications and analyze the rates for various items of work.
C701.4	Assess contract and tender documents for various construction works
C701.5	Prepare valuation reports of buildings

**Course Code :18CV72 Course Name :DESIGN OF RCC AND STEEL STRUCTURES**

<b>CO</b>	<b>Course Outcome</b>
C702.1	Students will acquire the basic knowledge in design of RCC and Steel Structures.
C702.2	Students will have the ability to follow design procedures as per codal provisions and skills to arrive at structurally safe RC and Steel members

**Course Code :18CV731 Course Name : THEORY OF ELASTICITY**

<b>CO</b>	<b>Course Outcome</b>
C703.1	Ability to apply knowledge of mechanics and mathematics to model elastic bodies as continuum
C703.2	Ability to formulate boundary value problems; and calculate stresses and strains
C703.3	Ability to comprehend constitutive relations for elastic solids and compatibility constraints

C703.4	Ability to solve two-dimensional problems (plane stress and plane strain) using the concept of stress function
<b>Course Code :18CV732 Course Name :AIR POLLUTION AND CONTROL</b>	
<b>CO</b>	<b>Course Outcome</b>
C704.1	Identify the major sources of air pollution and understand their effects on health and environment
C704.2	Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality mo
C704.3	Ascertain and evaluate sampling techniques for atmospheric and stack pollutants
C704.4	Choose and design control techniques for particulate and gaseous emissions.
<b>Course Code :18CV733 Course Name :PAVEMENT MATERIALS AND CONSTRUCTION</b>	
<b>CO</b>	<b>Course Outcome</b>
C705.1	Students will be able to evaluate and assess the suitability of any pavement material to be used in various components of pavement by conducting required tests as per IS,IRC specifications
C705.2	Students will be able to formulate the proportions of different sizes of aggregates to suit gradation criteria for various mixes as per MORTH and also design bituminous mixes
C705.3	Students will be competent to adapt suitable modern technique and equipment for speedy and economic construction
C705.4	Student will be able to execute the construction of embankment, flexible, rigid pavement and perform required quality control tests at different stages of pavement construction
<b>Course Code :18CV734 Course Name : GROUND WATER HYDRAULICS</b>	
<b>CO</b>	<b>Course Outcome</b>
C706.1	Find the characteristics of aquifers
C706.2	Estimate the quantity of ground water by various methods
C706.3	Locate the zones of ground water resources
C706.4	Select particular type of well and augment the ground water storage
<b>Course Code :18CV735 Course Name : MASONRY STRUCTURES</b>	
<b>CO</b>	<b>Course Outcome</b>
C707.1	Select suitable material for masonry construction by understanding engineering properties.
C707.2	Compute loads, load combinations and analyze the stresses in masonry.
C707.3	Design masonry under compression (Axial load) for various requirements and conditions
C707.4	Design masonry under bending (Eccentric, lateral, transverse load) for various requirements and conditions
C707.5	Assess the behavior of shear wall and reinforced masonry
<b>Course Code :18CV741 Course Name : EARTHQUAKE ENGINEERING</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Acquire basic knowledge of engineering seismology
C708.2	Develop response spectra for a given earthquake time history and its implementation to estimate response of a given structure
C708.3	Understanding of causes and types of damages to civil engineering structures during different earthquake scenarios

C708.4	Analyze multi-storied structures modeled as shear frames and determine lateral force distribution due to earthquake input motion using IS-1893 procedures
C708.5	Comprehend planning and design requirements of earthquake resistant features of RCC and Masonry structures thorough exposure to different IS-codes of practices
<b>Course Code :18CV742 Course Name : DESIGN CONCEPT OF BUILDING SERVICES</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Describe the basics of house plumbing and waste water collection and disposal
C708.2	Discuss the safety and guidelines with respect to fire safety
C708.3	Describe the issues with respect to quantity of water, rain water harvesting and roof top harvesting
C708.4	Understand and implement the requirements of thermal comfort in buildings
<b>Course Code :18CV743 Course Name :REINFORCED EARTH STRUCTURES</b>	
<b>CO</b>	<b>Course Outcome</b>
C709.1	identify, formulate reinforced earth techniques that are suitable for different soils and in different structures
C709.2	understand the laboratory testing concepts of Geo synthetics
C709.3	design RE retaining structures and Soil Nailing concepts
C709.4	Determine the load carrying capacity of Foundations resting on RE soil bed
C709.5	asses the use of Geo synthetics in drainage requirements and landfill designs
<b>Course Code :18CV744 Course Name : DESIGN OF HYDRAULIC STRUCTURES</b>	
<b>CO</b>	<b>Course Outcome</b>
C710.1	Check the stability of gravity dams and design the dam
C710.2	Estimate the quantity of seepage through earth dams
C710.3	Design spillways and aprons for various diversion works
C710.4	Select particular type of canal regulation work for canal network
<b>Course Code :18CV745 Course Name : URBAN TRANSPORT PLANNING</b>	
<b>CO</b>	<b>Course Outcome</b>
C711.1	Design, conduct and administer surveys to provide the data required for transportation planning
C711.2	Supervise the process of data collection about travel behavior and analyze the data for use in transport planning
C711.3	Develop and calibrate modal split, trip generation rates for specific types of land use developments
C711.4	Adopt the steps that are necessary to complete a long-term transportation plan
<b>Course Code :18CV751 Course Name : FINITE ELEMENT METHOD</b>	
<b>CO</b>	<b>Course Outcome</b>
C712.1	The student will have the knowledge on advanced methods of analysis of structures
<b>Course Code :18CV752 Course Name : NUMERICAL METHODS AND APPLICATIONS</b>	
<b>CO</b>	<b>Course Outcome</b>

C713.1	The students will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from Industry, management and other engineering fields
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**Course Code :18CV753 Course Name : ENVIRONMENTAL PROTECTION AND MANAGEMENT**

CO	Course Outcome
C714.1	Appreciate the elements of Corporate Environmental Management systems complying to international environmental management system standards.
C714.2	Lead pollution prevention assessment team and implement waste minimization options
C714.3	Develop, Implement, maintain and Audit Environmental Management systems for Organizations

**Course Code :18CVL76 Course Name : COMPUTER AIDED DETAILING OF STRUCTURES**

CO	Course Outcome
C715.1	Prepare detailed working drawings

**Course Code :18CVL77 Course Name : GEOTECHNICAL ENGINEERING LABORATORY**

CO	Course Outcome
C716.1	Physical and index properties of the soil
C716.2	Classify based on index properties and field identification
C716.3	To determine OMC and MDD, plan and assess field compaction program
C716.4	Shear strength and consolidation parameters to assess strength and deformation characteristics
C716.5	In-situ shear strength characteristics (SPT-Demonstration)

**Course Code :18CV81 Course Name : DESIGN OF PRE-STRESSED CONCRETE**

CO	Course Outcome
C801.1	Understand the requirement of PSC members for present scenario.
C801.2	Analyse the stresses encountered in PSC element during transfer and at working
C801.3	Understand the effectiveness of the design of PSC after studying losses
C801.4	Capable of analyzing the PSC element and finding its efficiency
C801.5	Design PSC beam for different requirements

**Course Code :18CV821 Course Name : BRIDGE ENGINEERING**

CO	Course Outcome
C802.1	Understand the load distribution and IRC standards
C802.2	Design the slab and T beam bridges
C802.3	Design Box culvert, pipe culvert
C802.4	Use bearings, hinges and expansion joints and
C802.5	Design Piers and abutments

**Course Code :18CV822 Course Name : PREFABRICATED STRUCTURES**

CO	Course Outcome
C803.1	Use modular construction, industrialized construction
C803.2	Design prefabricated elements

C803.3	Design some of the prefabricated elements
C803.4	Use the knowledge of the construction methods and prefabricated elements in buildings
<b>Course Code :18CV823 Course Name : ADVANCED FOUNDATION ENGINEERING</b>	
<b>CO</b>	<b>Course Outcome</b>
C804.1	Estimate the size of isolated and combined foundations to satisfy bearing capacity and settlement criteria
C804.2	Estimate the load carrying capacity and settlement of single piles and pile groups including laterally loaded piles
C804.3	Understand the basics of analysis and design principles of well foundation, drilled piers and caissons
C804.4	Understand basics of analysis and design principles of machine foundations
<b>Course Code :18CV824 Course Name : REHABILITATION AND RETROFITTING</b>	
<b>CO</b>	<b>Course Outcome</b>
C805.1	Identify the causes for structural (Concrete) deterioration
C805.2	Assess the type and extent of damage and carry out damage assessment of structures through various types of tests.
C805.3	Recommend maintenance requirements of the buildings and preventive measures against influencing factors
C805.4	Select suitable material and suggest an appropriate method for repair and rehabilitation
<b>Course Code :18CV825 Course Name : PAVEMENT DESIGN</b>	
<b>CO</b>	<b>Course Outcome</b>
C806.1	Systematically generate and compile required data's for design of pavement (Highway & Airfield).
C806.2	Analyze stress, strain and deflection by boussinesq's, bur mister's and westergaard's theory
C806.3	Design rigid pavement and flexible pavement conforming to IRC58-2002 and IRC37-2001
C806.4	Evaluate the performance of the pavement and also develops maintenance statement based on site specific requirements
<b>Course Code :18CVP83 Course Name : PROJECT WORK PHASE-2</b>	
<b>CO</b>	<b>Course Outcome</b>
C807.1	Describe the project and be able to defend it.
C807.2	Develop critical thinking and problem solving skills
C807.3	Learn to use modern tools and techniques
C807.4	Communicate effectively and to present ideas clearly and coherently both in written and oral forms.
C807.5	Develop skills to work in a team to achieve common goal
C807.6	Develop skills of project management and finance
C807.7	Develop skills of self learning, evaluate their learning and take appropriate actions to improve it
C807.8	Prepare them for life-long learning to face the challenges and support the technological changes to meet the societal needs.
<b>Course Code :18CVS84 Course Name : TECHNICAL SEMINAR</b>	
<b>CO</b>	<b>Course Outcome</b>

C808.1	Develop knowledge in the field of Civil Engineering and other disciplines through independent learning and collaborative study
C808.2	Identify and discuss the current, real-time issues and challenges in engineering & technology
C808.3	Develop written and oral communication skills.
C808.4	Explore concepts in larger diverse social and academic contexts
C808.5	Apply principles of ethics and respect in interaction with others
C808.6	Develop the skills to enable life-long learning

**Course Code :18CVI85 Course Name : INTERNSHIP /PROFESSIONAL PRACTICE**

<b>CO</b>	<b>Course Outcome</b>
C809.1	Apply knowledge and skills learned to classroom work.
C809.2	Experience the activities and functions of professionals.
C809.3	Develop and refine oral and written communication skills.
C809.4	Recognize the areas for future knowledge and skill development.
C809.5	Acquire the basic knowledge of administration, marketing, finance and economics
C809.6	Develop the skills to enable lifelong learning.

**ECE Department:**

**Course Code :18MAT31 Course Name: Transform Calculus, Fourier Series And Numerical Techniques**

<b>CO</b>	<b>Course Outcome</b>
C301.1	Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.
C301.2	Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
C301.3	Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.
C301.4	Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
C301.5	Determine the extremals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

**Course Code :18EC32 Course Name :NETWORK THEORY**

<b>CO</b>	<b>Course Outcome</b>
C302.1	Determine currents and voltages using source transformation/ source shifting/ mesh/ nodal analysis and reduce given network using star-delta transformation/source transformation/ source shifting.
C302.2	Solve network problems by applying Superposition/ Reciprocity/ Thevenin's/ Norton's/ Maximum Power Transfer/ Millman's Network Theorems and electrical laws to reduce circuit complexities and to arrive at feasible solutions.
C302.3	Calculate current and voltages for the given circuit under transient conditions.

C302.4	Apply Laplace transform to solve the given network.
C302.5	Solve the given network using specified two port network parameter like Z or Y or T or h.
C302.6	Understand the concept of resonance

<b>Course Code :18EC33 Course Name :ELECTRONIC DEVICES</b>	
<b>CO</b>	<b>Course Outcome</b>
C303.1	Understand the principles of semiconductor Physics
C303.2	Understand the principles and characteristics of different types of semiconductor devices
C303.3	Understand the fabrication process of semiconductor devices
C303.4	Utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.

<b>Course Code :18EC34 Course Name :DIGITAL SYSTEM DESIGN</b>	
<b>CO</b>	<b>Course Outcome</b>
C304.1	Explain the concept of combinational and sequential logic circuits.
C304.2	Design the combinational logic circuits.
C304.3	Design the sequential circuits using SR, JK, D, T flip-flops and Mealy & Moore machines
C304.4	Design applications of Combinational & Sequential Circuits.

<b>Course Code :18EC35 Course Name :COMPUTER ORGANIZATION AND ARCHITECTURE</b>	
<b>CO</b>	<b>Course Outcome</b>
C305.1	Explain the basic organization of a computer system.
C305.2	Explain different ways of accessing an input / output device including interrupts.
C305.3	Illustrate the organization of different types of semiconductor and other secondary storage memories.
C305.4	Illustrate simple processor organization based on hardwired control and micro programmed control.

<b>Course Code :18EC36 Course Name : POWER ELECTRONICS AND INSTRUMENTATION</b>	
<b>CO</b>	<b>Course Outcome</b>
C306.1	Build and test circuits using power electronic devices.
C306.2	Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters and SMPS.
C306.3	Define instrument errors.
C306.4	Develop circuits for multirange Ammeters, Voltmeters and Bridges to measure passive component values and frequency.
C306.5	Describe the principle of operation of Digital instruments and PLCs.
C306.6	Use Instrumentation amplifier for measuring physical parameters.

<b>Course Code :18ECL37 Course Name :Electronic Devices And Instrumentation Laboratory</b>	
<b>CO</b>	<b>Course Outcome</b>
C307.1	Understand the characteristics of various electronic devices and measurement of parameters.
C307.2	Design and test simple electronic circuits.
C307.3	Use of circuit simulation software for the implementation and characterization of electronic circuits and devices.

<b>Course Code :18ECL38 Course Name : DIGITAL SYSTEM DESIGN LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C308.1	Demonstrate the truth table of various expressions and combinational circuits using logicgates.
C308.2	Design various combinational circuits such as adders, subtractors, comparators, multiplexers and demultiplexers.
C308.3	Construct flips-flops, counters and shift registers.
C308.4	Simulate Serial adder and Binary Multiplier.

<b>Course Code :18KAK28/39/49 Course Name :Aadalitha Kannada</b>	
<b>CO</b>	<b>Course Outcome</b>
C309.1	• ಆಡಳಿತ ಭಾಷೆ ಕನ್ನಡದ ಪರಿಚಯವಾಗುತ್ತದೆ.
C309.2	• ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡುತ್ತದೆ.
C309.3	• ಕನ್ನಡ ಭಾಷಾ ರಚನೆಯಲ್ಲಿನ ನಿಯಮಗಳು ಮತ್ತು ಲೇಖನ ಚಿಹ್ನೆಗಳು ಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ.
C309.4	• ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡುತ್ತದೆ.
C309.5	• ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಅಸಕ್ತಿ ಮೂಡುತ್ತದೆ.
C309.6	• ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ ಮತ್ತು ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳು ಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ.

<b>Course Code :8KVK28/39/49 Course Name :Vyavaharika Kannada</b>	
<b>CO</b>	<b>Course Outcome</b>
C3010.1	understand Kannada and communicate in Kannada language.

<b>Course Code :18CPC39/49 Course Name :CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW (CPC)</b>	
<b>CO</b>	<b>Course Outcome</b>
C3011.1	Have constitutional knowledge and legal literacy.
C3011.2	Understand Engineering and Professional ethics and responsibilities of Engineers.
C3011.3	Understand the the cybercrimes and cyber laws for cyber safety measures.

<b>Course Code :18MATDIP31 Course Name :ADDITIONAL MATHEMATICS – I</b>	
<b>CO</b>	<b>Course Outcome</b>
C3012.1	Apply concepts of complex numbers and vector algebra to analyze the problems arising in related area.
C3012.2	Use derivatives and partial derivatives to calculate rate of change of multivariate functions.
C3012.3	Analyze position, velocity and acceleration in two and three dimensions of vector valued functions.
C3012.4	Learn techniques of integration including the evaluation of double and triple integrals.
C3012.5	Identify and solve first order ordinary differential equations.

<b>Course Code :18MAT41 Course Name: COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS</b>	
<b>CO</b>	<b>Course Outcome</b>
C401.1	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
C401.2	Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.

C401.3	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
C401.4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
C401.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis.

<b>Course Code :18EC42 Course Name :ANALOG CIRCUITS</b>	
<b>CO</b>	<b>Course Outcome</b>
C402.1	Understand the characteristics of BJTs and FETs.
C402.2	Design and analyze BJT and FET amplifier circuits.
C402.3	Design sinusoidal and non-sinusoidal oscillators.
C402.4	Understand the functioning of linear ICs.
C402.5	Design of Linear IC based circuits.

<b>Course Code : 18EC43 Course Name :CONTROL SYSTEMS</b>	
<b>CO</b>	<b>Course Outcome</b>
C403.1	Develop the mathematical model of mechanical and electrical systems.
C403.2	Develop transfer function for a given control system using block diagram reduction techniques and signal flow graph method.
C403.3	Determine the time domain specifications for first and second order systems.
C403.4	Determine the stability of a system in the time domain using Routh-Hurwitz criterion and Root-locus technique.
C403.5	Determine the stability of a system in the frequency domain using Nyquist and bode plots.

<b>Course Code :18EC44 Course Name :ENGINEERING STATISTICS and LINEAR ALGEBRA</b>	
<b>CO</b>	<b>Course Outcome</b>
C404.1	Identify and associate Random Variables and Random Processes in Communication events.
C404.2	Analyze and model the Random events in typical communication events to extract quantitative statistical parameters.
C404.3	Analyze and model typical signal sets in terms of a basis function set of Amplitude, phase and frequency.
C404.4	Demonstrate by way of simulation or emulation the ease of analysis employing basis functions, statistical representation and Eigen values.

<b>Course Code :18EC45 Course Name :SIGNALS AND SYSTEMS</b>	
<b>CO</b>	<b>Course Outcome</b>
C405.1	Analyze the different types of signals and systems.
C405.2	Determine the linearity, causality, time-invariance and stability properties of continuous and discrete time systems.
C405.3	Represent continuous and discrete systems in time and frequency domain using different transforms Test whether the system is stable.

<b>Course Code :18EC46 Course Name :MICROCONTROLLER</b>	
<b>CO</b>	<b>Course Outcome</b>

C406.1	Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 Microcontroller, Interfacing of 8051 to external memory and Instruction set of 8051.
C406.2	Write 8051 Assembly level programs using 8051 instruction set.
C406.3	Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051.
C406.4	Write 8051 Assembly language program to generate timings and waveforms using 8051 timers, to send & receive serial data using 8051 serial port and to generate an external interrupt using a switch.
C406.5	Write 8051 Assembly language programs to generate square wave on 8051 I/O port pin using interrupt and C Programme to send & receive serial data using 8051 serial port.
C406.6	Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 using 8051 I/O ports.

<b>Course Code :18ECL47 Course Name :MICROCONTROLLER LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C407.1	Write Assembly language programs in 8051 for solving simple problems that manipulate input data using different instructions of 8051.
C407.2	Interface different input and output devices to 8051 and control them using Assembly language programs.
C407.3	Interface the serial devices to 8051 and do the serial transfer using C programming.

<b>Course Code :18ECL48 Course Name :ANALOG CIRCUITS LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C408.1	Design analog circuits using BJT/FETs and evaluate their performance characteristics.
C408.2	Design analog circuits using OPAMPs for different applications
C408.3	Simulate and analyze analog circuits that uses ICs for different electronic applications.

<b>Course Code :18MATDIP41 Course Name :ADDITIONAL MATHEMATICS – II</b>	
<b>CO</b>	<b>Course Outcome</b>
C409.1	Solve systems of linear equations using matrix algebra.
C409.2	Apply the knowledge of numerical methods in modelling and solving engineering problems.
C409.3	Make use of analytical methods to solve higher order differential equations.
C409.4	Classify partial differential equations and solve them by exact methods.
C409.5	Apply elementary probability theory and solve related problems.

<b>Course Code :18ES51 Course Name: TECHNOLOGICAL INNOVATION MANAGEMENT AND ENTREPRENEURSHIP</b>	
<b>CO</b>	<b>Course Outcome</b>
C501.1	Understand the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup a business
C501.2	Describe the functions of Managers, Entrepreneurs and their social responsibilities
C501.3	Understand the components in developing a business plan
C501.4	Awareness about various sources of funding and institutions supporting entrepreneurs

<b>Course Code :18EC52 Course Name :DIGITAL SIGNAL PROCESSING</b>	
<b>CO</b>	<b>Course Outcome</b>

C502.1	Determine response of LTI systems using time domain and DFT techniques.
C502.2	Compute DFT of real and complex discrete time signals.
C502.3	Computation of DFT using FFT algorithms and linear filtering approach.
C502.4	Design and realize FIR and IIR digital filters
C502.5	Understand the DSP processor architecture.

<b>Course Code :18EC53 Course Name :PRINCIPLES OF COMMUNICATION SYSTEMS</b>	
<b>CO</b>	<b>Course Outcome</b>
C503.1	Analyze and compute performance of AM and FM modulation in the presence of noise at the receiver.
C503.2	Analyze and compute performance of digital formatting processes with quantization noise.
C503.3	Multiplex digitally formatted signals at Transmitter and demultiplex the signals and reconstruct digitally formatted signals at the receiver.
C503.4	Design/Demonstrate the use of digital formatting in Multiplexers, Vocoders and Video transmission.

<b>Course Code :18EC54 Course Name :INFORMATION THEORY and CODING</b>	
<b>CO</b>	<b>Course Outcome</b>
C504.1	Explain concept of Dependent & Independent Source, measure of information, Entropy, Rate of Information and Order of a source
C504.2	Represent the information using Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithms
C504.3	Model the continuous and discrete communication channels using input, output and joint probabilities
C504.4	Determine a codeword comprising of the check bits computed using Linear Block codes, cyclic codes & convolutional codes
C504.5	Design the encoding and decoding circuits for Linear Block codes, cyclic codes, convolutional codes, BCH and Golay codes.

<b>Course Code :18EC55 Course Name :ELECTROMAGNETIC WAVES</b>	
<b>CO</b>	<b>Course Outcome</b>
C505.1	Evaluate problems on electrostatic force, electric field due to point, linear, volume charges by applying conventional methods and charge in a volume.
C505.2	Apply Gauss law to evaluate Electric fields due to different charge distributions and Volume Charge distribution by using Divergence Theorem.
C505.3	Determine potential and energy with respect to point charge and capacitance using Laplace equation and Apply Biot-Savart's and Ampere's laws for evaluating Magnetic field for different current configurations
C505.4	Calculate magnetic force, potential energy and Magnetization with respect to magnetic materials and voltage induced in electric circuits.
C505.5	Apply Maxwell's equations for time varying fields, EM waves in free space and conductors and Evaluate power associated with EM waves using Poynting theorem

<b>Course Code :18EC56 Course Name :Verilog HDL</b>	
<b>CO</b>	<b>Course Outcome</b>
C506.1	Write Verilog programs in gate, dataflow (RTL), behavioral and switch modeling levels of Abstraction.

C506.2	Design and verify the functionality of digital circuit/system using test benches.
C506.3	Identify the suitable Abstraction level for a particular digital design.
C506.4	Write the programs more effectively using Verilog tasks, functions and directives.
C506.5	Perform timing and delay Simulation
C506.6	Interpret the various constructs in logic synthesis.

<b>Course Code :18ECL57 Course Name :DIGITAL SIGNAL PROCESSING LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C507.1	Understand the concepts of analog to digital conversion of signals and frequency domain sampling of signals.
C507.2	Modeling of discrete time signals and systems and verification of its properties and results.
C507.3	Implementation of discrete computations using DSP processor and verify the results.
C507.4	Realize the digital filters using a simulation tool and analyze the response of the filter for an audio signal.

<b>Course Code : 18ECL58 Course Name : HDL LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C508.1	Write the Verilog/VHDL programs to simulate Combinational circuits in Dataflow, Behavioral and Gate level Abstractions.
C508.2	Describe sequential circuits like flip flops and counters in Behavioral description and obtain simulation waveforms.
C508.3	Synthesize Combinational and Sequential circuits on programmable ICs and test the hardware.
C508.4	Interface the hardware to the programmable chips and obtain the required output

<b>Course Code : 18CIV59 Course Name : ENVIRONMENTAL STUDIES</b>	
<b>CO</b>	<b>Course Outcome</b>
C509.1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale
C509.2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
C509.3	Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components.
C509.4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

<b>Course Code :18EC61 Course Name: DIGITAL COMMUNICATION</b>	
<b>CO</b>	<b>Course Outcome</b>
C601.1	Associate and apply the concepts of Bandpass sampling to well specified signals and channels.
C601.2	Analyze and compute performance parameters and transfer rates for low pass and bandpass symbol under ideal and corrupted non band limited channels.
C601.3	Test and validate symbol processing and performance parameters at the receiver under ideal and corrupted bandlimited channels.
C601.4	Demonstrate that bandpass signals subjected to corruption and distortion in a bandlimited channel can be processed at the receiver to meet specified performance criteria.

<b>Course Code :18EC62 Course Name :EMBEDDED SYSTEMS</b>	
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<b>CO</b>	<b>Course Outcome</b>
C602.1	Describe the architectural features and instructions of 32 bit microcontroller ARM Cortex M3.
C602.2	Apply the knowledge gained for Programming ARM Cortex M3 for different applications.
C602.3	Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
C602.4	Develop the hardware software co-design and firmware design approaches.
C602.5	Explain the need of real time operating system for embedded system applications.

<b>Course Code :18EC63 Course Name :MICROWAVE and ANTENNAS</b>	
<b>CO</b>	<b>Course Outcome</b>
C603.1	Describe the use and advantages of microwave transmission
C603.2	Analyze various parameters related to microwave transmission lines and waveguides
C603.3	Identify microwave devices for several applications
C603.4	Analyze various antenna parameters necessary for building a RF system
C603.5	Recommend various antenna configurations according to the applications.

<b>Course Code : 18EC 646 Course Name : PYTHON APPLICATION PROGRAMMING</b>	
<b>CO</b>	<b>Course Outcome</b>
C604.1	Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
C604.2	Demonstrate proficiency in handling Strings and File Systems.
C604.3	Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
C604.4	Interpret the concepts of Object-Oriented Programming as used in Python.
C604.5	Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

<b>Course Code :18CS651 Course Name :MOBILE APPLICATION DEVELOPMENT</b>	
<b>CO</b>	<b>Course Outcome</b>
C605.1	Create, test and debug Android application by setting up Android development environment
C605.2	• Implement adaptive, responsive user interfaces that work across a wide range of devices.
C605.3	• Infer long running tasks and background work in Android applications
C605.4	• Demonstrate methods in storing, sharing and retrieving data in Android applications
C605.5	• Analyze performance of android applications and understand the role of permissions and security
C605.6	• Describe the steps involved in publishing Android application to share with the world

<b>Course Code : 18ECL66 Course Name : EMBEDDED SYSTEMS LAB</b>	
<b>CO</b>	<b>Course Outcome</b>
C606.1	Understand the instruction set of 32 bit microcontroller ARM Cortex M3, and the software tool required for programming in Assembly and C language.
C606.2	Develop assembly language programs using ARM Cortex M3 for different applications.
C606.3	Interface external devices and I/O with ARM Cortex M3.
C606.4	Develop C language programs and library functions for embedded system applications.

<b>Course Code : 18ECL67 Course Name : COMMUNICATION LAB</b>	
<b>CO</b>	<b>Course Outcome</b>
C607.1	Determine the characteristics and response of microwave waveguide.
C607.2	Determine the characteristics of microstrip antennas and devices and compute the parameters associated with it.
C607.3	Design and test the digital and analog modulation circuits and display the waveforms.
C607.4	Simulate the digital modulation systems and compare the error performance of basic digital modulation schemes.

<b>Course Code : 18EC71 Course Name: COMPUTER NETWORKS</b>	
<b>CO</b>	<b>Course Outcome</b>
C701.1	Understand the concepts of networking thoroughly
C701.2	Identify the protocols and services of different layers.
C701.3	Distinguish the basic network configurations and standards associated with each network.
C701.4	Analyze a simple network and measurement of its parameters.

<b>Course Code : 18EC72 Course Name : VLSI DESIGN</b>	
<b>CO</b>	<b>Course Outcome</b>
C702.1	Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling.
C702.2	Draw the basic gates using the stick and layout diagrams with the knowledge of physical design aspects.
C702.3	Demonstrate ability to design Combinational, sequential and dynamic logic circuits as per the requirements
C702.4	Interpret Memory elements along with timing considerations
C702.5	Interpret testing and testability issues in VLSI Design

<b>Course Code : 18EC733 Course Name : DIGITAL IMAGEPROCESSING</b>	
<b>CO</b>	<b>Course Outcome</b>
C703.1	Understand image formation and the role human visual system plays in perception of gray and color image data.
C703.2	Apply image processing techniques in both the spatial and frequency (Fourier) domains.
C703.3	Design and evaluate image analysis techniques
C703.4	Conduct independent study and analysis of Image Enhancement and restoration techniques.

<b>Course Code : 18EC741 Course Name : IoT &amp; WIRELESS SENSOR NETWORKS</b>	
<b>CO</b>	<b>Course Outcome</b>
C704.1	Understand choice and application of IoT & M2M communication protocols.
C704.2	Describe Cloud computing and design principles of IoT.
C704.3	Awareness of MQTT clients, MQTT server and its programming.
C704.4	Develop an architecture and its communication protocols of of WSNs.

<b>Course Code : 18EE754 Course Name : ELECTRICAL ENERGY CONSERVATION AND AUDITING</b>	
<b>CO</b>	<b>Course Outcome</b>

C705.1	Analyze about energy scenario nationwide and worldwide , also outline Energy Conservation Act and its features.
C705.2	Discuss load management techniques and energy efficiency.
C705.3	Understand the need of energy audit and energy audit methodology.
C705.4	Understand various pillars of electricity market design. • Conduct energy audit of electrical systems and buildings.
C705.5	Show an understanding of demand side management and energy conservation.

<b>Course Code : 18ME753 Course Name : INDUSTRIAL SAFETY</b>	
<b>CO</b>	<b>Course Outcome</b>
C706.1	Understand the basic safety terms and international standards.
C706.2	Identify the hazards and risk analysis around the work environment and industries.
C706.3	Use the safe measures while performing work in and around the work area of the available laboratories. Able to recognize the sign boards and its application
C706.4	Recognise the types of fires extinguishers and to demonstrate the portable extinguishers used for different classes of fires.
C706.5	Report the case studies by sharing experience of the employees working in housekeeping, laboratories like workshops, electrical labs, machine shops, electronics and computer laboratories.
C706.6	Recognise the chemical and electrical hazards for its prevention and control.

<b>Course Code : 18ECL76 Course Name : COMPUTER NETWORKS LAB</b>	
<b>CO</b>	<b>Course Outcome</b>
C707.1	Use the network simulator for learning and practice of networking algorithms.
C707.2	Illustrate the operations of network protocols and algorithms using C programming.
C707.3	Simulate the network with different configurations to measure the performance parameters.
C707.4	Implement the data link and routing protocols using C programming.

<b>Course Code : 18ECL77 Course Name : VLSI LAB</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Design and simulate combinational and sequential digital circuits using Verilog HDL
C708.2	Understand the Synthesis process of digital circuits using EDA tool.
C708.3	Perform ASIC design flow and understand the process of synthesis, synthesis constraints and evaluating the synthesis reports to obtain optimum gate level net list
C708.4	Design and simulate basic CMOS circuits like inverter, common source amplifier and differential amplifiers.
C708.5	Perform RTL-GDSII flow and understand the stages in ASIC design.

<b>Course Code : 18EC81 Course Name WIRELESS AND CELLULAR COMMUNICATION</b>	
<b>CO</b>	<b>Course Outcome</b>
C801.1	Explain concepts of propagation mechanisms like Reflection, Diffraction, Scattering in wireless channels.
C801.2	Develop a scheme for idle mode, call set up, call progress handling and call tear down in a GSM cellular network.

C801.3	Develop a scheme for idle mode, call set up, call progress handling and call tear down in a CDMA cellular network.
C801.4	Understand the Basic operations of Air interface in a LTE 4G system.

## EEE Department:

<b>Course Code :18MAT31 Course Name: Transform Calculus, Fourier Series And Numerical Techniques</b>	
<b>CO</b>	<b>Course Outcome</b>
C301.1	Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.
C301.2	Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
C301.3	Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.
C301.4	Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
C301.5	Determine the externals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

<b>Course Code :18EE32 Course Name :ELECTRIC CIRCUIT ANALYSIS</b>	
<b>CO</b>	<b>Course Outcome</b>
C302.1	Understand the basic concepts, basic laws and methods of analysis of DC and AC networks and reduce the complexity of network using source shifting, source transformation and network reduction using transformations
C302.2	Solve complex electric circuits using network theorems.
C302.3	Discuss resonance in series and parallel circuits and also the importance of initial conditions and their evaluation
C302.4	Synthesize typical waveforms using Laplace transformation
C302.5	Solve unbalanced three phase systems and also evaluate the performance of two port networks

<b>Course Code :18EE33 Course Name :TRANSFORMERS AND GENERATORS</b>	
<b>CO</b>	<b>Course Outcome</b>
C303.1	Understand the construction and operation of 1-phase, 3-Phase transformers and Autotransformer.
C303.2	Analyze the performance of transformers by polarity test, Sumpner's Test, phase conversion, 3-phase connection, and parallel operation.
C303.3	Understand the construction and working of AC and DC Generators.

C303.4	Analyze the performance of the AC Generators on infinite bus and parallel operation.
C303.5	Determine the regulation of AC Generator by Slip test, EMF, MMF, and ZPF Methods

<b>Course Code :18EE34 Course Name :ANALOG ELECTRONIC CIRCUITS</b>	
<b>CO</b>	<b>Course Outcome</b>
C304.1	Obtain the output characteristics of clipper and clamper circuits.
C304.2	Design and compare biasing circuits for transistor amplifiers & explain the transistor switching.
C304.3	Explain the concept of feedback, its types and design of feedback circuits
C304.4	Design and analyze the power amplifier circuits and oscillators for different frequencies.
C304.5	Design and analysis of FET and MOSFET amplifiers

<b>Course Code :18EE35 Course Name :DIGITAL SYSTEM DESIGN</b>	
<b>CO</b>	<b>Course Outcome</b>
C305.1	Develop simplified switching equation using Karnaugh Maps and QuineMcClusky techniques.
C305.2	Design Multiplexer, Encoder, Decoder, Adder, Subtractors and Comparator as digital combinational control circuits.
C305.3	Design flip flops, counters, shift registers as sequential control circuits.
C305.4	Develop Mealy/Moore Models and state diagrams for the given clocked sequential circuits.
C305.5	Explain the functioning of Read only and Read/Write Memories, Programmable ROM, EPROM and Flash memory.

<b>Course Code :18EE36 Course Name :ELECTRICAL AND ELECTRONIC MEASUREMENTS</b>	
<b>CO</b>	<b>Course Outcome</b>
C306.1	Measure resistance, inductance and capacitance using bridges and determine earth resistance.
C306.2	Explain the working of various meters used for measurement of Power, Energy & understand the adjustments, calibration & errors in energy meters.
C306.3	Understand methods of extending the range of instruments & instrument transformers.
C306.4	Explain the working of different electronic instruments.
C306.5	Explain the working of different display and recording devices

<b>Course Code :18EEL37 Course Name :ELECTRICAL MACHINES LABORATORY - 1</b>	
<b>CO</b>	<b>Course Outcome</b>
C307.1	Evaluate the performance of transformers from the test data obtained.
C307.2	Connect and operate two single phase transformers of different KVA rating in parallel.
C307.3	Connect single phase transformers for three phase operation and phase conversion.
C307.4	Compute the voltage regulation of synchronous generator using the test data obtained in the laboratory.
C307.5	Evaluate the performance of synchronous generators from the test data and assess the performance of synchronous generator connected to infinite bus.

<b>Course Code :18EEL38 Course Name :ELECTRONICS LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C308.1	Design and test rectifier circuits with and without capacitor filters.
C308.2	Determine h-parameter models of transistor for all modes.

C308.3	Design and test BJT and FET amplifier and oscillator circuits.
C308.4	Realize Boolean expressions, adders and subtractors using gates.
C308.5	Design and test Ring counter/Johnson counter, Sequence generator and 3 bit counters

<b>Course Code :18KAK28/39/49 Course Name :Aadalitha Kannada</b>	
<b>CO</b>	<b>Course Outcome</b>
C308.1	• ಆಡಳಿತ ಭಾಷೆ ಕನ್ನಡದ ಪರಿಚಯವಾಗುತ್ತದೆ.
C308.2	• ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡುತ್ತದೆ.
C308.3	• ಕನ್ನಡ ಭಾಷಾ ರಚನೆಯಲ್ಲಿನ ನಿಯಮಗಳು ಮತ್ತು ಲೇಖನ ಚಿಹ್ನೆಗಳು ಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ.
C308.4	• ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡುತ್ತದೆ.
C308.5	• ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಅನುಕ್ರಮ ಮೂಡುತ್ತದೆ.
C308.6	• ಕನ್ನಡ ಭಾಷಾವ್ಯಾಸ ಮತ್ತು ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳು ಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ.

<b>Course Code :18KVK28/39/49 Course Name : Vyavaharika Kannada</b>	
<b>CO</b>	<b>Course Outcome</b>
C308.1	The student will be able to understand Kannada and communicate in Kannada language.

<b>Course Code :18CPC39/49 Course Name : CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW (CPC)</b>	
<b>CO</b>	<b>Course Outcome</b>
C308.1	Have constitutional knowledge and legal literacy.
C308.2	Understand Engineering and Professional ethics and responsibilities of Engineers.
C308.3	Understand the the cybercrimes and cyber laws for cyber safety measures

<b>Course Code :18MATDIP31 Course Name : ADDITIONAL MATHEMATICS – I</b>	
<b>CO</b>	<b>Course Outcome</b>
C308.1	Apply concepts of complex numbers and vector algebra to analyze the problems arising in related area.
C308.2	Use derivatives and partial derivatives to calculate rate of change of multivariate functions.
C308.3	Analyze position, velocity and acceleration in two and three dimensions of vector valued functions.
C308.4	Learn techniques of integration including the evaluation of double and triple integrals.
C308.5	Identify and solve first order ordinary differential equations

<b>Course Code :18MAT41 Course Name : COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS</b>	
<b>CO</b>	<b>Course Outcome</b>
C401.1	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
C401.2	Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
C401.3	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
C401.4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
C401.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis

<b>Course Code :18EE42 Course Name :POWER GENERATION AND ECONOMICS</b>	
<b>CO</b>	<b>Course Outcome</b>
C402.1	Describe the working of hydroelectric, steam, nuclear power plants and state functions of major equipment of the power plants.
C402.2	Classify various substations and explain the functions of major equipments in substations.
C402.3	Explain the types of grounding and its importance.
C402.4	Infer the economic aspects of power system operation and its effects.
C402.5	Explain the importance of power factor improvement.

<b>Course Code :18EE43 Course Name :TRANSMISSION AND DISTRIBUTION</b>	
<b>CO</b>	<b>Course Outcome</b>
C403.1	Explain transmission and distribution scheme, identify the importance of different transmission systems and types of insulators.
C403.2	Analyze and compute the parameters of the transmission line for different configurations.
C403.3	Assess the performance of overhead lines.
C403.4	Interpret corona, explain the use of underground cables.
C403.5	Classify different types of distribution systems; examine its quality & reliability

<b>Course Code :18EE44 Course Name :ELECTRIC MOTORS</b>	
<b>CO</b>	<b>Course Outcome</b>
C404.1	Explain the construction, operation and classification of DC Motor, AC motor and Special purpose motors.
C404.2	Describe the performance characteristics & applications of Electric motors.
C404.3	Demonstrate and explain the methods of testing of DC machines and determine losses and efficiency.
C404.4	Control the speed of DC motor and induction motor.
C404.5	Explain the starting methods, equivalent circuit and phasor diagrams, torque angle, effect of change in excitation and change in load, hunting and damping of synchronous motors

<b>Course Code :18EE45 Course Name :ELECTROMAGNETIC FIELD THEORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C405.1	Use different coordinate systems , Coulomb's Law and Gauss Law for the evaluation of electric fields produced by different charge configurations.
C405.2	Calculate the energy and potential due to a system of charges & Explain the behavior of electric field across a boundary conditions.
C405.3	Explain the Poisson's, Laplace equations and behavior of steady magnetic fields.
C405.4	Explain the behavior of magnetic fields and magnetic materials.
C405.5	Asses time varying fields and propagation of waves in different media

<b>Course Code :18EE46 Course Name :OPERATIONAL AMPLIFIERS AND LINEAR ICs</b>	
<b>CO</b>	<b>Course Outcome</b>
C406.1	Describe the characteristics of ideal and practical operational amplifier.
C406.2	Design filters and signal generators using linear ICs.
C406.3	Demonstrate the application of Linear ICs as comparators and rectifiers.

C406.4	Analyze voltage regulators for given specification using op-amp and IC voltage regulators.
C406.5	Summarize the basics of PLL and Timer

<b>Course Code :18EEL47 Course Name : ELECTRICAL MACHINES LABORATORY - 2</b>	
<b>CO</b>	<b>Course Outcome</b>
C407.1	Test DC machines to determine their characteristics and also to control the speed of DC motor.
C407.2	Pre-determine the performance characteristics of DC machines by conducting suitable tests.
C407.3	Perform load test on single phase and three phase induction motor to assess its performance.
C407.4	Conduct test on induction motor to pre-determine the performance characteristics.
C407.5	Conduct test on synchronous motor to draw the performance curves

<b>Course Code :18EEL48 Course Name :OP- AMP AND LINEAR ICS LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C408.1	To conduct experiment to determine the characteristic parameters of OP-Amp
C408.2	To design test the OP-Amp as Amplifier, adder, subtractor, differentiator and integrator.
C408.3	To design test the OP-Amp as oscillators and filters.
C408.4	Design and study of Linear IC's as multivibrator power supplies

<b>Course Code :18MATDIP41 Course Name :ADDITIONAL MATHEMATICS – II</b>	
<b>CO</b>	<b>Course Outcome</b>
C408.1	Solve systems of linear equations using matrix algebra.
C408.2	Apply the knowledge of numerical methods in modelling and solving engineering problems.
C408.3	Make use of analytical methods to solve higher order differential equations.
C408.4	Classify partial differential equations and solve them by exact methods.
C408.5	Apply elementary probability theory and solve related problems.

<b>Course Code :18EE51 Course Name MANAGEMENT AND ENTREPRENEURSHIP</b>	
<b>CO</b>	<b>Course Outcome</b>
C501.1	Explain the field of management, task of the manager, planning and steps in decision making.
C501.2	Discuss the structure of organization, importance of staffing, leadership styles, modes of communication, techniques of coordination and importance of managerial control in business.
C501.3	Explain the concepts of entrepreneurship and a businessman's social responsibilities towards different groups.
C501.4	Show an understanding of role of SSI's in the development of country and state/central level institutions/agencies supporting business enterprises.
C501.5	Discuss the concepts of project management, capital budgeting, project feasibility studies, need for project

<b>Course Code :18EE52 Course Name :MICROCONTROLLER</b>	
<b>CO</b>	<b>Course Outcome</b>
C502.1	Outline the 8051 architecture, registers, internal memory organization, addressing modes.
C502.2	Discuss 8051 addressing modes, instruction set of 8051, accessing data and I/O port programming.

C502.3	Develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic and arithmetic operations, data conversion and timer/counter programming.
C502.4	Summarize the basics of serial communication and interrupts, also develop 8051 programs for serial data communication and interrupt programming.
C502.5	Program 8051 to work with external devices for ADC, DAC, Stepper motor control, DC motor control, Elevator control

<b>Course Code :18EE53 Course Name :POWER ELECTRONICS</b>	
<b>CO</b>	<b>Course Outcome</b>
C503.1	To give an overview of applications power electronics, different types of power semiconductor devices, their switching characteristics, power diode characteristics, types, their operation and the effects of power diodes on RL circuits.
C503.2	To explain the techniques for design and analysis of single phase diode rectifier circuits.
C503.3	To explain different power transistors, their steady state and switching characteristics and limitations.
C503.4	To explain different types of Thyristors, their gate characteristics and gate control requirements.
C503.5	To explain the design, analysis techniques, performance parameters and characteristics of controlled rectifiers, DC- DC, DC -AC converters and Voltage controllers

<b>Course Code :18EE54 Course Name :SIGNALS AND SYSTEMS</b>	
<b>CO</b>	<b>Course Outcome</b>
C504.1	Explain the generation of signals, behavior of system and the basic operations that can be performed on signals and properties of systems.
C504.2	Apply convolution in both continuous and discrete domain for the analysis of systems given impulse response of a system.
C504.3	Solve the continuous time and discrete time systems by various methods and their representation by block diagram.
C504.4	Perform Fourier analysis for continuous and discrete time, linear time invariant systems.
C504.5	Apply Z-transform and properties of Z transform for the analysis of discrete time systems

<b>Course Code :18EE55 Course Name :ELECTRICAL MACHINE DESIGN</b>	
<b>CO</b>	<b>Course Outcome</b>
C505.1	Identify and list, limitations, modern trends in design, manufacturing of electrical machines and properties of materials used in the electrical machines.
C505.2	Derive the output equation of DC machine, discuss selection of specific loadings and magnetic circuits of DC machines, design the field windings of DC machine, and design stator and rotor circuits of a DC machine.
C505.3	Derive the output equations of transformer, discuss selection of specific loadings, estimate the number of cooling tubes, no load current and leakage reactance of core type transformer.
C505.4	Develop the output equation of induction motor, discuss selection of specific loadings and magnetic circuits of induction motor, design stator and rotor circuits of a induction motor.
C505.5	Formulate the output equation of alternator, design the field windings of Synchronous machine, discuss short circuit ratio and its effects on performance of synchronous machines, design salient pole and non-salient pole alternators for given specifications

<b>Course Code :18EE56 Course Name :HIGH VOLTAGE ENGINEERING</b>	
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<b>CO</b>	<b>Course Outcome</b>
C506.1	Explain conduction and breakdown phenomenon in gases, liquid dielectrics and breakdown phenomenon in solid dielectrics.
C506.2	Summarize generation of high voltages and currents
C506.3	Outline measurement techniques for high voltages and currents.
C506.4	Summarize overvoltage phenomenon and insulation coordination in electric power systems.
C506.5	Explain non-destructive testing of materials and electric apparatus, high-voltage testing of electric apparatus

<b>Course Code :18EEL57 Course Name :MICROCONTROLLER LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C507.1	Write assembly language programs for data transfer, arithmetic, Boolean and logical instructions and code conversions.
C507.2	Write ALP using subroutines for generation of delays, counters, configuration of SFRs for serial communication and timers.
C507.3	Perform interfacing of stepper motor and dc motor for controlling the speed, elevator, LCD, external ADC and temperature control.
C507.4	Generate different waveforms using DAC interface.
C507.5	Work with a small team to carryout experiments using microcontroller concepts and prepare reports that present lab work

<b>Course Code :18EEL58 Course Name :POWER ELECTRONICS LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C508.1	Obtain static characteristics of semiconductor devices to discuss their performance.
C508.2	Trigger the SCR by different methods
C508.3	Verify the performance of single phase controlled full wave rectifier and AC voltage controller with R and RL loads.
C508.4	Control the speed of a DC motor, universal motor and stepper motors.
C508.5	Verify the performance of single phase full bridge inverter connected to resistive load

<b>Course Code :18CIV59 Course Name :ENVIRONMENTAL STUDIES</b>	
<b>CO</b>	<b>Course Outcome</b>
C508.1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale
C508.2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
C508.3	Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components.
C508.4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues

<b>Course Code :18EE61 Course Name : CONTROL SYSTEMS</b>	
<b>CO</b>	<b>Course Outcome</b>
C601.1	Analyze and model electrical and mechanical system using analogous.
C601.2	Formulate transfer functions using block diagram and signal flow graphs.

C601.3	Analyze the stability of control system, ability to determine transient and steady state time response.
C601.4	Illustrate the performance of a given system in time and frequency domains, stability analysis using Root locus and Bode plots.
C601.5	Discuss stability analysis using Nyquist plots, Design controller and compensator for a given specification

<b>Course Code :18EE62 Course Name :POWER SYSTEM ANALYSIS – 1</b>	
<b>CO</b>	<b>Course Outcome</b>
C602.1	Model the power system components & construct per unit impedance diagram of power system.
C602.2	Analyze three phase symmetrical faults on power system.
C602.3	Compute unbalanced phasors in terms of sequence components and vice versa, also develop sequence networks.
C602.4	Analyze various unsymmetrical faults on power system.
C602.5	Examine dynamics of synchronous machine and determine the power system stability

<b>Course Code :18EE63 Course Name :DIGITAL SIGNAL PROCESSING</b>	
<b>CO</b>	<b>Course Outcome</b>
C603.1	Apply DFT and IDFT to perform linear filtering techniques on given sequences to determine the output.
C603.2	Apply fast and efficient algorithms for computing DFT and inverse DFT of a given sequence
C603.3	Design and realize infinite impulse response Butterworth and Chebyshev digital filters using impulse invariant and bilinear transformation techniques.
C603.4	Develop a digital IIR filter by direct, cascade, parallel, ladder and FIR filter by direct, cascade and linear phase methods of realization.
C603.5	Design and realize FIR filters by use of window function and frequency sampling method

<b>Course Code :18EE641 Course Name :INTRODUCTION TO NUCLEAR POWER</b>	
<b>CO</b>	<b>Course Outcome</b>
C604.1	Explain the fission process in nuclear materials, basic components of nuclear reactors, types of nuclear reactors and their working.
C604.2	List different types of coolants, their features, and cooling of reactors,
C604.3	Summarize loss of cooling accidents in different reactors.
C604.4	Discuss postulated severe accidents in reactors and cooling of reactor during removal of spent fuel.
C604.5	Discuss cooling and disposing the nuclear waste and prospect of fusion energy in the future.

<b>Course Code :18EE642 Course Name :ELECTRICAL ENGINEERING MATERIALS</b>	
<b>CO</b>	<b>Course Outcome</b>
C605.1	Discuss electrical and electronics materials, their importance, classification and operational requirement
C605.2	Discuss conducting, dielectric, insulating and magnetic materials used in engineering, their properties and classification.
C605.3	Explain the phenomenon superconductivity, super conducting materials and their application in engineering.
C605.4	Explain the plastic and its properties and applications

<b>Course Code :18EE643 Course Name :COMPUTER AIDED ELECTRICAL DRAWING</b>	
<b>CO</b>	<b>Course Outcome</b>
C606.1	Develop armature winding diagram for DC and AC machines
C606.2	Develop a Single Line Diagram of Generating Stations and substation using the standard symbols.
C606.3	Construct sectional views of core and shell types transformers using the design data
C606.4	Construct sectional views of assembled DC and AC machine and their parts using the design data or the sketches

<b>Course Code :18EE644 Course Name :EMBEDDED SYSTEMS</b>	
<b>CO</b>	<b>Course Outcome</b>
C607.1	Identify the Embedded system components.
C607.2	Apply technological aspects to various interfacing with devices.
C607.3	Elaborate various design trade-offs.
C607.4	Apply software aspects and programming concepts to the design of Embedded System.
C607.5	Explain how to interface subsystems with external systems

<b>Course Code :18EE645 Course Name :OBJECT ORIENTED PROGRAMMING USING C++</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	Explain the basics of Object Oriented Programming concepts.
C608.2	Apply the object initialization and destroy concept using constructors and destructors.
C608.3	Apply the concept of polymorphism to implement compile time polymorphism in programs by using overloading methods and operators.
C608.4	Utilize the concept of inheritance to reduce the length of code and evaluate the usefulness.
C608.5	Apply the concept of run time polymorphism by using virtual functions, overriding functions and abstract class in programs.
C608.6	Utilize I/O operations and file streams in programs

<b>Course Code :18EE646 Course Name :ELECTRIC VEHICLE TECHNOLOGIES</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	Explain the working of electric vehicles and recent trends.
C608.2	Analyze different power converter topology used for electric vehicle application.
C608.3	Develop the electric propulsion unit and its control for application of electric vehicles.
C608.4	Design converters for battery charging and explain transformer less topology.

<b>Course Code :18EE647 Course Name :SENSORS AND TRANSDUCERS</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	Use gauges and transducers to measure pressure, direction and distance.
C608.2	Discuss the use of light transducers and other devices used for the measurement of electromagnetic radiations.
C608.3	Explain the working of different temperature sensing devices.
C608.4	Discuss the principles and applications of audio electrical sensors and transducers used for the measurement of sound.
C608.5	Discuss the use of sensors for the measurement of mass, volume and environmental quantities

<b>Course Code :18EE651 Course Name :INDUSTRIAL SERVO CONTROL SYSTEMS</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	Explain the evolution and classification of servos, with descriptions of servo drive actuators, amplifiers, feedback transducers, performance, and troubleshooting techniques.
C608.2	Discuss system analogs, vectors and transfer functions of differential equations.
C608.3	Discuss mathematical equations for electric servo motors, both DC and brushless DC servo motors.
C608.4	Represent servo drive components by their transfer function, to combine the servo drive building blocks into system block diagrams.
C608.5	Determine the frequency response techniques for proper servo compensation.
C608.6	Explain perform indices and performance criteria for servo systems and discuss the mechanical considerations of servo systems

<b>Course Code :18EE652 Course Name :PLC AND SCADA</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	Discuss history of PLC and describe the hardware components of PLC: I/O modules, CPU, memory devices, other support devices, operating modes and PLC programming.
C608.2	Describe field devices Relays, Contactors, Motor Starters, Switches, Sensors, Output Control Devices, Seal-In Circuits, and Latching Relays commonly used with I/O module.
C608.3	Analyze PLC timer and counter ladder logic programs and describe the operation of different program control instructions
C608.4	Discuss the execution of data transfer instructions, data compare instructions and the basic operation of PLC closed-loop control system.
C608.5	Describe the operation of mechanical sequencers, bit and word shift registers, processes and structure of control systems and communication between the processes.

<b>Course Code :18EE653 Course Name :RENEWABLE ENERGY RESOURCES</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	Discuss causes of energy scarcity and its solution, energy resources and availability of renewable energy.
C608.2	Outline energy from sun, energy reaching the Earth's surface and solar thermal energy applications.
C608.3	Discuss types of solar collectors, their configurations, solar cell system, its characteristics and their applications.
C608.4	Explain generation of energy from hydrogen, wind, geothermal system, solid waste and agriculture refuse.
C608.5	Discuss production of energy from biomass, biogas.
C608.6	Summarize tidal energy resources, sea wave energy and ocean thermal energy.

<b>Course Code :18EE654 Course Name :INTRODUCTION TO DATA ANALYTICS</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	Define data, its architecture and examples of data use.
C608.2	Explain methods of descriptive analytics of data.
C608.3	Explain methods for multivariate analysis, data preparation and data transformation and reducing.

C608.4	Explain techniques for clustering the data and pattern mining
C608.5	Explain the methods of predictive analytics, performance measures for regression and algorithms for regression.
C608.6	Explain performance measures for classification of data and methods of prediction.

<b>Course Code :18EEL66 Course Name :CONTROL SYSTEM LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	Utilize software package and discrete components in assessing the time and frequency domain response of a given second order system.
C608.2	Design, analyze and simulate Lead, Lag and Lag – Le ad compensators for given specifications.
C608.3	Determine the performance characteristics of ac and DC servomotors and synchro-transmitter receiver pair used in control systems.
C608.4	Simulate the DC position and feedback control system to study the effect of P, PI, PD and PID controller and Lead compensator on the step response of the system.
C608.5	Develop a script files to plot Root locus, Bode plot and Nyquist plot to study the stability

<b>Course Code :18EEL67 Course Name :DIGITAL SIGNAL PROCESSING LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	Explain physical interpretation of sampling theorem in time and frequency domains.
C608.2	Evaluate the impulse response of a system.
C608.3	Perform convolution of given sequences to evaluate the response of a system.
C608.4	Compute DFT and IDFT of a given sequence using the basic definition and/or fast methods.
C608.5	Provide a solution for a given difference equation.
C608.6	Design and implement IIR and FIR filters

<b>Course Code :18EEMP68 Course Name :MINI PROJECT</b>	
<b>CO</b>	<b>Course Outcome</b>
C608.1	To support independent learning and innovative attitude.
C608.2	To guide to select and utilize adequate information from varied resources upholding ethics.
C608.3	To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
C608.4	To develop interactive, communication, organisation, time management, and presentation skills.
C608.5	To impart flexibility and adaptability.
C608.6	To inspire independent and team working.
C608.7	To expand intellectual capacity, credibility, judgement, intuition.
C608.8	To adhere to punctuality, setting and meeting deadlines.

<b>Course Code :18EE71 Course Name : POWER SYSTEM ANALYSIS – 2</b>	
<b>CO</b>	<b>Course Outcome</b>
C701.1	Formulate network matrices and models for solving load flow problems.
C701.2	Perform steady state power flow analysis of power systems using numerical iterative techniques.
C701.3	Solve issues of economic load dispatch and unit commitment problems.
C701.4	Analyze short circuit faults in power system networks using bus impedance matrix.

C701.5	Apply Point by Point method and Runge Kutta Method to solve Swing Equation
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<b>Course Code :18EE72 Course Name :POWER SYSTEM PROTECTION</b>	
<b>CO</b>	<b>Course Outcome</b>
C702.1	Discuss performance of protective relays, components of protection scheme and relay terminology over current protection.
C702.2	Explain the working of distance relays and the effects of arc resistance, power swings, line length and source impedance on performance of distance relays.
C702.3	Discuss pilot protection, construction, operating principles and performance of
C702.4	differential relays and discuss protection of generators, motors, transformer and Bus Zone Protection.
C702.5	Explain the construction and operation of different types of circuit breakers.
C702.6	Outline features of fuse, causes of overvoltages and its protection, also modern trends in Power System Protection

<b>Course Code :18EE731 Course Name : SOLAR AND WIND ENERGY (Professional Elective)</b>	
<b>CO</b>	<b>Course Outcome</b>
C703.1	Discuss the importance of the role of renewable energy, the concept of energy storage and the principles of energy storage devices.
C703.2	Discuss the concept of solar radiation data and solar PV system fabrication, operation of solar cell, sizing and design of PV system.
C703.3	Describe the process of harnessing solar energy and its applications in heating and cooling.
C703.4	Explain basic Principles of Wind Energy Conversion, collection of wind data, energy estimation and site selection.
C703.5	Discuss the performance of Wind-machines, energy storage, applications of Wind Energy and environmental aspects

<b>Course Code :18EE732 Course Name :MICRO- AND NANO-SCALE SENSORS AND TRANSDUCERS (PROFESSIONAL ELECTIVE)</b>	
<b>CO</b>	<b>Course Outcome</b>
C704.1	Understand the differences between the sensor and transducer technology based on nanotechnology and nanofabrication and the classical sensor technologies
C704.2	Make an informed selection of a sensor or transducer for a particular application;
C704.3	Become knowledgeable about the technologies that are available commercially at the present time.

<b>Course Code :18EE733 Course Name :INTEGRATION OF DISTRIBUTION GENERATION (PROFESSIONAL ELECTIVE)</b>	
<b>CO</b>	<b>Course Outcome</b>
C705.1	Explain energy generation by wind power and solar power.
C705.2	Discuss the variation in production capacity at different time scales, the size of individual units, and the flexibility in choosing locations with respect to wind and solar systems.
C705.3	Explain the performance of the system when distributed generation is integrated to the system.
C705.4	Discuss effects of the integration of DG: the increased risk of overload, increased losses, increased risk of overvoltages and increased levels of power quality disturbances.
C705.5	Discuss effects of the integration of DG: incorrect operation of the protection.

C705.6	Discuss the impact the integration of DG on power system stability and operation.
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<b>Course Code :18EE734 Course Name :ADVANCED CONTROL SYSTEMS (PROFESSIONAL ELECTIVE)</b>	
<b>CO</b>	<b>Course Outcome</b>
C706.1	Discuss state variable approach for linear time invariant systems in both the continuous and discrete time systems.
C706.2	Develop of state models for linear continuous–time and discrete–time systems.
C706.3	Apply vector and matrix algebra to find the solution of state equations for linear continuous–time and discrete–time systems.
C706.4	Define controllability and observability of a system and test for controllability and observability of a given system.
C706.5	Design pole assignment and state observer using state feedback.

<b>Course Code :18EE735 Course Name :REACTIVE POWER CONTROL IN ELECTRIC POWER SYSTEMS (PROFESSIONAL ELECTIVE)</b>	
<b>CO</b>	<b>Course Outcome</b>
C707.1	Distinguish the importance of load compensation in symmetrical as well as unsymmetrical loads.
C707.2	Observe various compensation methods in transmission lines.
C707.3	Distinguish demand side reactive power management & user side reactive power management.
C707.4	Construct model for reactive power coordination and effects of harmonics on electrical equipment.
C707.5	Discuss the Reactive Power Planning for the electricity boards

<b>Course Code :18EE741 Course Name :INDUSTRIAL DRIVES AND APPLICATION (PROFESSIONAL ELECTIVE)</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Explain the advantages, choice and control of electric drive
C708.2	Explain the dynamics, generating and motoring modes of operation of electric drives
C708.3	Explain the selection of motor power rating to suit industry requirements
C708.4	Analyze the performance & control of DC motor drives using controlled rectifiers
C708.5	Analyze the performance & control of converter fed Induction motor, synchronous motor & stepper motor drives

<b>Course Code :18EE742 Course Name :UTILIZATION OF ELECTRICAL POWER (PROFESSIONAL ELECTIVE)</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Discuss different methods of electric heating & welding.
C708.2	Discuss the laws of electrolysis, extraction, refining of metals and electro deposition process.
C708.3	Discuss the laws of illumination, different types of lamps, lighting schemes and design of lighting systems.
C708.4	Analyze systems of electric traction, speed time curves and mechanics of train movement.
C708.5	Explain the motors used for electric traction, their control & braking and power supply system used for electric traction

<b>Course Code :18EE743 Course Name :Ai Techniques For Electric And Hybrid Electric Vehicles (Professional Elective)</b>	
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<b>CO</b>	<b>Course Outcome</b>
C708.1	Discuss IoT Based Battery Management System and type of batteries for EV and HEV.
C708.2	Explain AI Based BLDC drive for optimum operation of EV.
C708.3	Explain Active Magnetic Bearing system for EVs.
C708.4	Model and analyse three phase converters for EV applications.
C708.5	Model and analyse Energy Management of HESS in PHEV.

<b>Course Code :18EE744 Course Name :SMART GRID (PROFESSIONAL ELECTIVE)</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Explain the concept of Smart grid enables the ElectricNet and need of smart grid.
C708.2	Outline the benefits and drivers of DC Power delivery system.
C708.3	Summarize the Intelligrid Architecture for the smart grid.
C708.4	Explain the Efficient Electric End-use Technology Alternatives.
C708.5	Discuss Demand side planning and Evaluation.

<b>Course Code :18EE745 Course Name :Artificial Neural Network With Applications To Power Systems (Professional Elective)</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Develop Neural Network and apply elementary information processing tasks that neural network can solve.
C708.2	Develop Neural Network and apply powerful, useful learning techniques.
C708.3	Develop and Analyze multilayer feed forward network for mapping provided through the first network layer and error back propagation algorithm.
C708.4	Analyze and apply algorithmic type problems to tackle problems for which algorithms are not available.
C708.5	Develop and Analyze supervised/unsupervised, learning modes of Neural Network for different applications.

<b>Course Code :18EE751 Course Name :CARBON CAPTURE AND STORAGE (OPEN ELECTIVE)</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Discuss the impacts of climate change and the measures that can be taken to reduce emissions.
C708.2	Discuss carbon capture and carbon storage.
C708.3	Explain the fundamentals of power generation.
C708.4	Explain methods of carbon capture from power generation and industrial processes.
C708.5	Explain different carbon storage methods: storage in coal seams, depleted gas reservoirs and saline formations

<b>Course Code :18EE752 Course Name :ELECTRIC VEHICLES (OPEN ELECTIVE)</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Explain the roadway fundamentals, laws of motion, vehicle mechanics and propulsion system design.
C708.2	Explain the working of electric vehicles and hybrid electric vehicles in recent trends.
C708.3	Model batteries, Fuel cells, PEMFC and super capacitors.
C708.4	Analyze DC and AC drive topologies used for electric vehicle application.
C708.5	Develop the electric propulsion unit and its control for application of electric vehicles.

<b>Course Code :18EE753 Course Name :DISASTERS MANAGEMENT (OPEN ELECTIVE)</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Discuss disaster management plan, cyclones and their hazard potential
C708.2	Understand the role of IMD and cyclone prediction and cyclone warning system in India
C708.3	Understand the role of different institutions defence and other services in natural disaster management.
C708.4	Understand the role of Central Water Commission in river water sharing, Draught, its assessment and draught management plan

<b>Course Code :18EE754 Course Name :ELECTRICAL ENERGY CONSERVATION AND AUDITING (OPEN ELECTIVE)</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Analyze about energy scenario nationwide and worldwide , also outline Energy Conservation Act and its features.
C708.2	Discuss load management techniques and energy efficiency.
C708.3	Understand the need of energy audit and energy audit methodology.
C708.4	Understand various pillars of electricity market design.
C708.5	Conduct energy audit of electrical systems and buildings.
C708.6	Show an understanding of demand side management and energy conservation

<b>Course Code :18EEL76 Course Name :POWER SYSTEM SIMULATION LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Develop a program in suitable package to assess the performance of medium and long transmission lines.
C708.2	Develop a program in suitable package to obtain the power angle characteristics of salient and non-salient pole alternator.
C708.3	Develop a program in suitable package to assess the transient stability under three phase fault at different locations in a of radial power systems.
C708.4	Develop programs in suitable package to formulate bus admittance and bus impedance matrices of interconnected power systems.
C708.5	Use suitable package to solve power flow problem for simple power systems.
C708.6	Use suitable package to study unsymmetrical faults at different locations in radial power systems
C708.7	Use of suitable package to study optimal generation scheduling problems for thermal power plants

<b>Course Code :18EEL77 Course Name :RELAY AND HIGH VOLTAGE LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Verify the characteristics of over current, over voltage, under voltage and negative sequence relay both electromagnetic and static type.
C708.2	Verify the characteristics of microprocessor based over current, over voltage, under voltage relays and distance relay.
C708.3	Show knowledge of protecting generator, motor and feeders.
C708.4	Analyze the spark over characteristics for both uniform and non-uniform configurations using High A and DC voltages.
C708.5	Measure high AC and DC voltages and breakdown strength of transformer oil.

C708.6	Draw electric field and measure the capacitance of different electrode configuration models.
C708.7	Show knowledge of generating standard lightning impulse voltage to determine efficiency, energy of impulse generator and 50% probability flashover voltage for air insulation

<b>Course Code :18EEP78 Course Name :PROJECT PHASE – I</b>	
<b>CO</b>	<b>Course Outcome</b>
C708.1	Demonstrate a sound technical knowledge of their selected project topic.
C708.2	Undertake problem identification, formulation and solution.
C708.3	Design engineering solutions to complex problems utilizing a systems approach.
C708.4	Communicate with engineers and the community at large in written and oral forms

<b>Course Code :18EE81 Course Name :POWER SYSTEM OPERATION AND CONTROL</b>	
<b>CO</b>	<b>Course Outcome</b>
C801.1	Describe various levels of controls in power systems, architecture and configuration of SCADA.
C801.2	Develop and analyze mathematical models of Automatic Load Frequency Control.
C801.3	Develop mathematical model of Automatic Generation Control in Interconnected Power system
C801.4	Discuss the Control of Voltage , Reactive Power and Voltage collapse.
C801.5	Explain security, contingency analysis, state estimation of power systems

<b>Course Code :18EE821 Course Name :FACTS AND HVDC TRANSMISSION</b>	
<b>CO</b>	<b>Course Outcome</b>
C802.1	Discuss transmission interconnections, flow of Power in an AC System, limits of the loading capability, dynamic stability considerations of a transmission interconnection and controllable parameters.
C802.2	Explain the basic concepts, definitions of flexible ac transmission systems and benefits from FACTS technology.
C802.3	Describe shunt controllers, Static Var Compensator and Static Compensator for injecting reactive power in the transmission system in enhancing the controllability and power transfer capability.
C802.4	Describe series Controllers Thyristor-Controlled Series Capacitor (TCSC) and the Static Synchronous Series Compensator (SSSC) for control of the transmission line current.
C802.5	Explain advantages of HVDC power transmission, overview and organization of HVDC system.
C802.6	Describe the basic components of a converter, the methods for compensating the reactive power demanded by the converter.
C802.7	Explain converter control for HVDC systems, commutation failure, control.

<b>Course Code :18EE822 Course Name :ELECTRICAL ESTIMATION AND COSTING</b>	
<b>CO</b>	<b>Course Outcome</b>
C803.1	Discuss wiring methods, cables used, design of lighting points and sub-circuits, internal wiring, wiring accessories and fittings, fuses and types.
C803.2	Discuss estimation of service mains and power circuits.
C803.3	Discuss estimation of overhead transmission and distribution system its components.
C803.4	Discuss types of substation, main components and estimation of substation

<b>Course Code :18EE823 Course Name :BIG DATA ANALYTICS IN POWER SYSTEMS</b>	
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<b>CO</b>	<b>Course Outcome</b>
C804.1	Discuss role of big data and machine-learning methods applicable to power systems and in particular to Smart Grid communications.
C804.2	Discuss optimization methods which are suitable for big data models in power systems.
C804.3	Discuss various cyber security issues, electricity theft detection and mitigation that exist in IoT-enabled future power systems.
C804.4	Discuss renewable energy planning concerns associated with planned future power systems that have high renewable penetration

**Course Code :18EE824 Course Name :POWER SYSTEM PLANNING (PROFESSIONAL**

<b>CO</b>	<b>Course Outcome</b>
C805.1	Discuss primary components of power system planning, planning methodology for optimum power system expansion and load forecasting.
C805.2	Understand economic appraisal to allocate the resources efficiently and appreciate the investment decisions
C805.3	Discuss expansion of power generation and planning for system energy in the country, evaluation of operating states of transmission system, their associated contingencies and the stability of the system.
C805.4	Discuss principles of distribution planning, supply rules, network development and the system studies
C805.5	Discuss reliability criteria for generation, transmission, distribution and reliability evaluation and analysis, grid reliability, voltage disturbances and their remedies
C805.6	Discuss planning and implementation of electric –utility activities, market principles and the norms framed

**Course Code :18EE825 Course Name :ELECTRICAL POWER QUALITY**

<b>CO</b>	<b>Course Outcome</b>
C806.1	Define Power quality; evaluate power quality procedures and standards.
C806.2	Estimate voltage sag performance; explain principles of protection and Sources of transient over voltages.
C806.3	Identify various sources of harmonics, explain effects of harmonic distortion.
C806.4	Evaluate harmonic distortion, control harmonic distortion.
C806.5	Estimate power quality in distribution planning. Identify power quality issues in utility system.

**Course Code :18EEP83 Course Name :PROJECT WORK PHASE -II**

<b>CO</b>	<b>Course Outcome</b>
C807.1	Present the project and be able to defend it.
C807.2	Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
C807.3	Habituated to critical thinking and use problem solving skills
C807.4	Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
C807.5	Work in a team to achieve common goal.

**Course Code :18EES84 Course Name :TECHNICAL SEMINAR**

<b>CO</b>	<b>Course Outcome</b>
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C808.1	Attain, use and develop knowledge in the field of engineering and other disciplines through independent learning and collaborative study.
C808.2	Identify, understand and discuss current, real-time issues.
C808.3	Improve oral and written communication skills.
C808.4	Explore an appreciation of the self in relation to its larger diverse social and academic contexts

## ISE Department:

### Course Code: 18MAT31 Course Name : TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES

CO	Course Outcome
C301.1	Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.
C301.2	Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
C301.3	Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.
C301.4	Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
C301.5	Determine the externals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

### Course Code: 18CS32 Course Name : DATA STRUCTURES AND APPLICATIONS

CO	Course Outcome
C302.1	Use different types of data structures, operations and algorithms
C302.2	Apply searching and sorting operations on files
C302.3	Use stack, Queue, Lists, Trees and Graphs in problem solving
C302.4	Implement all data structures in a high-level language for problem solving.

### Course Code: 18CS33 Course Name : ANALOG AND DIGITAL ELECTRONICS

CO	Course Outcome
C303.1	Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.
C303.2	Explain the basic principles of A/D and D/A conversion circuits and develop the same.
C303.3	Simplify digital circuits using Karnaugh Map , and Quine-McClusky Methods
C303.4	Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types.
C303.5	Develop simple HDL programs

### Course Code: 18CS34 Course Name : COMPUTER ORGANIZATION

CO	Course Outcome
C304.1	Explain the basic organization of a computer system.

C304.2	Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.
C304.3	Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.
C304.4	Design and analyse simple arithmetic and logical units.

**Course Code: 18CS35 Course Name :SOFTWARE ENGINEERING**

<b>CO</b>	<b>Course Outcome</b>
C305.1	Design a software system, component, or process to meet desired needs within realistic constraints.
C305.2	Assess professional and ethical responsibility
C305.3	Function on multi-disciplinary teams
C305.4	Use the techniques, skills, and modern engineering tools necessary for engineering practice
C305.5	Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems

**Course Code: 18CS36 Course Name :DISCRETE MATHEMATICAL STRUCTURES**

<b>CO</b>	<b>Course Outcome</b>
C306.1	Use propositional and predicate logic in knowledge representation and truth verification.
C306.2	Demonstrate the application of discrete structures in different fields of computer science.
C306.3	Solve problems using recurrence relations and generating functions.
C306.4	Application of different mathematical proofs techniques in proving theorems in the courses.
C306.5	Compare graphs, trees and their applications.

**Course Code: 18CSL37 Course Name : ANALOG AND DIGITAL ELECTRONICS LABORATORY**

<b>CO</b>	<b>Course Outcome</b>
C307.1	Use appropriate design equations / methods to design the given circuit.
C307.2	Examine and verify the design of both analog and digital circuits using simulators.
C307.3	Make use of electronic components, ICs, instruments and tools for design and testing of circuits for the given the appropriate inputs.
C307.4	Compile a laboratory journal which includes; aim, tool/instruments/software/components used, design equations used and designs, schematics, program listing, procedure followed, relevant theory, results as graphs and tables, interpreting and concluding the findings.

**Course Code: 18CSL38 Course Name :DATA STRUCTURES LABORATORY**

<b>CO</b>	<b>Course Outcome</b>
C308.1	Analyze and Compare various linear and non-linear data structures
C308.2	Code, debug and demonstrate the working nature of different types of data structures and their applications
C308.3	Implement, analyze and evaluate the searching and sorting algorithms
C308.4	Choose the appropriate data structure for solving real world problems

<b>Course Code: 18MAT41 Course Name : COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS</b>	
<b>CO</b>	<b>Course Outcome</b>
C401.1	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
C401.2	Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
C401.3	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
C401.4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
C401.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis.
<b>Course Code: 18CS42 Course Name :DESIGN AND ANALYSIS OF ALGORITHMS</b>	
<b>CO</b>	<b>Course Outcome</b>
C402.1	Describe computational solution to well known problems like searching, sorting etc.
C402.2	Estimate the computational complexity of different algorithms.
C402.3	Devise an algorithm using appropriate design strategies for problem solving.
<b>Course Code: 18CS43 Course Name :OPERATING SYSTEMS</b>	
<b>CO</b>	<b>Course Outcome</b>
C403.1	Demonstrate need for OS and different types of OS
C403.2	Apply suitable techniques for management of different resources
C403.3	Use processor, memory, storage and file system commands
C403.4	Realize the different concepts of OS in platform of usage through case studies
<b>Course Code: 18CS44 Course Name : MICROCONTROLLER AND EMBEDDED SYSTEMS</b>	
<b>CO</b>	<b>Course Outcome</b>
C404.1	Describe the architectural features and instructions of ARM microcontroller
C404.2	Apply the knowledge gained for Programming ARM for different applications.
C404.3	Interface external devices and I/O with ARM microcontroller.
C404.4	Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
C404.5	Develop the hardware /software co-design and firmware design approaches.
C404.6	Demonstrate the need of real time operating system for embedded system applications
<b>Course Code: 18CS45 Course Name : OBJECT ORIENTED CONCEPTS</b>	
<b>CO</b>	<b>Course Outcome</b>
C405.1	Explain the object-oriented concepts and JAVA.
C405.2	Develop computer programs to solve real world problems in Java.
C405.3	Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings.
<b>Course Code: 18CS46 Course Name : DATA COMMUNICATION</b>	
<b>CO</b>	<b>Course Outcome</b>

C406.1	Explain the various components of data communication.
C406.2	Explain the fundamentals of digital communication and switching.
C406.3	Compare and contrast data link layer protocols.
C406.4	Summarize IEEE 802.xx standards
<b>Course Code: 18CSL47 Course Name : DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C407.1	Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
C407.2	Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high level language.
C407.3	Analyze and compare the performance of algorithms using language features.
C407.4	Apply and implement learned algorithm design techniques and data structures to solve real-world problems.
<b>Course Code: 18CSL48 Course Name : MICROCONTROLLER AND EMBEDDED SYSTEMS LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C408.1	Develop and test program using ARM7TDMI/LPC2148
C408.2	Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.
<b>Course : 18CS51 Course Name: MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY</b>	
<b>CO</b>	<b>Course Outcome</b>
C501.1	Define management, organization, entrepreneur, planning, staffing, ERP and outline their importance in entrepreneurship
C501.2	Utilize the resources available effectively through ERP
C501.3	Make use of IPRs and institutional support in entrepreneurship
C501.4	Interpret the concepts of directing, leading, communication, coordination and controlling
<b>Course : 18CS52 Course Name :Computer Networks and Security</b>	
<b>CO</b>	<b>Course Outcome</b>
C502.1	Explain principles of application layer protocols
C502.2	Recognize transport layer services and infer UDP and TCP protocols
C502.3	Classify routers, IP and Routing Algorithms in network layer
C502.4	Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard
C502.5	Describe Multimedia Networking and Network Management
<b>Course : 18CS53 Course Name : DATABASE MANAGEMENT SYSTEM</b>	
<b>CO</b>	<b>Course Outcome</b>
C503.1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.
C503.2	Use Structured Query Language (SQL) for database manipulation.
C503.3	Design and build simple database systems

C503.4	Develop application to interact with databases.
<b>Course : 18CS54 Course Name:AUTOMATA THEORY AND COMPUTABILITY</b>	
<b>CO</b>	<b>Course Outcome</b>
C504.1	Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation
C504.2	Learn how to translate between different models of Computation (e.g., Deterministic and Non-deterministic and Software models).
C504.3	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.
C504.4	Develop skills in formal reasoning and reduction of a problem to a formal model, with an emphasis on semantic precision and conciseness.
C504.5	Classify a problem with respect to different models of Computation.
<b>Course : 18CS55 Course Name : APPLICATION DEVELOPMENT USING PYTHON</b>	
<b>CO</b>	<b>Course Outcome</b>
C505.1	Demonstrate proficiency in handling of loops and creation of functions.
C505.2	Identify the methods to create and manipulate lists, tuples and dictionaries.
C505.3	Discover the commonly used operations involving regular expressions and file system.
C505.4	Interpret the concepts of Object-Oriented Programming as used in Python.
C505.5	Determine the need for scraping websites and working with CSV, JSON and other file formats.
<b>Course: 18CS56 Course Name : UNIX PROGRAMMING</b>	
<b>CO</b>	<b>Course Outcome</b>
C506.1	Explain Unix Architecture, File system and use of Basic Commands
C506.2	Illustrate Shell Programming and to write Shell Scripts
C506.3	Categorize, compare and make use of Unix System Calls
C506.4	Build an application/service over a Unix system.
<b>Course: 18CSL57 Course Name : COMPUTER NETWORK LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C507.1	Analyze and Compare various networking protocols.
C507.2	Demonstrate the working of different concepts of networking.
C507.3	Implement, analyze and evaluate networking protocols in NS2 / NS3 and JAVA programming language
<b>Course: 18CSL58 Course Name :DBMS LABORATORY WITH MINI PROJECT</b>	
<b>CO</b>	<b>Course Outcome</b>
C508.1	Create, Update and query on the database.
C508.2	Demonstrate the working of different concepts of DBMS
C508.3	Implement, analyze and evaluate the project developed for an application.

<b>Course: 18IS61 Course Name : FILE STRUCTURES</b>	
<b>CO</b>	<b>Course Outcome</b>
C601.1	Choose appropriate file structure for storage representation.
C601.2	Identify a suitable sorting technique to arrange the data.
C601.3	Select suitable indexing and hashing techniques for better performance to a given problem.
<b>Course: 18IS62 Course Name : SOFTWARE TESTING</b>	
<b>CO</b>	<b>Course Outcome</b>
C602.1	Derive test cases for any given problem
C602.2	Compare the different testing techniques
C602.3	Classify the problem into suitable testing model
C602.4	Apply the appropriate technique for the design of flow graph.
C602.5	Create appropriate document for the software artefact.
<b>Course: 18CS63 Course Name :WEB TECHNOLOGY AND ITS APPLICATIONS</b>	
<b>CO</b>	<b>Course Outcome</b>
C603.1	Adapt HTML and CSS syntax and semantics to build web pages.
C603.2	Construct and visually format tables and forms using HTML and CSS
C603.3	Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
C603.4	Appraise the principles of object oriented development using PHP
C603.5	Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.
<b>Course: 18CS641 Course Name :DATA MINING AND DATA WAREHOUSING</b>	
<b>CO</b>	<b>Course Outcome</b>
C604.1	Identify data mining problems and implement the data warehouse
C604.2	Write association rules for a given data pattern.
C604.3	Choose between classification and clustering solution.
<b>Course:18CS643 Course Name :CLOUD COMPUTING AND ITS APPLICATIONS</b>	
<b>CO</b>	<b>Course Outcome</b>
C605.1	Explain cloud computing, virtualization and classify services of cloud computing
C605.2	Illustrate architecture and programming in cloud
C605.3	Describe the platforms for development of cloud applications and List the application of cloud.
<b>Course:18ISL66 Course Name :SOFTWARE TESTING LABORATORY</b>	
<b>CO</b>	<b>Course Outcome</b>
C606.1	List out the requirements for the given problem
C606.2	Design and implement the solution for given problem in any programming language(C,C++,JAVA)
C606.3	Derive test cases for any given problem
C606.4	Apply the appropriate technique for the design of flow graph.

C606.5	Create appropriate document for the software artefact.
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**Course: 18ISL67 Course Name :FILE STRUCTURES LABORATORY WITH MINI PROJECT**

CO	Course Outcome
C607.1	Implement operations related to files
C607.2	Apply the concepts of file system to produce the given application.
C607.3	Evaluate performance of various file systems on given parameters

**Course: 18CSMP68 Course Name : MOBILE APPLICATION DEVELOPMENT**

CO	Course Outcome
C608.1	Create, test and debug Android application by setting up Android development environment.
C608.2	Implement adaptive, responsive user interfaces that work across a wide range of devices.
C608.3	Infer long running tasks and background work in Android applications.
C608.4	Demonstrate methods in storing, sharing and retrieving data in Android applications.
C608.5	Infer the role of permissions and security for Android applications.

**Course Code: 18CS71 Course Name: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**

CO	Course Outcome
C701.1	Appraise the theory of Artificial intelligence and Machine Learning.
C701.2	Illustrate the working of AI and ML Algorithms.
C701.3	Demonstrate the applications of AI and ML.

**Course Code: 18CS72 Course Name : BIG DATA AND ANALYTICS**

CO	Course Outcome
C702.1	Understand fundamentals of Big Data analytics.
C702.2	Investigate Hadoop framework and Hadoop Distributed File system.
C702.3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
C702.4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
C702.5	Use Machine Learning algorithms for real world big data.
C702.6	Analyze web contents and Social Networks to provide analytics with relevant visualization tools.

**Course Code: 18CS734 Course Name :USER INTERFACE DESIGN**

CO	Course Outcome
C703.1	Design the User Interface, design, menu creation, windows creation and connection between menus and windows

**Course Code: 18CS742 Course Name :NETWORK MANAGEMENT**

CO	Course Outcome
C704.1	Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.

C704.2	Apply network management standards to manage practical networks
C704.3	Formulate possible approaches for managing OSI network model.
C704.4	Use on SNMP for managing the network
C704.5	Use RMON for monitoring the behavior of the network
C704.6	Identify the various components of network and formulate the scheme for the managing them

**Course Code: 18CSL76 Course Name :ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY**

CO	Course Outcome
C705.1	Implement and demonstrate AI and ML algorithms.
C705.2	Evaluate different algorithms.

**Course Code:18CS81 Course Name : INTERNET OF THINGS**

CO	Course Outcome
C801.1	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
C801.2	Compare and contrast the deployment of smart objects and the technologies to connect them to network.
C801.3	Appraise the role of IoT protocols for efficient network communication.
C801.4	Elaborate the need for Data Analytics and Security in IoT.
C801.5	Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

**ME Department:**

**Course Code :18MAT31 Course Name :Transform calculus, Fourier Series and Numerical techniques**

CO	Course Outcome
C301.1	Use Laplace transform and inverse Laplace transform in solving differential/integral equation arising in network analysis, control systems and other fields of engineering.
C301.2	Demonstrate Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field theory.
C301.3	Make use of Fourier transform and Z- transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.
C301.4	Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
C301.5	Determine the externals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

**Course Code :18ME32 Course Name :MECHANICS OF MATERIALS**

CO	Course Outcome
C302.1	Understand simple, compound, thermal stresses and strains their relations and strain energy.
C302.2	Analyse structural members for stresses, strains and deformations.
C302.3	Analyse the structural members subjected to bending and shear loads.

C302.4	Analyse shafts subjected to twisting loads.
C302.5	Analyse the short columns for stability.

**Course Code : 18ME33** Course Name : Basic Thermodynamics

CO	Course Outcome
C303.1	Explain fundamentals of thermodynamics and evaluate energy interactions across the boundary of thermodynamic systems
C303.2	Evaluate the feasibility of cyclic and non-cyclic processes using 2nd law of thermodynamics
C303.3	Apply the knowledge of entropy, reversibility and irreversibility to solve numerical problems and apply 1st law of thermodynamics to closed and open systems and determine quantity of energy transfers and change in properties
C303.4	Interpret the behavior of pure substances and its application in practical problems.
C303.5	Recognize differences between ideal and real gases and evaluate thermodynamic properties of ideal and real gas mixtures using various relations

**Course Code :18ME34** Course Name :Material Science

CO	Course Outcome
C304.1	Understand the mechanical properties of metals and their alloys.
C304.2	Analyze the various modes of failure and understand the microstructures of ferrous and nonferrous materials.
C304.3	Describe the processes of heat treatment of various alloys.
C304.4	Acquire the Knowledge of composite materials and their production process as well as applications.
C304.5	Understand the properties and potentialities of various materials available and material selection procedures

**Course Code : 18ME35B** Course Name : Metal Casting & Welding

CO	Course Outcome
C305.1	Describe the casting process and prepare different types of cast products, Acquire knowledge on Pattern, Core, Gating, Riser system and to use Jolt, Squeeze, Sand Slinger, Moulding machines
C305.2	Compare the Gas fired pit, Resistance, Coreless, Electrical and Cupola Metal Furnaces
C305.3	Compare the Gravity, Pressure die, Centrifugal, Squeeze, slush and Continuous Metal mold castings. Understand the Solidification process and Casting of Non-Ferrous Metals.
C305.4	Describe the Metal Arc, TIG, MIG, Submerged and Atomic Hydrogen Welding processes etc. used in manufacturing
C305.5	Describe the Metal Arc, TIG, MIG, Submerged and Atomic Hydrogen Welding processes etc. used in manufacturing

**Course Code :18ME36B** Course Name :Mechanical Measurements And Metrology

CO	Course Outcome
C306.1	Understand the objectives of metrology, methods of measurement, standards of measurement & various measurement parameters.

C306.2	Explain tolerance, limits of size, fits, geometric and position tolerances, gauges and their design
C306.3	Understand the working principle of different types of comparators. Describe measurement of major & minor diameter, pitch, angle and effective diameter of screw threads.
C306.4	Explain measurement systems, transducers, intermediate modifying devices and terminating devices..
C306.5	Describe functioning of force, torque, pressure, strain and temperature measuring devices.

<b>Course Code : 18MEL38B</b> Course Name : Foundry, Forging And Welding Lab	
<b>CO</b>	<b>Course Outcome</b>
C307.1	Demonstrate various skills in preparation of molding sand for conducting tensile, shear and compression tests using Universal sand testing machine.
C307.2	Demonstrate skills in determining permeability, clay content and Grain Fineness Number of base sands.
C307.3	Demonstrate skills in preparation of forging models involving upsetting, drawing and bending operations.

<b>Course Code :18MEL37B</b> Course Name :Mechanical Measurements and Metrology Lab	
<b>CO</b>	<b>Course Outcome</b>
C308.1	Demonstrate the necessary skills for calibration and testing of different gauges and instruments.
C308.2	Demonstrate the necessary skills to collect data, perform analysis and interpret results to draw valid conclusions through standard test procedures using various metrology instruments.

<b>Course Code : 18MAT41</b> Course Name : <b>Complex Analysis ,Probability And Statistical Methods</b>	
<b>CO</b>	<b>Course Outcome</b>
C401.1	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
C401.2	Utilize Conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
C401.3	Apply discrete and continuous probability distributions in analysing the probability models arising in engineering field.
C401.4	Make use of the correlation and regression analysis to fit a suitable mathematics model for the statistical data.
C401.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis.

<b>Course Code : 18ME42</b> Course Name : <b>Applied Thermodynamics</b>	
<b>CO</b>	<b>Course Outcome</b>
C402.1	Apply thermodynamic concepts to analyze the performance of gas power cycles.
C402.2	Understand combustion of fuels and performance of I C engines.
C402.3	Apply thermodynamic concepts to analyze the performance of vapour power cycles.
C402.4	Understand the principles and applications of refrigeration systems and Apply Thermodynamic concepts to determine performance parameters of refrigeration and air-conditioning systems.

C402.5	Understand the working principle of Air compressors and Steam nozzles, applications, relevance of air and identify methods for performance improvement.
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**Course Code : 18ME43 Course Name : Fluid Mechanics**

CO	Course Outcome
C403.1	Identify and calculate the key fluid properties used in the analysis of fluid behaviour.
C403.2	Explain the principles of pressure, buoyancy and floatation
C403.3	Apply the knowledge of fluid statics, kinematics and dynamics while addressing problems of mechanical and chemical engineering.
C403.4	Describe the principles of fluid kinematics and dynamics.
C403.5	Explain the concept of boundary layer in fluid flow and apply dimensional analysis to form dimensionless numbers in terms of input output variables. Illustrate and explain the basic concept of compressible flow and CFD

**Course Code : 18ME44 Course Name : Kinematics of Machines**

CO	Course Outcome
C404.1	Knowledge of mechanisms and their motion.
C404.2	Understand the inversions of four bar mechanisms.
C404.3	Analyse the velocity, acceleration of links and joints of mechanisms.
C404.4	Analysis of cam follower motion for the motion specifications.
C404.5	Analyse the gear trains speed ratio and torque.

**Course Code : 18ME45A Course Name : METAL CUTTING AND FORMING**

CO	Course Outcome
C405.1	Explain the construction & specification of various machine tools, Discuss different cutting tool materials, tool nomenclature & surface finish.
C405.2	Apply mechanics of machining process to evaluate machining time
C405.3	Analyse tool wear mechanisms and equations to enhance tool life and minimize machining cost
C405.4	Understand the concepts of different metal forming processes
C405.5	Apply the concepts of design of sheet metal dies to design different dies for simple sheet metal components.

**Course Code : 18ME406A Course Name : Computer Aided Machine Drawing**

CO	Course Outcome
C406.1	Sections of pyramids, prisms, cubes, cones and cylinders resting on their bases in 2D & Orthographic views of machine parts with and without sectioning in 2D.
C406.2	Sectional views for threads with terminologies of ISO Metric, BSW, square and acme, sellers and American standard threads in 2D & Hexagonal and square headed bolt and nut with washer, stud bolts with nut and lock nut, flanged nut, slotted nut, taper and split pin for locking counter sunk head screw, grub screw, Allen screw assemblies in 2D
C406.3	Parallel key, Taper key, and Woodruff Key as per the ISO standards in 2D
C406.4	Sketch split muff, protected type flanged, pin type flexible, Oldham's and universal couplings in 2D

C406.5	Assemblies from the part drawings with limits ,fits and tolerance given for Screw Jack Plummer block, Machine Vice ,I.C. Engine connecting rod, , Tailstock of lathe, and Lathe square tool post in 2D and 3D
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<b>Course Code :18MEL47A Course Name :MATERIAL TESTING LAB</b>	
<b>CO</b>	<b>Course Outcome</b>
C407.1	students will learn the concept of the preparation of samples to perform characterization such as microstructure, volume fraction of phases and grain size.
C407.2	To learn material failure modes and the different loads causing failure.
C407.3	To understand mechanical behaviour of various engineering materials by conducting standard tests.
C407.4	To learn the concepts of improving the mechanical properties of materials by different methods like heat treatment, surface treatment etc.

<b>Course Code : 18MEL48A Course Name :Workshop And Machine Shop Practice</b>	
<b>CO</b>	<b>Course Outcome</b>
C408.1	To read working drawings, understand operational symbols and execute machining operations
C408.2	Prepare fitting models according to drawings using hand tools- V-block, marking gauge, files, hack saw, drills etc.
C408.3	Understand integral parts of lathe, shaping and milling machines and various accessories and attachments used.
C408.4	Select cutting parameters like cutting speed, feed, depth of cut, and tooling for various machining operations.
C408.5	Perform cylindrical turning operations such as plain turning, taper turning, step turning, thread Cutting, facing, knurling, internal thread cutting, eccentric turning and estimate cutting time.
C408.6	Perform machining operations such as plain shaping, inclined shaping, keyway cutting, Indexing and Gear cutting and estimate cutting time.

<b>Course Code : 18ME51 Course Name : Management and Economics</b>	
<b>CO</b>	<b>Course Outcome</b>
C501.1	Understand needs, functions, roles, scope and evolution of Management
C501.2	Understand importance, purpose of Planning and hierarchy of planning and also analyse its types.
C501.3	Discuss Decision making, Organizing, Staffing, Directing and Controlling.
C501.4	Understand various interest rate methods and implement the suitable one.
C501.5	Prepare the project reports effectively.

<b>Course Code :18ME52 Course Name :Design of Machine Elements-1</b>	
<b>CO</b>	<b>Course Outcome</b>
C502.1	Apply the concepts of selection of materials for given mechanical components.
C502.2	Design of Impact and Fatigue loading
C502.3	Design of shafts, keys and coupling
C502.4	Design of permanent joints such and welded and riveted joints

C502.5	Design of temporary joined, threaded fasteners and power screws
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<b>Course Code : 18ME53 Course Name : Dynamics of machines</b>	
<b>CO</b>	<b>Course Outcome</b>
C503.1	Analyse the mechanisms for static and dynamic equilibrium.
C503.2	Carry out the balancing of rotating and reciprocating masses
C503.3	Analyse different types of governors used in real life situation.
C503.4	Understand the free and forced vibration phenomenon.
C503.5	Determine the natural frequency, force and motion transmitted in vibrating systems.

<b>Course Code : 18ME54 Course Name : Turbomachines</b>	
<b>CO</b>	<b>Course Outcome</b>
C504.1	Model studies and thermodynamics analysis of turbomachines.
C504.2	Analyse the energy transfer in Turbo machine with degree of reaction and utilisation factor.
C504.3	Classify, analyse and understand various type of steam turbine.
C504.4	Classify, analyse and understand various type of hydraulic turbine.
C504.5	Understand the concept of radial power absorbing machine and the problems involved during its operation.

<b>Course Code : 18ME55 Course Name : Fluid Power Engineering</b>	
<b>CO</b>	<b>Course Outcome</b>
C505.1	Identify and analyse the functional requirements of a fluid power transmission system for a given application.
C505.2	Visualize how a hydraulic/pneumatic circuit will work to accomplish the function.
C505.3	Design an appropriate hydraulic or pneumatic circuit or combination circuit like electro-hydraulics, electro- pneumatics for a given application.
C505.4	Select and size the different components of the circuit.
C505.5	Develop a comprehensive circuit diagram by integrating the components selected for the given application.

<b>Course Code :</b>	<b>Course Name : OPERATIONS MANAGEMENT</b>
<b>CO</b>	<b>Course Outcome</b>
C506.1	Explain the concept and scope of operations management in a business context
C506.2	Recognize the role of Operations management among various business functions and its role in the organizations' strategic planning and gaining competitive advantage.
C506.3	Analyze the appropriateness and applicability of a range of operations management systems/models in decision making.
C506.4	Assess a range of strategies for improving the efficiency and effectiveness of organizational operations.
C506.5	Evaluate a selection of frameworks used in the design and delivery of operations

Course Name : Fluid Mechanics Lab
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CO	Course Outcome
C507.1	Perform experiments to determine the coefficient of discharge of flow measuring devices
C507.2	Conduct experiments on hydraulic turbines and pumps to draw characteristics.
C507.3	Test basic performance parameters of hydraulic turbines and pumps and execute the knowledge in real life situations.
C507.4	Determine the energy flow pattern through the hydraulic turbines and pumps.
C507.5	Exhibit his competency towards preventive maintenance of hydraulic machines

**Course Name : Energy Lab**

CO	Course Outcome
C508.1	Perform experiments to determine the properties of fuels and oils.
C508.2	Conduct experiments on engines and draw characteristics
C508.3	Test basic performance parameters of I.C. Engine and implement the knowledge in industry.
C508.4	Identify exhaust emission, factors affecting them and exhibit his competency towards preventive maintenance of IC engines.

**Course Code :18ME61 Course Name: FINITE ELEMENT METHOD**

CO	Course Outcome
C601.1	To learn the basic principles of finite element analysis procedure
C601.2	To understand the design and heat transfer problems with application of FEM.
C601.3	Solve 1 D, 2 D and dynamic problems using Finite Element Analysis approach.
C601.4	To learn the theory and characteristics of finite elements that represent engineering structures
C601.5	To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses.

**Course Code :18ME62 Course Name : Design of Machine Elements-2**

CO	Course Outcome
C602.1	Apply design principles for the design of mechanical systems involving springs, belts, pulleys, and wire ropes.
C602.2	Design spur and helical gear
C602.3	Design worm and bevel gear
C602.4	Understand the design principles of brakes and clutches
C602.5	Apply design concepts of hydrodynamic bearings for different applications and select Anti friction bearings for different applications using the manufacturers, catalogue

**Course Code :18ME63 Course Name : HEAT TRANSFER**

CO	Course Outcome
C603.1	Understand the modes of heat transfer and apply the basic laws to formulate engineering systems
C603.2	Understand and apply the basic laws of heat transfer to extended surface, composite material and unsteady state heat transfer problems

C603.3	Analyze heat conduction through numerical methods and apply the fundamental principle to solve radiation heat transfer problems.
C603.4	Analyze heat transfer due to free and forced convective heat transfer.
C603.5	Understand the design and performance analysis of heat exchangers and their practical applications, Condensation and Boiling phenomena

<b>Course Code : 18ME641 Course Name : Non-Traditional Machining</b>	
<b>CO</b>	<b>Course Outcome</b>
C604.1	Understand the compare traditional and non-traditional machining process and recognize the need for Non- traditional machining process.
C604.2	Understand the constructional features, performance parameters, process characteristics, applications, advantages and limitations of USM, AJM and WJM.
C604.3	Identify the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages and limitations.
C604.4	Understand the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM & PAM.
C604.5	Understand the LBM equipment, LBM parameters, and characteristics. EBM equipment and mechanism of metal removal, applications, advantages and limitations LBM & EBM.

<b>Course Code :18CIV59 Course Name : Occupational health &amp; safety Environmental Studies</b>	
<b>CO</b>	<b>Course Outcome</b>
C605.1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
C605.2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment
C605.3	Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components
C605.4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

<b>Course Code :18MEL66 Course Name :Computer Aided Modelling And Analysis Lab</b>	
<b>CO</b>	<b>Course Outcome</b>
C606.1	To acquire basic understanding of Modeling and Analysis software
C606.2	To understand the concepts of different kinds of loading on bars, trusses and beams, and analyze the results pertaining to various parameters like stresses and deformations.
C606.3	To lean to apply the basic principles to carry out dynamic analysis to know the natural frequencies of different kind of beams.

<b>Course Code :18MEL67 Course Name :HEAT TRANSFER LAB</b>	
<b>CO</b>	<b>Course Outcome</b>

C607.1	Determine the thermal conductivity of a metal rod and overall heat transfer coefficient of composite slabs.
C607.2	Determine convective heat transfer coefficient for free and forced convection and correlate with theoretical values
C607.3	Evaluate temperature distribution characteristics of steady and transient heat conduction through solid cylinder experimentally
C607.4	Determine surface emissivity of a test plate and Stefan Boltzmann constant
C607.5	Estimate performance of a refrigerator and effectiveness of a fin and Double pipe heat exchanger

**Course Code :18MEM68 Course Name :Mini-Project**

CO	Course Outcome
C608.1	Demonstrate a thorough and systematic understanding of project contents.
C608.2	Understand methodologies and professional way of documentation and communication.
C608.3	Know the key stages in development of the project.
C608.4	Extend or use the idea in mini project for major project.

**Course Code :18ME71 Course Name : Control Engineering**

CO	Course Outcome
C701.1	Identify the type of control and control actions. Develop the mathematical model of the physical system
C701.2	Estimate the response and error in response of first and second order systems subjected standard input signals
C701.3	Represent the complex physical system using block diagram and signal flow graph and obtain transfer function.
C701.4	Analyse a linear feedback control system for stability using Hurwitz criterion, Routh's criterion and root locus technique in complex domain.
C701.5	Analyse the stability of linear feedback control systems in frequency domain using polar plots, Nyquist and Bode plots

**Course Code : 18ME72 Course Name : Computer Aided Design Manufacturing**

CO	Course Outcome
C702.1	Able to define Automation, CIM, CAD, CAM and explain the differences between these concepts.
C702.2	Solve simple problems of transformations of entities on computer screen. Explain the basics of automated manufacturing industries through mathematical models and analyze different types of automated flow lines.
C702.3	Analyze the automated flow lines to reduce down time and enhance productivity.
C702.4	Explain the use of different computer applications in manufacturing, and able to prepare part programs for simple jobs on CNC machine tools and robot programming.
C702.5	Visualize and appreciate the modern trends in Manufacturing like additive manufacturing, Industry 4.0 and applications of Internet of Things leading to Smart Manufacturing

**Course Code :18ME731** Course Name :Design for Manufacture

<b>CO</b>	<b>Course Outcome</b>
C703.1	Select proper materials and manufacturing processes for designing products/components by applying the relevant principles for ease and economic production.
C703.2	Identify faulty design factors leading to increased costs in producing mechanical components.
C703.3	Apply appropriate design tolerances – dimensional, geometric and true position tolerances for the production processes of mechanical components.
C703.4	Apply the concepts related to reducing machined areas, simplification by amalgamation and separation, clamp ability, accessibility etc., in the design of mechanical components.
C703.5	Analyse the design of castings, weldments, forgings, powder metallurgy components and suggest design modifications to reduce the cost.

**Course Code :18ME744** Course Name :Mechatronics

<b>CO</b>	<b>Course Outcome</b>
C704.1	Illustrate various components of Mechatronics systems.
C704.2	Assess various control systems used in automation
C704.3	Design and conduct experiments to evaluate performance of mechatronics system
C704.4	apply principles of mechatronic design to product design
C704.5	function effectively as members of multidisciplinary teams

**Course Code :18EE754** Course Name :ELECTRICAL ENERGY CONSERVATION & AUDITING

<b>CO</b>	<b>Course Outcome</b>
C705.1	Analyze about energy scenario nationwide and worldwide, also outline Energy Conservation Act and its features.
C705.2	Discuss load management techniques and energy efficiency.
C705.3	Understand the need of energy audit and energy audit methodology.
C705.4	Understand various pillars of electricity market design.
C705.5	Conduct energy audit of electrical systems and buildings.
C705.6	Show an understanding of demand side management and energy conservation.

**Course Code :18MEL76** Course Name :Computer Aided Manufacturing Lab/CIM Lab

<b>CO</b>	<b>Course Outcome</b>
C706.1	Knowledge on Automation, CIM, CAD, CAM and differences between these concepts.
C706.2	Understanding use of different computer applications in manufacturing, and able to prepare part programs for simple jobs on CNC Milling tools
C706.3	Understanding use of different computer applications in manufacturing, and able to prepare part programs for simple jobs on CNC Milling tools programs for simple jobs on CNC Lathe tools
C706.4	Visualize and appreciate the modern trends in Manufacturing

**Course Code :18MEL77** Course Name :DESIGN LAB

CO	Course Outcome
C707.1	Compute the natural frequency of the free and forced vibration of single degree freedom systems, critical speed of shafts
C707.2	Carry out balancing of rotating masses. Analyse the governor characteristics.
C707.3	Determine stresses in disk, beams, plates and hook using photo elastic bench
C707.4	Determination of Pressure distribution in Journal bearing
C707.5	Analyse the stress and strains using strain gauges in compression and bending test and stress distribution in curved beams.

**Course Code :18MEP78** Course Name :Project work Phase-1

CO	Course Outcome
C708.1	Identify an Engineering problem.
C708.2	students will be able to learn to do the detailed literature survey and build a document with respect Engineering problem.
C708.3	Devise a means of solving and exhibit the ability to execute the solution.

**Course Code :18ME81** Course Name : ENERGY ENGINEERING

CO	Course Outcome
C801.1	Understand the construction and working of steam generators and their accessories
C801.2	Identify renewable energy sources and their utilization
C801.3	Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, nuclear, hydel and tidal

**Course Code : 17ME82** Course Name : Additive Manufacturing

CO	Course Outcome
C802.1	Understand the different process of Additive Manufacturing. using Polymer, Powder and Nano materials manufacturing.
C802.2	Analyse the different characterization techniques.
C802.3	Describe the various NC, CNC machine programming and Automation techniques.
C802.4	Describe the effects of surface finish and microstructural properties on behaviour for components produced using additive manufacturing
C802.5	Display an awareness of residual stresses that may occur during additive manufacturing and their effects.

**Course Code :MEP-83** Course Name :PROJECT WORK PHASE-II

CO	Course Outcome
C803.1	Demonstrate knowledge of professional and ethical responsibilities.
C803.2	Show the understanding of impact of engineering solutions on the society

C803.3	Develop confidence for self-education and ability for lifelong learning
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**Course Code :MES84 Course Name : TECHNICAL SEMINAR**

<b>CO</b>	<b>Course Outcome</b>
C804.1	Establish motivation for any topic of interest of new and recent technology and develop a thought process for technical presentation.
C804.2	Organize a detailed literature survey and build a document with respect to technical publications.
C804.3	Analysis and comprehension of proof-of-concept and related data.
C804.4	Effective presentation and improve soft skills.

**Course Code :18MEI85 Course Name :INTERNSHIP**

<b>CO</b>	<b>Course Outcome</b>
C805.1	Student will be able to articulate and apply principles learned in and outside of the classroom to a specific internship.
C805.2	Student will complete assignments that encourage in-depth reflection of the internship experience.
C805.3	Student will gain self-understanding, self-confidence, and interpersonal skills.
C805.4	Student will develop work competencies for a specific profession or occupation.
C805.5	Student will explore career options and gain general work experience.
C805.6	Student will complete any specific learning outcomes identified in supplemental documentation provided as part of the internship application process.