Course Outcomes

COURSE OUTCOMES-2018 Scheme

I year Common to ALL BRANCHES

Course code	Course Name	Course Outcomes-On completion of this course the students will be able to
18MAT11	ENGINEERING MATHEMATICS I	CO1. Apply the knowledge of calculus to solve problems related to polar curves and its application in determining the bendness of a curve CO2. Solve 1st order Ordinary differential equations including problems in electrical circuits CO3. Apply the Partial differentiation to find total derivative and jacobians of a given multi Variable functions. CO4. Evaluate multiple integrals in Cartesian and Polar coordinate systems CO5. Solve the system of simultaneous linear equations using matrix and rank techniques.
18PHY12/22	ENGINEERING PHYSICS	CO1. Able to analyze various types of oscillations and there implications, the role of shock waves in various fields and recognize the elastic properties of materials in engineering applications. CO2. Recognize the interrelation between time varying electric and magnetic field, transverse nature of EM waves and the role in OFC CO3. Analyze Eigen values and Eigen functions, momentum of atomic and subatomic participles using time independent Schrodinger's wave equations in 1D CO4. Understand theoretical background of laser, construction and working of different types of laser and its applications. CO5. Understand various electrical and thermal properties of materials
18ELE13/23	BASIC ELECTRICAL ENGINEERING	CO1. Define the basics of electrical sciences related to principles of electromagnetism & analyse AC and DC circuits CO2. Distinguish between the 3 phase measuring instruments and study the domestic wiring CO3. Explain the principle of operation and construction of single phase transformer CO4. Explain the principle of operation and construction of DC machines and synchronous machines CO5. Explain the principle of operation and construction of three phase induction motors
18CIV14/24	ELEMENTS OF CIVIL ENGG.	CO1. Know the basics of civil engineering its scope of study, knowledge about roads bridges and dams. CO2. Comprehend the action of forces, moments and other loads on system of rigid bodies. CO3. Compute the relative forces and effects that develop as a result of external loads. CO4. Locate the Centroid and compute the moment of intertia of regular cross sections CO5. Express the relationship between the motions of bodies and equipped to pursue studies courses in mechanics.
18EGDL15/25	ENGINEERING GRAPHICS	CO1. Sketch and draft the orthographic projection of points and lines with the help of solid edge software using standards and conventions CO2. Relate and acknowledge orthographic projection in

		projecting the various planes as per given condition CO3. Sketch the projection of solids after identify the given conditions and translating it in to engineering drawings CO4. Construct the isometric views of simple objects reading the orthographic projections
18PHYL16/26	ENGG. PHYSICS LAB	CO1. Analyze and demonstrate the concept of phenomenon of light and Magnetic effect of current. CO2. Analyze and demonstrate the principles of operations of optical fibers and semi-conductor devices. CO3. Determine elastic module and moment of inertia of given materials CO4. Able to demonstrate the resonance concept and its applications CO5. Understand the importance of measurement procedure, honest recording and representing the data, reproduction of final results.
18ELE17/27	BASIC ELECTRICAL LAB	CO1. Explain the fundamentals of basic electrical circuits. CO2. Describe the direct current and alternating current circuits CO3. Discuss the concepts of circuit protecting device and earthing. CO4. Explain the principal of operation & construction of different machines.
18ENG18	TECHNICAL ENGLISH-1	CO1. To make them understand technical communication. CO2. Introducing skills of listening, speaking, reading & writing. CO3. Understanding listening skills and phonetics. CO4. Developing Listening skills vocabulary CO5. To develop speaking skills, grammar, and vocabulary
18MAT21	ADVANCED CALCULUS AND NUMERICAL METHODS	CO1. Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the interdependence of line surface and volume integrals. CO2. Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations CO3. Construct a variety of partial differential equations and solution by exact methods/method of separation of variables. CO4. Explain the applications of infinite series and obtain series solution of ordinary differential equations. CO5. Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.
18CHE12/22	ENGG. CHEMISTRY	CO1. Able to understand operating principles and the reaction mechanism of electrodes, batteries and fuel cells CO2. Able to analyses the causes and control of corrosion of metals for industrial applications CO3. Able to calculate the calorific value of different types of fuels for production and Consumption of energy. CO4. Able to measure and arrive valid conclusion for the usage of water by various chemical Processes CO5. Differential techniques of instrumental methods of analysis, Fundamental principles of nano materials
18CPS13/23	C Programming for Problem Solving	CO1. Explain the various hardware and software components and fundamentals of C. CO2. Understand and use various decision making statements

		CO3. Construct a programming solution to the given problem using arrays CO4. Understand the concept of functions CO5. Construct a program using structures and pointers.
18ELN14/24	BASIC ELECTRONICS	CO1. Describe the operations of some basic semiconductor devices and its applications. CO2. Evaluate some analog circuits and linear IC's applications. CO3. Describe and evaluate number system, simple combinational and sequential logic circuits. CO4. Illustrate basic working principle of communication systems and GSM
18ME15/25	ELEMENTS OF MECHANICAL ENGINEERING	CO1. Explain the fundamental concepts of energy and its sources of conversion. And thermodynamics CO2. Demonstrate the concepts of Boiler, Turbines and Pumps. CO3. Explain the basic concepts of IC Engines and Refrigeration. CO4. Distinguish between Metal joining process and Power transmission in engineering industry. CO5. Associate the different Metal removal process and Automation techniques in manufacturing system.
18CHEL16/26	ENGG. CHEMISTRY LAB	CO1. Able to handle different types of instruments and develop skills in operating instruments CO2. Able to prepare solutions of different concentrations and calculate equivalence points through graph CO3. Able to distinguish between the types of water from different sources to get accurate results using sample materials.
18CPL17/27	COMPUTER PROGRAMMING LAB	CO1. Understand the basic principles of programming and its tools. CO2. Achieve knowledge of design and develop c problem solving skills CO3. Trace, develop and debug modular programming skills
18EGH28	TECHNICAL ENGLISH-II	CO1. Identify common errors in spoken and written communication CO2. Get familiarized with English vocabulary and language proficiency. CO3. Improve nature and style of sensible writing and acquire employment and workplace communication skills CO4. Improve their Technical Communication Skills through Technical Reading and writing practices. CO5. Perform well in campus recruitment, engineering and all other general competitive examination.

Department of Electronics and Communication Engineering

Course Outcomes: After studying this course, the students will be able to:

Semester: 3
Course1: Transform Calculus, Fourier series and Numerical Techniques
Course1 Code: 18MAT31

CO 1	Use Laplace transforms and inverse Laplace transforms in solving differential/ Integral equation arising in network analysis, control systems and other field of engineering
CO 2	Demonstrate Fourier series to study the behavior of periodic functions and their applications in system communication, digital signal processing and field theory
CO 3	Make use of Fourier transform and Z transform to illustrate discrete/ continuous function arising in wave and heat propagation, signals and systems
CO 4	Solve I and II order ODE's arising in engineering problems using single and multi step numerical methods.
CO 5	Determine the extremals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

Course2: Network Theory **Course2 Code: 18EC32**

CO 1	Compute currents and voltages using source transformation and shifting, kvl, kcl, node and mesh analysis, and star-delta transformation.
CO 2	Apply superposition, reciprocity, thevinins, nortons, milmans, maximum power transfer theorems and electrical laws to reduce circuit complexities and to arrive at feasible solutions.
CO 3	Estimate the values of currents and voltages for given circuit under transient conditions.
CO 4	Apply the laplace transform to solve the any given network using matlab, python.
CO 5	Solve the network using two port network parameters like z/y/h/t.

Course3: Electronic Devices **Course3 Code: 18EC33**

CO 1	Describe the principles of semiconductor physics.
CO 2	Illustrate the principles and characteristics of pn junctions and optoelectronic devices.
CO 3	Analyze and illustrate the principles and characteristics of different types of semiconductor devices (BJT, FETs).
CO 4	Elucidate the fabrication of pn junctions and integrated circuits.

Course4: Digital System Design **Course4 Code: 18EC34**

CO 1	Explain the concept of combinational and sequential logic circuits.
CO 2	Analyze and Design the combinational logic circuits.
CO 3	Analyze and Design the sequential circuits using SR, JK, D, T flip-flops and Mealy & Moore machines
CO 4	Design applications of Combinational & Sequential Circuits.

Course5: Computer Organization & Architecture **Course5 Code: 18EC35**

CO 1	Able to describe the basic structure of a computer and to analyze the different addressing modes.
CO 2	Able to analyze different ways of accessing input/output devices including interrupts.
CO 3	Able to analyze different types of semiconductor and other secondary storage memories
CO 4	Able to illustrate simple processor organization based on hardwired control and micro-programmed control.

Course6: Power Electronics & Instrumentation **Course6 Code: 18EC36**

CO 1	Build and test the power electronics circuits using power electronic devices.
CO 2	Analyze and design the controlled rectifier and DC to DC converters.
CO 3	Analyze the Inverters, SMPS and Develop the Circuits for multi range Ammeters and voltmeters to measure passive component values.
CO 4	Illustrate the principle of operation of Digital voltmeter, Digital multi meter and bridges.
CO 5	Describe the types of Transducers and PLC
CO 6	Use Instrumentation amplifier for measuring physical parameters.

Course7: Electronic Devices & Instrumentation Laboratory
Course7 Code: 18ECL37

CO 1	Understand the characteristics of various electronic devices and measurement of parameters.
CO 2	Design and test simple electronic circuits.
CO 3	Use of circuit simulation software for the implementation and characterization of electronic circuits and devices

Course8: Digital System Design Laboratory **Course8 Code: 18ECL38**

Course Outcomes: After studying this course, the students will be able to:

CO 1	Able to demonstrate the truth table of various expressions and combinational circuits using logic gates.
CO 2	Able to design the combinational circuits such as adders, Subtractors and comparator.
CO 3	Able to construct flip flops, counters and shift registers.
CO 4	Able to simulate binary multiplier using Pspice Simulation tool

Semester: 4
Course1: Complex Analysis, Probability and Statistical Methods
Course1 Code: 18MAT41

CO 1	Use the concept of analytic functions and complex potential to solve the problems arising in electromagnetic field theory
CO 2	Utilize conformal transformation and complex integral arising in aerofoil theory
CO 3	Apply discrete and continuous probability distributions arising in engineering fields.
CO 4	Make use of correlation regression analysis to fit suitable mathematical module for the statistical data.
CO 5	Construct joint probability distribution and demonstrate validity of testing the hypothesis.

Course2: Analog Circuits **Course2 Code: 18EC42**

CO 1	Design and analyze BJT and MOSFET amplifier circuits.
CO 2	Explain frequency response of MOSFET amplifier at various frequencies.
CO 3	Design and analyze feedback and oscillator circuits.
CO 4	Analyze various types of power amplifiers.
CO 5	Design the various applications of op-amps.

Course3: Control Systems **Course3 Code: 18EC43**

CO 1	Develop the mathematical model of mechanical and electrical systems.

CO 2	Develop transfer function for a given control system using block diagram reduction, techniques and signal flow graph method.
CO 3	Determine the time domain specifications for first and second order systems. Learn how to find a mathematical model of electrical, mechanical and electromechanical systems.
CO 4	Determine the stability of a system in the time domain and frequency domain also develop a control system model in continuous and discrete time using state variable techniques.

Course4: Engineering Statistics & Linear Algebra **Course4 Code: 18EC44**

CO 1	Identify and associate random variables and random processes in communication events.
CO 2	Analyze and model the random events in typical communication events to extract quantitative statistical parameters.
CO 3	Analyze and model typical signal sets in terms of a basis function set of amplitude, phase and frequency.
CO 4	Demonstrate by way of simulation or emulation the ease of analysis employing basis functions statistical representation and eigen values.

Course5: Signals & Systems **Course5 Code: 18EC45**

CO 1	Sketch and analyze different types of signals and systems.
CO 2	Obtain the output for LTI systems using time domain and frequency domain representation.
CO 3	Analyze the performance of LTI systems in terms of impulse response.
CO 4	Analyze the performance of LTI systems in frequency domain and time domain using various transforms.

Course6: Microcontroller **Course6 Code: 18EC46**

CO 1	Explain and build circuits using Power Electronic devices.
CO 2	Design Controlled Rectifier, DC to DC Converters,
CO 3	Define Instrumental Errors and develop Circuits for Multi range Ammeters, Voltmeters, Bridges to measure, Current, Voltage, Resistance, Inductance, Capacitance and Frequency.
CO 4	Describe the principle of operation of Digital Instruments and PLC's and various components designed using Transducers
CO 5	Explain the operation and use of inbuilt Timers/ Counters and serial port of 8051.

CO 6	Interface 8051 to external memory and I/O devices using its I/O ports.

Course7: Microcontroller Laboratory **Course7 Code: 18ECL47**

CO 1	Write Assembly language programs in 8051 for solving simple problems that manipulate input data using different instructions of 8051.
CO 2	Interface different input and output devices to 8051 and control them using Assembly language programs.
CO 3	Interface the serial devices to 8051 and do the serial transfer using C programming.

Course8: Analog Circuits Laboratory **Course8 Code: 18ECL48**

CO 1	Design and evaluate the performance of analog circuits using BJT/FET.
CO 2	Design and evaluate the performance of analog circuits using opamps for different apps.
CO 3	Design and analyze different oscillators using BJT/FET.
CO 4	Simulate and analyze various analog circuits for different electronic applications.

Semester: 5
Course1: Technological Innovation Management and Entrepreneurship
Course1 Code: 18ES51

CO 1	Explain the fundamental concepts of Management and Entrepreneurship.
CO 2	Describe the concept of organizing, staffing, directing and controlling.
CO 3	Explain the functions of Managers, Entrepreneurs and their social responsibilities.
CO 4	Describe family business, their stages of development and feasibility analysis.
CO 5	Analyze the business model, financial opportunities to start business and describe project design and network analysis.

Course2: Digital Signal Processing **Course2 Code: 18EC52**

CO 1	Develop the mathematical model of mechanical and electrical systems.
CO 2	Develop transfer function for a given control system using block diagram reduction.

CO 3	Determine the time domain specifications for first and second order systems. Learn how to find a mathematical model of electrical, mechanical and electromechanical systems.
CO 4	Determine the stability of a system in the time domain and frequency domain also develop a control system model in continuous and discrete time using state variable techniques.

Course3: Principles of Communication Systems **Course3 Code: 18EC53**

CO 1	Design simple systems for generating and demodulating AM, DSB, SSB and VSB signals.
CO 2	Understand the concepts in Angle modulation for the design of communication systems.
CO 3	Design simple systems for generating and demodulating frequency modulated signals.
CO 4	Learn the concepts of random process and various types of noise
CO 5	Evaluate the performance of the communication system in presence of noise
CO 6	Analyze pulse modulation and sampling techniques

Course4: Information Theory & Coding **Course4 Code: 18EC54**

CO 1	Design the channel performance using Information theory of a random variable from its probability distribution.
CO 2	Apply various encoding scheme for data representation.
CO 3	Analyze and verify the shannan's theorem for continuous and discrete communication channels using input, output and joint probabilities.
CO 4	Apply linear block codes and cyclic codes for error detection and correction.
CO 5	Apply convolution codes for data error correction, BCH & Golay codes for Channel performance improvement against burst errors.

Course5: Electromagnetics **Course5 Code: 18EC55**

CO 1	Evaluate problems on electrostatic force, electric field due to point linear, volume charges by applying conventional methods and charge in a volume
CO 2	Apply Gauss law to evaluate Electric fields due to different charge distributions by using Divergence theorem.
CO 3	Determine potential and energy with respect to point and capacitance using place Laplace equation and Apply Biot-Savart's and Ampere's laws for evaluating Magnetic field for different current configurations.
CO 4	Calculate magnetic force, potential energy and Magnetization with respect to magnetic materials and voltage induced in electric circuits.

CO 5	Apply Maxwell's equations for time varying fields, EM waves in free space and conductors and Evaluate power associated with EM waves using pointing theorem.

Course6: Verilog HDL **Course6 Code: 18EC56**

CO 1	Write Verilog programs in gate, dataflow (RTL), behavioral and switch modeling levels of Abstraction.
CO 2	Design and verify the functionality of digital circuit/system using test benches.
CO 3	Identify the suitable Abstraction level for a particular digital design.
CO 4	Develop the programs more effectively using Verilog tasks and directives.
CO 5	Write simple programs in VHDL in different styles.

Course7: Digital Signal Processing Laboratory **Course7 Code: 18ECL57**

CO 1	Understand the concepts of analog to digital conversion of signals and frequency domain sampling of signals.
CO 2	Modeling of discrete time signals and systems and verification of its properties and results.
CO 3	Implementation of discrete computations using DSP processor and verify the results.
CO 4	Realize the digital filters using a simulation tool and a DSP processor and verify the frequency and phase response

Course8: HDL Laboratory **Course8 Code: 18ECL58**

CO 1	Write the Verilog / VHDL programs to simulate Combinational circuits in Dataflow, Behavioral and Gate level Abstractions.
CO 2	Describe sequential circuits like flip flops and counters in Behavioral description and obtain simulation waveforms.
CO 3	Synthesize Combinational and Sequential circuits on programmable ICs and test the hardware.
CO 4	Interface the hardware to the programmable chips and obtain the required output.

Semester: 6

Course1: Digital Communication **Course1 Code: 18EC61**

CO 1	Understand the mathematical representation of signal, symbol, noise and channels.
CO 2	Apply the concept of signal conversion to symbols and signal processing to symbols in transmitter and receiver functional blocks.
CO 3	Compute performance issues and parameters for symbol processing and recovery in ideal and corrupted channel conditions.

CO 4	Compute performance parameters and mitigate for these parameters in corrupted and distorted channel conditions.

Course2: Embedded Systems **Course2 Code: 18EC62**

CO 1	Describe the architectural features and instructions of 32 bit microcontroller ARM cortex M3.
CO 2	Apply the knowledge gained for Programming ARM Cortex M3 for different applications.
CO 3	Describe the basic hardware components and their selection methods based on the characteristics and attributes of an embedded system.
CO 4	Develop the hardware/software co-design and firmware design approaches and explains the need of real time operating system for embedded system

Course3: Microwave and Antennas **Course3 Code: 18EC63**

CO 1	Describe structural and operational characteristics of microwave tubes
CO 2	Analyze various parameters related to microwave transmission lines and waveguides
CO 3	Describe various antenna types and its applications
CO 4	Analyze the structure radiation pattern, characteristics of antenna
CO 5	Analyze various antenna parameters which are necessary for building an RF system.

Course4: Python Application Programming **Course4 Code: 18EC646**

CO 1	Examine Python syntax and semantics and be fluent in the use of python flow control and functions.
CO 2	Demonstrate proficiency in handling strings and file systems.
CO 3	Create, run and manipulate python programs using core data structures like Lists, Dictionaries and Regular expressions.
CO 4	Interpret the concepts of Object oriented programming as used in python.
CO 5	Implement exemplary applications related to Network programming, web services and databases in Python.

Course5: Renewable Energy Resources **Course5 Code: 18EC653**

CO 1	Illustrate the need of energy conversion and the various methods of energy storage.
CO 2	Estimate the solar energy utilization, principle involved in collection and conversion of solar energy into electrical energy.

CO 3	Explore the concept involved in wind, geothermal and hydrogen energy conversion system by studying its components types and performance.
CO 4	Explain waste recycling, bio gas generation and its impact on environment.
CO 5	Acquire knowledge on ocean thermal and tidal energy its mechanism of production and its application.

Course6: Embedded Systems Laboratory **Course6 Code: 18ECL66**

CO 1	Understand the instruction set of 32 bit microcontroller ARM Cortex M3, and the software tool required for programming in Assembly and C language.
CO 2	Develop assembly language programs using ARM Cortex M3 for different applications.
CO 3	Interface external devices and I/O with ARM Cortex M3.
CO 4	Develop C language programs and library functions for embedded system applications.

Course7: Communication Laboratory **Course7 Code: 18ECL67**

CO 1	Design and test the digital modulation & demodulation circuits and display the Waveforms.
CO 2	Determine the characteristics and response of microwave device, micro strip and compute the parameters associated with it.
CO 3	Simulate the digital modulation schemes with the display of waveforms and Computation of performance parameters.

Course8: Mini Project **Course8 Code: 18ECM68**

CO 1	Implement electronic hardware and software by learning the design techniques, testing, troubleshooting, etc.,
CO 2	Know the key stages in development of the Project work.
CO 3	Understand methodologies and professional way of documentation and communication.

Department of Mining Engineering

Course Outcomes: After studying this course, the students will be able to:

Semester: 3

Course1: MATHEMATICS -III **Course1 Code:** 18MAT31

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

Course2: ELEMENT OF MINING ENGINEERING. **Course2 Code:** 18MN32

CO 1	An Overall Knowledge of mineral industry and related policy issues. Basics of financial and cost accounting aspects.
CO 2	An ability to select proper sampling method and to classify the ore reserve and resources.
CO 3	An ability to compute ore reserve and value of a mining projects
CO 4	An ability to evaluate the economic feasibility of a mining project given the Geological mining and financial parameters
CO 5	An overall knowledge of cost accounting. Budget and budgetary control

Course3: MINE SURVEYING-1 **Course3 Code:** 18MN33

CO 1	The students will be able to apply technical knowledge on linear measurements by chain, tape, compass and plane table surveying
CO 2	The students will possess ability to identify, formulate and solve engineering problems in levelling
CO 3	The students will possess ability to determine angles using theodolite
CO 4	The students will possess ability to use the techniques, skills and modern engineering tools necessary for mine surveying

Course4: MECHANICS OF MATERIALS **Course4 Code:** 18MN34

CO 1	To Compute the influence of stress and strain acting on the materials
CO 2	To analyse principle stresses and maximum shear stress and determine internal pressure in thin cylinders
CO 3	Design a beam and compute shear force and bending moment for various loading conditions and determine the slope and deflection of beams
CO 4	Apply Euler's column theory for various end conditions and compute the crippling load

Course5: GEOLOGY FOR MINING ENGINEERING - 1 **Course5 Code:** 18MN35

CO 1	The Students will gain technical knowledge on shape, size, mass & density of earth, age of the earth structure of the earth
CO 2	They will be able to identify, formulate and solve engineering problems related to properties of minerals, Structural geology, types of rocks and geology maps
CO 3	They will possess ability to use the techniques, skills and modern engineering tools necessary for engineering Geology
CO 4	The students will gain technical knowledge on stratigraphy of Indian important geological formation of India

Course6: Mineralogy, Petrology and Stratigraphy **Course6 Code:** 18MN36

CO 1	Ability to select drilling equipment for drilling in mines under various conditions
CO 2	Ability to select explosives and accessories for mine specific blasting
CO 3	Ability to select accessories used in blasting and various methods of blasting
CO 4	Ability to handle explosives and other accessories with safety
CO5	Ability to understand the mechanics of blasting which in turn helps in blasting design

Semester: 4

Course1: Mathematics-IV **Course1 Code:** 18MAT41

CO 1	Use the concept of analytic functions and complex potential to solve the problems arising in electromagnetic field theory
CO 2	Utilize conformal transformation and complex integral arising in aerofoil theory
CO 3	Apply discrete and continuous probability distributions arising in engineering fields
CO 4	Make use of correlation regression analysis to fit suitable mathematical module for the statistical data.
CO 5	Construct joint probability distribution and demonstrate validity of testing the hypothesis

Course2: UNDERGROUND METAL MINING **Course2 Code:** 18MN42

CO 1	Apply the fundamentals of thermodynamics and its application to work and heat.
CO 2	Analyse the first and second law of thermodynamics and its application to wide range of systems.
CO 3	Identify basic properties of fluid mechanics.
CO 4	Choose the manometer for different purpose and select the appropriate one for particular application.
CO 5	Adopt the Bernoulli's equation for various application and its limitation to various uses.

Course3: MINE SURVEYING-II **Course3 Code:** 18MN43

CO 1	Understand the basic concepts of surveying an underground
CO 2	Understand different methods of underground surveying
CO 3	Understand different methods of underground traversing, setting out gradients in tunnels and adits Mine plans and sections
CO 4	Understand the duties and responsibility of surveyor's care and precaution in storage and statutory responsibility.
CO5	Understand the Application of Photogrammetric surveying and Remote sensing in Mining

Course4: MINING MACHINERY **Course4 Code:** 18MN44

CO 1	Apply the fundamentals of Air Compressors and Mine Transport System.
CO 2	Choose an appropriate wire rope for different purposes and to adopt different rope haulages in underground mines.
CO 3	Select appropriate conveyor and locomotive system based on various conditions in underground mines.
CO 4	Identify and explain different winding systems used in underground mines.
CO 5	Adopt proper braking system of winders in underground mines.

Course5: GEOLOGY FOR MINING ENGINEERING **Course5 Code:** 18MN45

CO 1	The students will be able to identify, formulate and solve the problems of economic minerals
CO 2	The students to learn to use the technique skills

CO 3	The students to learn to use modern engineering tool necessary for Geophysical and geochemical prospecting
CO 4	To identify coal & petroleum deposits
CO 5	Familiarise with exploration prospecting sampling ore estimation and report writing

Course6: THERMODYNAMICS AND FLUID MECHANICS **Course6 Code: 18MN46**

CO 1	Define system and outline the fundamental of thermodynamic, classify work and heat
CO 2	Apply laws of thermodynamics and calculate change in internal energy and power of compressor
CO 3	Explain the fundamentals of fluid mechanics like properties, surface tension and capillary
CO 4	Describe monuments and pressure gauge and calculate metacentric height
CO 5	Formulate on expression for Bernoulli's equation form Euler's equation of motion and predict the limitations of Bernoulli's equation.

Department of Electrical and Electronics Engineering

Course Outcomes: After studying this course, the students will be able to:

Semester: 7

Course1: Power System Analysis – 2 **Course1 Code:**17EE71

CO 1	Formulate network matrices and models for solving load flow problems
CO 2	Perform steady state power flow analysis of power systems using numerical iterative techniques.
CO 3	Understanding of optimal operation of generators on a bus bar, optimal unit commitment.
CO 4	Discuss optimal scheduling for hydro thermal system and power system security.
CO 5	Analysis short circuit faults in power system networks using bus impedance matrix & to perform numerical solution of swing equation for multi machine stability

Course2: Power System Protection **Course2 Code:**17EE72

CO 1	Discuss performance of protective relays protection scheme & relay technology, overcurrent protection.
CO 2	Explain the working of distance relays& the effects of arc resistance .power swings & source impedance.
CO 3	Discuss pilot protection, wire pilot relaying & carrier pilot relaying.
CO 4	Discuss construction, operating principles & performance of differential relays
CO 5	Discuss protection of generators, transformers 7 busbar protection.

Course3: High Voltage Engineering **Course3 Code:** 17EE73

CO 1	Explain conduction and breakdown in gases, liquid dielectrics and solid dielectricts.
CO 2	Differentiate various techniques used in generation of high voltage, current with measurement techniques.
CO 3	Analyse overvoltage phenomenon and insulation co ordination in power systems.
CO 4	Applying various techniques for non distructive testing of materials and highvoltage testing of electric apparatus.

Course4: Power System Planning **Course4 Code:** 17EE744

CO 1	Discuss primary components of power system planning, planning methodology for optimum power system expansion, various types of generation, transmission and distribution.
CO 2	Analyse the forecasting of future load requirements of both demand and energy by deterministic and statistical techniques using forecasting tools.
CO 3	Discuss methods to mobilize resources to meet the investment requirement for the power sector
CO 4	Explain the expansion of power generation and planning for system energy in the country, evaluation of operating sates of transmission system.

Course5: FACTs and HVDC Transmission **Course5 Code:** 17EE751

CO 1	Discuss the basic concepts, transmission interconnections and flow of power in an AC system.
CO 2	Know the significance of shunt, series compensation and role of FACTS devices on system control.
CO 3	Identify significance of DC over AC transmission system, types and application of HVDC links
CO 4	Describe the basic components of a converter and the methods for compensating the reactive power demanded by the converter.

Course6: Power system Simulation Laboratory **Course6 Code:** 17EEL76

CO 1	Write Matlab program to find y bus
CO 2	Write Matlab program for Transmission line parameters
CO 3	Write programs using mi power for different fault analysis

Course7: Rely and High Voltage Laboratory **Course7 Code:** 17EEL77

CO 1	Discuss performance of protective relays protection scheme & relay technology over current protection
CO 2	Explain the working of distance relays & the effects of arc resistance, power swings & source impedance
CO 3	Discuss piolet protection, wire pilot relaying & carrier pilot relaying
CO 4	Discuss construction, operating principles & performance of different relays
CO5	Discuss protection of generators, transformers 7 bus bar protection.

Semester: 8
Course1: Power System Operation and Control **Course1 Code:** 17EE81

CO 1	Describe various levels of controls in power systems, the vulnerability of the system, components, architecture, configuration of SCADA and unit commitment problems
CO 2	Explain issues of hydrothermal scheduling and solutions to hydro thermal problems
CO 3	Explain basic generator control loops, functions of Automatic generation control, speed governors
CO 4	Develop and analyse mathematical models of Automatic load frequency control
CO 5	Explain reliability, security, contigency analysis, state estimation and related issues of power systems.

Course2: Industrial Drives and Applications **Course2 Code:** 17EE82

CO 1	Explain the Advantages and choice of Electric Drive Dynamic different modes of Electric drives
CO 2	To Suggest a motor for a drive and control of DC motor using controlled rectifiers
CO 3	Analysis the performance induction motor drives under different conditions
CO 4	Control induction motor, synchronous motor and stepper motor drives and its applications.

Course3: Operation and Maintenance of Solar Electric Systems
Course3 Code: 17EE832

CO 1	Discuss basics of solar resource data, photovoltaic technology & usage
CO 2	Explain the use of photovoltaic system components
CO 3	Assess the site for photovoltaic system installation & grid connected system
CO 4	Explain installation, commissioning, operation & maintenance of photovoltaic systems

Department of Computer Science Engineering

Course Outcomes: After studying this course, the students will be able to:

Semester: 3

Course: Transform Calculus, Fourier series and Numerical Techniques

Course Code: 18MAT31

CO 1	Use Laplace transforms and inverse Laplace transforms in solving differential/ Integral equation arising in network analysis, control systems and other field of engineering
CO 2	Demonstrate Fourier series to study the behavior of periodic functions and their applications in system communication, digital signal processing and field theory
CO 3	Make use of Fourier transform and Z transform to illustrate discrete/ continuous function arising in wave and heat propagation, signals and systems
CO 4	Solve I and II order ODE's arising in engineering problems using single and multi step numerical methods.
CO 5	Determine the extremals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

Course Code: Data structure and its application Course:18CS32

CO 1	Acquire knowledge of - Various types of data structures, operations like arrays , dynamic allocations and different application on array data structure.
CO 2	Design and Analyze the performance of – Stack, Queue and its applications
CO 3	Design and implement the applications based on linked list data structures
CO 4	Implement a nonlinear data structure like trees, graphs and its applications

Course Code: ANALOG AND DIGITAL ELECTRONICS Course: 18CS33

CO 1	Acquire knowledge of JFETs and MOSFETs, Operational Amplifier circuits and their applications.
CO 2	Combinational Logic, Simplification Techniques using Karnaugh Maps, Quine McClusky
CO 3	Operation of Decoders, Encoders, Multiplexers, Adders and Subtractors.
CO 4	Working of Latches, Flip-Flops, Designing Registers, Counters
CO5	A/D and D/A Converters.

Course Code: COMPUTER ORGANIZING Course: 18CS34

CO 1	Explain the organization of computer systems.
CO 2	Analyze the programs as sequence of machine instructions.
CO 3	Evaluate the performance of memory systems.
CO 4	Analyze simple arithmetic and logic units.

Course Code: SOFTWARE ENGINEERING Course: 18CS35

CO 1	Design the software systems/components using software development process
CO 2	Apply appropriate software systems models in developing the software
CO 3	Analyze software models with appropriate testing methods
CO 4	Comprehend software development approaches, UML models
	Assess professional and ethical responsibility .

Course Code: DISCRETE MATHEMATICAL STRUCTURE Course: 18CS36

CO 1	Gain the knowledge of propositional, predicate logic in knowledge representation and truth table verification.
CO 2	Solve problems using recurrence relations and generating functions
CO 3	Solve problems on Relations and Function
CO 4	Compare graphs , trees and their applications

Course Code: ANALOG & DIGITAL ELECTRONICS LAB
Course: 18CSL37

CO 1	Use appropriate design / equations/ methods to design the given circuit
CO 2	Examine and verify the design of both analog and digital circuits using simulators.
CO 3	Make use of electronic components, ICs, instruments and tools for design and testing of circuits for the given appropriate inputs

CO4	Compile a lab experiments which includes aim, tool/instruments/software used, design equations used, schematics, results as graphs & tables and concluding the findings.

Course Code: DATA STRUCTURE & APPLICATION LAB
Course: 18CSL38

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

Semester: 4th
Course: Complex Analysis, Probability and Statistical Methods
Course Code: 18MAT41

CO 1	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
CO 2	Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
CO 3	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
CO 4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.

Course: DESIGN & ANALYSIS OF ALGORITHMS
Course Code: 18CS42

CO 1	Explain various computational problem solving techniques
CO 2	Apply appropriate method of algorithm analysis
CO 3	Evaluate running time and space complexity of algorithms
CO 4	Differentiate between different approaches of algorithm design
CO 5	Devise an algorithm using appropriate design strategies for problem solving

Course: OPEATING SYSTEM Course Code: 18CS43

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

Course: MICROCONTROLLER EMBEDDED SYSTEMS
Course Code: 18CS44

CO 1	Describe the architectural features and instructions of ARM microcontroller
CO 2	Apply the knowledge gained for Programming ARM for different applications.
CO 3	Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
CO 4	Develop the hardware /software co-design and firmware design approaches
CO5	Demonstrate the need of real time operating system for embedded system applications

Course: OBJECT ORIENTED CONCEPTS Course Code: 18CS45

CO 1	Animate real world problems using OpenGL
CO 2	Explain the Object Oriented Concepts of JAVA
CO 3	Develop computer programs to solve real world problems in JAVA
CO 4	Develop simple GUI interface for a computer program to interact with users
CO5	Understand the event based GUI handling principles using Applets and Swings

Course: DATA COMMUNICATION Course Code: 18CS46

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

Course: DESIGN & ANALYSIS OF ALGORITHMS LAB
Course Code: 18CSL47

CO 1	Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
CO 2	Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language.
CO 3	Analyze and compare the performance of algorithms using language features.
CO4	Apply and implement learned algorithm design techniques and data structures to solve real-world problems.

Course: MICROCONTROLLER EMBEDDED SYSTEMS LAB
Course code: 18CSL48

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

Department of Civil Engineering

Course Outcomes: After studying this course, the students will be able to:

Semester: 3
Course: Transform Calculus, Fourier series and Numerical Techniques
Course Code: 18MAT31

CO 1	Use Laplace transforms and inverse Laplace transforms in solving differential/ Integral equation arising in network analysis, control systems and other field of engineering
CO 2	Demonstrate Fourier series to study the behavior of periodic functions and their applications in system communication, digital signal processing and field theory
CO 3	Make use of Fourier transform and Z transform to illustrate discrete/ continuous function arising in wave and heat propagation, signals and systems
CO 4	Solve I and II order ODE's arising in engineering problems using single and multi step numerical methods.
CO 5	Determine the extremals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

Course: Strength of materials **Course Code: 18CV32**

CO 1	To evaluate the basic concepts of the stresses and strains for different materials and strength of structural elements
CO 2	To evaluate the development of internal forces and resistance mechanism for one dimensional and two dimensional structural elements
CO 3	To analyze different internal forces and stresses induced due to representative loads on structural elements
CO 4	To evaluate slope and deflections of beams.
CO 5	To evaluate the behavior of torsion members, columns and struts.

Course: Fluid mechanics **Course Code: 18CV33**

CO 1	Possess a sound knowledge of fundamental properties of fluids and fluid Continuum
CO 2	Compute and solve problems on hydrostatics, including practical applications
CO 3	Apply principles of mathematics to represent kinematic concepts related to fluid flow
CO 4	Apply fundamental laws of fluid mechanics and the Bernoulli's principle for practical applications
CO 5	Compute the discharge through pipes and over notches and weirs

Course: building materials and construction **Course Code: 18CV34**

CO 1	Select suitable materials for buildings and adopt suitable construction techniques.
CO 2	Decide suitable type of foundation based on soil parameters
CO 3	Supervise the construction of different building elements based on suitability
CO 4	Exhibit the knowledge of building finishes and form work requirements

Course: Basic surveying **Course Code: 18CV35**

CO 1	Posses a sound knowledge of fundamental principles Geodetics
CO 2	Measurement of vertical and horizontal plane, linear and angular dimensions to arrive at solutions to basic surveying problems.
CO 3	Capture geodetic data to process and perform analysis for survey problems
CO 4	Analyse the obtained spatial data and compute areas and volumes. Represent 3D data on plane figures as contours

Course: Engineering Geology **Course Code: 18CV36**

CO 1	Apply geological knowledge in different civil engineering practice.
CO 2	Students will acquire knowledge on durability and competence of foundation confidence enough
CO 3	Civil Engineers are competent enough for the safety, stability, economy and life structures that they construct.
CO 4	Able to solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems.
CO 5	Intelligent enough to apply GIS, GPS and remote sensing as a latest tool in different civil engineering construction.

Course: Computer aided building planning and drawing **Course Code: 18CVL37**

CO 1	Prepare, read and interpret the drawings in a professional set up.
CO 2	Know the procedures of submission of drawings and Develop working and submission drawings for building.
CO 3	Plan and design a residential or public building as per the given requirements.

Course: Building materials testing Laboratory **Course Code: 18CVL38**

CO 1	Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear and torsion
CO 2	Identify, formulate and solve engineering problems of structural elements subjected to flexure
CO 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.

Department of Mechanical Engineering

Course Outcomes: After studying this course, the students will be able to:

Semester: 8

Course: Operations Research **Course Code:** 17ME81

CO 1	Understand the meaning, definitions, scope need phases and techniques of operations Research and formulate as LPP and derive optimal solution to linear programming problems by graphical method.
CO 2	Formulate as LPP and derive optimal solution to linear programming problems by simplex method, Big-M method and Dual Simplex method.
CO 3	Formulate as Transportation and Assignment problems and derive solutions for Transportation, Assignment and Travelling salesman problems.
CO 4	Solve waiting line problems M/M/I and M/M/K Queuing models and construct Network diagrams and determine Critical path , Floats for deterministic and PERT networks including crashin
CO 5	Solve problems on Game Theory for pure and mixed strategy under competitive environment and determine minimum processing times for sequencing of n-jobs 2 machines, n-jobs 3 machines, n jobs m machines and johnsons algorithm.

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

CO 1	Understand the different process of AM, guidelines and applications of AM.
CO 2	Understand the hydraulic and Pneumatic motors, Electrical Motors and Actuators.
CO 3	Understand the different process of AM using polymers and powder production technology.
CO 4	Analyse the different characterisation techniques in nano materials Manufacturing.
CO 5	Describe the NC, CNC Machine programming and automation techniques.

Course: Product Life Cycle Management **Course Code: 17ME835**

CO 1	Explain the various strategies of PLM and Product Data Management
CO 2	Describe decomposition of product design and model simulation
CO 3	Apply the concept of New Product Development and its structuring
CO 4	Analyze the technological forecasting and the tools in the innovation
CO 5	Apply the virtual product development and model analysis

Course: INTERNSHIP **Course Code: 17ME84**

CO 1	Apply engineering and management principles
CO 2	Analyze real-time problems and suggest alternate solutions
CO 3	Communicate effectively and work in teams
CO 4	Imbibe the practice of professional ethics and need for lifelong learning.

Course: PROJECT PHASE II **Course Code: 17MEP85**

CO 1	Identify and analyze problems by applying engineering concepts.
CO 2	Select and apply efficient tools for designing project modules.
CO 3	Work in a team to solve real life problems and maintain professionalism.
CO 4	Prepare a report as per recommemded format and defend the work.

Course: TECHNICAL SEMINAR **Course Code: 17ECS86**

CO 1	perform survey and review relevent information to the field of study
CO 2	enhance presentation skills and report writing skills to use the best building ls.
CO 3	develop alternative solutions which are sustainable