NARASARAOPETA
ENGINEERING COLLEGE
(AUTONOMOUS)

Course Outcomes

B. TECH.(EEE) - COURSE OUTCOMES ACADEMIC YEAR: 2020-21	
I B. TECH (R 20)	
I Semester	**II Semester**
Technical and Communicative English – I [20CC1101] **CO1**:Infer explicit and implicit meaning of a text, recognize Key passages; raise questions and summarize it. **CO2**: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **CO3**: Build grammatically correct sentences using a variety of sentence structures. **CO4**: Enhance word power and usage of lexicons.	**Differential Equations and Vector calculus [R20CC1201]** **CO1**: Apply first order ordinary differential equations to real life situations. **CO2**:Identify and apply suitable methods in solving the higher order differential equations. **CO3**:Solve the partial differentiation equations. **CO4**:Interpret the physical meaning of different operators as gradient, curl and divergence. **CO5**: Estimate the work done against a field, circulation and flux using vector calculus.
Matrix Algebra and Calculus [R20CC1102] **CO1**: Solve the system of linear equations. **CO2**:Analyse the applications of matrices in various fields and obtain Eigen values and Eigenvectors. **CO3**:Relate the results of mean value theorems in calculus to Engineering problems. **CO4**: Apply the functions of several variables to valuate the rates of change with respect to time and space variables in engineering. **CO5**: Identify the area and volume by interlinking them toappropriate double and triple integrals.	**Applied Physics [R20CC1205]** **CO1**: Interpret the experimental evidence of wave nature of light and interference in thin Films, Diffraction grating and Polaraisation in various fields. **CO2**: Analyse and understand various types of lasers and Optical fibers. **CO3**: Identify the crystal structures and XRD techniques. **CO4**: Apply the magnetic materials in engineering field. **CO5**: Identify the various applications of semiconductors in engineering field.
Basics in Mechanical and Civil engineering[20EE1109] **CO1**:Illustrate the types of power plants and applications. **CO2**: Estimate the flow parameters in various devices. **CO3**: Understand the basics elements and measurements of civil engineering. **CO4**:Explain the usage and proper selection of construction materials.	**Electronics Devices and Circuits [R20EE1209]** **CO1**: Use P-N diodes in electronic circuits. **CO2**: Use special diodes and rectifiers in electronic circuits. **CO3**: Explore the operation of BJT and its applications. **CO4**: Analyse the thermal stability of BJT. **CO5**: Explore the operation of FET, other transistors and their applications.
Problem Solving Using C [R20CC1105] **CO1**: Develop algorithms and flow charts for simple problems. **CO2**: Utilize suitable control structures for developing code in C. **CO3**: Make use of functions and arrays in developing modular programs. **CO4**: Make use of structures and pointers to write well-structured programs. **CO5**:Make use of file Operations in C programming fora given application.	**Electrical CircuitAnalysis-I [R20EE1213]** **CO1**: Analyze basic electrical circuits using mesh and nodal analysis. **CO2**: Illustrate phase and phase relationship of basic electrical elements and circuits. **CO3**: Design of tank circuit for given frequency and analyse the coupled circuits. **CO4**: Analyze the electrical circuits using network theorems for D.C. excitation. **CO5**: Analyze the electrical circuits using network theorems for A.C. excitation.
Engineering Drawing and Design [R20EE1112] **CO1: Construct** the geometrical shapes of regular Polygons, Engineering Curves, and scales. **CO2: Illustrate** the orthographic projections, projections of points, and lines inclined to both the planes. **CO3:Construct** the projection of planes inclined to both the planes **CO4: Construct** the projection of solids for engineering applications. **CO5: Analyse** the conversion of isometric views to orthographic views vice versa.	**Data Structures using C [R20EE1217]** **CO1**: Illustrate sorting and searching algorithms. **CO2**: Summarize elementary data structures such as stacks, queues and linked lists. **CO3**: Compare and contrast various forms of trees. **CO4**: Outline graph data structures and various graph traversal techniques.
Soft Skills and Communication Skills Lab[R20CC11L1] **CO1:** Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and	**Applied Physics Lab [R20CC12L10]** **CO1**: Apply the principle of physics in engineering field. **CO2**: Utilize the modern engineering physics techniques and

professional environment. **CO2**: Listen and comprehend several accents of English Language **CO3**: Take part in various conversations/discourses using formal and informal expressions. **CO4**: Adapt soft skills successfully in personal and professional life.	tools in real time applications. **CO3**: Analyse characteristics, usage and the behaviour of Materials.
Basics in Mechanical and Civil Engineering Lab [R20EE11L6] **CO1: Estimate** the discharge through flow measurement Device. **CO2**: **Solve** the flow equations to estimate performance of the turbines and pumps. **CO3: Determine** the calorific value of fuel and to perform tests on engines and compressor. **CO4: Classify** and understand the applications of basic building materials. **CO5: Apply** the basic principles of engineering surveying, linearand Angular measurements**.**	**Electronics Devices and Circuits Lab [R20CC12L9]** **CO1**: Understand and analyze the behaviour of PN junction diode,Zener diode. **CO2**: Understand the operational difference between half wave and Full wave Rectifiers. **CO3**: Identify the switching characteristics of transistor. **CO4**: Analyze the characteristics of transistor. **CO5**: Identify and analyze the UJT characteristics and its Applications.
Problem Solving Using C Lab [R20CC11L2] **CO1**: Study, analyze and understand logical structure of computer programming and different Constructs to develop programs in C Language. **CO2**: Compare and contrast various data types and operator precedence. **CO3**: Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions. **CO4**: Analyze simple data structures, use of pointers and dynamic memory allocation techniques. **CO5**: Make use of functions and file I/O operations in developing C Programs.	**Data Structures using C Lab [R20CC12L8]** **CO1**: Develop various algorithms using recursive and Non-recursive functions. **CO2**: Experiment with linear data structures. **CO3**: Apply Tree traversal techniques in various applications.
	Constitution of India (MC) [R20CCMC1] **CO1**: Examine salient features of Indian Constitution and live accordingly in society and interpret the meaning of Fundamental Rights of State Policy. **CO2**: Discover various aspects of Union Government. legislation and live up to the Expectations of the rules. **CO3**: Critically examine State Government legislation and improve your living standards by following the rules strictly. **CO4**: Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living . **CO5**: Analyze the powers and functions of Election Commission and The Union PublicService Commission and decide upon it for safe and secured life.
II B.TECH.(R19)	
I Semester	**II Semester**
Electrical Circuit Analysis – II **CO1:**Solve three- phase circuits under balanced & unbalanced condition. **CO2:** Find out transient response of electrical networkswith different types of excitations. **CO3:**Estimate the different types of two port network parameters. **CO4:** Design k and m filters. **CO5:** Extract different harmonics components from the response of electrical network.	**Digital Electronics** **CO1:** Aware of Boolean algebra & the underlying features of various number systems. **CO2:** Design various combinational logic circuits. **CO3:** Design and realize Boolean functions using PLDs. **CO1:** Analyze and design various sequential circuits and illustrate basic gates with TTL, ECL, MOS logic family.

Electronic devices and Circuits **CO1:** Explore the semiconductors. **CO2:** Use P-N diodes and special diodes in electronic circuits. **CO3:** Analyze BJT and its thermal stability. **CO4:** Explore the operation of FET, other transistors and their applications.	**Control Systems** **CO1:** Develop a mathematical model of electrical and physical system. **CO2:** Analyze the electrical and mechanical analysis in time and frequency domains. **CO3:** Examine stability analysis techniques with appropriate compensators.
Electro Magnetic Fields **CO1:** Summarize the laws of Electrostatics and apply them in electrostatic field. **CO2:** Summarize the laws of Magneto statics and apply them in static magnetic field. **CO3:** Compute the force experienced by charged bodies in magnetic field and identify magnetic potential and its properties. **CO4:** Identify the time varying field and understand Faraday's Laws of Electromagnetic Induction.	**Power Generation and Economic Aspects** **CO1:** Identify the different components of thermal power plants. **CO2:** Identify the different components of nuclear Power plants. **CO3:** Distinguish between AC/DC distribution systems and also estimate voltage drops of distribution systems. **CO4:** Identify the different components of air and gas insulated substations. **CO5:** Identify single core and three core cables with different insulating materials. **CO6:** Analyse the different economic factors of power generation and tariffs.
Fluid Mechanics and Prime Movers **CO1:** Learn the concept of fluid and its properties, the basic laws of fluids. **CO2:** Get the knowledge of fluid kinematics and dynamics to solve the problems. **CO3:** Understand the concept of flow through pipes. **CO4:** Understand the working of different kinds of pumps. **CO5:** Understand the working of different kinds of turbines. **CO6:** Understand the concepts of hydro power generation.	**Electrical Machines-II** **CO1:** Working of induction motors and its characteristics. **CO2:** Performance test on the induction motor to find the losses, efficiency. **CO3:** Speed control techniques of induction motors for industry requirements. **CO4:** Working of synchronous generator, Calculation of voltage regulation and how to synchronize it with grid. **CO5:** Applications of synchronous motors and differences between the induction motor and synchronous motor.
Complex Variables and Statistical Methods **CO1:** Apply mathematical reasoning and the theory of complex variables to solve theoretical and applied problems. **CO2:** Calculate fundamental concepts such as the cumulative distribution function, expectations, and distributions of random variables. **CO3:** Apply this knowledge to identify, maximu error and determination of sample size, Interval Estimation (Large sample and small sample), Bayesian Estimation, Tests of Hypothesis.	**Business Management Concepts for Engineers** **CO1:** The outcome of this program is that the student learns necessary skills relating tothe economics, management a And accountancy which are useful for decision making. **CO2:** This course helps the student to equip themselves with the basic principles of accounting which will be of help to them to know the fundamentals of accounting. **CO3:** The student will also acquire necessary skills relating to various functional aspects of management viz., Human Resource Management, Marketing Management etc. **CO4:** This course will also help the student to acquaint with the latest management concepts and practices which are used in the industry.
Electrical Machines-I **CO1:** Understand the unifying principles of electromagnetic energy conversion. **CO2:** Understand the construction, principle of operation and performance of DC machines. **CO3:**Learn the characteristics, performance, methods of speed control and testing methods of DC motors.	**Analog Electronics** **CO1:** Understand and design the operation of feedback amplifiers. **CO2:** Understand different wave shaping circuits and design basic op-amp circuits. **CO3:** Design different multivibrators using op-amp and 555 timers, different oscillators. **CO4:** Know about different D/A and A/D converters.

CO4: To predetermine the performance of single phase transformers with equivalent circuit models. **CO5:** Understand the methods of testing of single-phase transformer. **CO6:** Analyze the three phase transformers and achieve three phase to two phase conversion.	
Electrical Circuits Lab **CO1:** Become familiar with the basic circuit components and know how to connect them to make a real electrical circuit. **CO2:** Become familiar with basic electrical measurement instruments and know how to use them to make different types of measurements. **CO3:** Verify the laws and principles of electrical circuits, understand the relationships and differences between theory and practice. **CO4:** Gain practical experience related to electrical circuits, stimulate more interest and motivation for further studies of electrical circuits.	**Electrical Machines - I Lab** **CO1:** Calculate the critical field resistance and critical speed of DC Generator **CO2:** Predetermine the efficiency of a given DC Shunt machine working as Motor and Generator. **CO3:** Analyse the characteristics of DC Motors and Generators. **CO4:** Evaluate efficiencies of DC Series and Shunt generators
Electronic devices and Circuits Lab **CO1:** Understand and analyze the behavior of electronic circuits. **CO2:** Understand the characteristics of various semiconductordevices like BJT, FET, UJT. **CO3:** Design transistor & FET amplifier circuits.	**Analog & Digital Circuits Lab** **CO1:** Understand the realization of logic gates and Flip-Flops. **CO2:** Design and analyze clippers, Clampers and also implement the applications using op- amps. **CO3:** Design of multivibrator using 555 IC timers and Schmitt trigger circuit using op-amp.
Verbal Ability **CO1:** Use appropriate words effectively in their Communication **CO2:** Identify and correct Grammar and vocabulary related errors **CO3:** Construct the sentences effectively using appropriate verbal reasoning abilities **CO4:** Demonstrate understanding and comprehensive skills **CO5:** To clear written test in campus placements as well as various competitive exams.	**Quantitative Aptitude and Reasoning-I** **CO1:** Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements **CO2:** Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors. **CO3:** Will be able to demonstrate various principles involved in solving mathematical. **CO4:** Problems and thereby reducing the time taken for performing job functions.

III B.TECH.(R16)

I Semester	II Semester
Power System Transmission Lines **CO1:** Apply the knowledge of mathematics for deriving the inductance and capacitance for various conductor configurations and to find ABCD constants for different transmission lines. **CO2:** Find efficiency and regulation of different transmission lines. **CO3:** Analyze the factors affecting the power loss due to corona and suggest methods to minimize the corona loss. **CO4:** Classify the insulators used in power transmission and distribution system. **CO5:** Analyze the different waves and transients in power systems. **CO6:** Calculate Sag and Tension in Transmission lines.	**Power System Analysis** **CO1:** Draw an impedance diagram for a power system network. **CO2:**Form a Ybus matrix for a power system network with or without mutual couplings. **CO3:** Find out the load flow solution of a power system network using different types of load flow methods. **CO4:** Formulate the Zbus for a power system network. **CO5:** Find out the fault currents for all types faults with a view to provide data for the design of protective devices. **CO6:** Find out the sequence components of currents for any unbalanced power system network.

Power Electronics **CO1:** Explain the characteristics of various power semiconductor devices like BJT, MOSFET, and IGBT &SCR. **CO2:** Identify the operation of Half–wave & full–wave converters and their comparisons. **CO3:** Identify the operation of three phase full–wave Converters and dual converter. **CO4:** Demonstrate the operation of single phase AC Voltage converters&Cyclo converters and their comparisons. **CO5:** Summarize the various DC-DC converters and four-quadrant operation of chopper clearly. **CO6:** Explain the working of inverters and make use of PWM techniques for voltage control and harmonic mitigation.	**Power Semiconductor Drives** **CO1:** Understand the fundamentals of electric drive and different electric braking methods. **CO2:** Analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters. **CO3:** Discuss the converter control of dc motors in various Quadrants. **CO4:** Understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters. **CO5:** Analyze the principles of static rotor resistance control and various slip power recovery schemes. **CO6:** Understand the speed control mechanism of synchronous motors.
Electrical Measurements **CO1:** Understand and describe construction, principle of construction operation, errors, and compensations **CO2:** Understand the extension of ranges of different electrical measurement instruments and understanding oferror analysis. **CO3:** Able to perform test on CTs and calculate Ratio and phase angle errors and calibrate the PF meters. To be acquainted with the knowledge of instruments that is useful for the measurement of power and energy. **CO4:** Describe and demonstrate the usage of DC and AC bridges for the measurement of resistance, inductance and capacitance and able to calibrate different measuring instruments using potentiometers. **CO5:** Determination of magnetic measurements including B-H curve, hysteresis loop. **CO6:** Understand usage of different digital meters for the measurement of voltage frequency and speed.	**Data Structures** **CO1:** Analyze sorting and searching algorithms. **CO2:** Summarize elementary data structures such as stacks, queues and linked lists. **CO3:** Compare and contrast various forms of trees. **CO4:** Outline graph data structures and various graph traversal techniques.
Microprocessor & Microcontrollers **CO1:** Recall the basic concepts, elements & operations of digital computer system. **CO2:** Demonstrate memory organization and I/O processing for microprocessor and microcontroller. **CO3:** Make use of Instruction set to develop Assembly Language Programming for computational operations. **CO4:** Model a microprocessor based system by interfacing different electronic devices. **CO5:** Illustrate the instruction set present in a microcontroller different operations. **CO6:** Develop cyber physical systems.	**ELECTRICAL DISTRIBUTION SYSTEMS** **(Professional Elective-II)** **CO1:** Able to understand various factors of distribution system. **CO2:** Able to design the substation and feeders. **CO3:** Able to determine the voltage drop and power loss **CO4:** Able to understand the protection and its coordination. **CO5:** Able to understand the effect of compensation for power factor improvement. **CO6:** Able to understand the effect of voltage control.
Signals and Systems **CO1:** Remember basic signals and its operations. **CO2:** Understand Fourier series representation of different signals. **CO3:** Translate signals from time-domain to frequency-domain and vice versa. **CO4:** Understand the LTI system and responses for different inputs. **CO5:** Understand different properties of Convolution Methods.	**ENERGY AUDIT, CONSERVATION & MANAGEMENT** **(Professional Elective-II)** **CO1:** Explain energy efficiency, conservation and various technologies. **CO2:** Design energy efficient lighting systems. **CO3:** Calculate power factor of systems and propose suitable compensation techniques. **CO4:** Explain energy conservation in HVAC systems. **CO5:** Calculate life cycle costing analysis and return on investment on energy efficient technologies. **CO6:** Understand economic aspects and analysis.

CO6: Understand Sampling theorem, Correlation and their applications.	
RENEWABLE ENERGY SOURCES (Professional Elective-I) **CO1:** Analyze the significance of renewable energy. **CO2:** Understand the principles of solar radiation and design the solar collectors. **CO3:** Know the functioning of basic components of wind energy and understand the utilization of biomass in power generation. **CO4:** Understand the working principles of geothermal, ocean, tidal and wave energy techniques. **CO5:** Know the functioning of direct energy conversion Techniques. **CO6:** Understand the MHD power generation and its future Prospects.	**DIGITAL SIGNAL PROCESSING (Professional Elective-II)** **CO1:** Analyze the signals and system in Time and Frequency domain through its respective tools. **CO2:** Find DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithm. **CO3:** Explain the significance of various filter structures and effects of roundoff errors. **CO4:** Demonstrate knowledge of complex number, Fourier Series and ability to design electrical and electronics systems. **CO5:** Construct the digital filter circuits for generating desired signal wave shapes (non- sinusoidal) for different applications like computers, control systems and counting and timing systems. **CO6:** Develop the digital computer or digital hardware for quantizing amplitudes of signals.
Electrical Machine Design (Professional Elective – I) **CO1:** Understand Material Selection, Heating & Cooling Techniques. **CO2:** Understand the design of various types of windings. **CO3:** Understand the design of various parts of DC machines and solve the problems of design **CO4:** Understand the design concepts of transformers and know about how to design the parts. **CO5:** Understand the design concepts of synchronous machines and solve the problems related to design. **CO6:** Understand the importance of design of machines based on their applications.	**SPECIALMACHINES (Professional Elective-II)** **CO1:** Explain theory of operation and control different types of single phase motors like Universal motor & Servo motors etc. **CO2:** Explain theory of operation and control of switched reluctance motor. **CO3:** Contrast the performance and control of stepper motors, and their applications. **CO4:** Classify different types of permanent magnet materials & explain PMDC motor operation. **CO5:** Compare brush dc motor and brush less dc motor. **CO6:** Explain the theory of travelling magnetic field in linear motors& summarize the AC&DC Traction systems.
MICRO ELECTRO MECHANICAL SYSTEMS (Professional Elective-I) **CO1:** Learn basics of Micro Electro Mechanical Systems (MEMS) & essential material properties. **CO2:** Learn the principle and various devices of MOEMS, Micro Fluidic systems. **CO3:** Study the Chemical and Bio Medical Micro Systems. **CO4:** Know machining process of MEMS. **CO5:** Know about the optical MEMS. **CO6:** Understand the operational theory of common MEMS sensors and MEMS actuators.	**POWER ELECTRONICS LAB** **CO1:** To study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR. **CO2:** To analyze the performance of single–phase and three–phase full wave bridge converters, single–phase dual converterwith both resistive and inductive loads. **CO3:** To understand the operation of AC voltage controller andcyclo converter with resistive and inductive loads. **CO4:** And the working of Buck converter, Boost converter, single–phase bridge inverter and PWM inverter.
INDUSTRIAL INSTRUMENTATION (Professional Elective-I) **CO1:** To understand various types of signals and their representation. **CO2:** To study various types of transducers: Electrical, Mechanical, Electromechanical, Optical etc. **CO3:** To analyze the measurement of the various types of Non–electrical quantities. **CO4:** To study various types of digital voltmeters **CO5:** To study the working principles of various types of oscilloscopes and their applications. **CO6:** To study various types of signal analyzers.	**Data Structures Lab** **CO1:** Develop various algorithms using recursive and non-recursive functions. **CO2:** Experiment with linear data structures. **CO3:** Apply Tree traversal techniques in various applications.

Electrical Machines - II Laboratory **CO1:** Conduct open circuit/ short circuit test on transformer **CO2:** Perform test on synchronous Machine to find Direct and quadrature axis reactance **CO3:** Conduct No Load and Full load tests on transformers/ Induction Motor **CO4:** Calculate torque and speed of given Machine.	**Microprocessors and Microcontrollers Lab** **CO1:** Build Up the assembly language programs on arithmetic, logical and string operations. **CO2:** Construct an 8086 system by interfacing I/O and other Devices. **CO2:** Make Use of Instruction set of 8086 for modular Programming and Dos/Bios programming. **CO4:** Model the 8051 based embedded systems for various applications.
Advanced Communication Skills **CO1:** Use English language fluently, accurately and appropriately **CO2:** Know how body language is used in communication and Interpret non-verbal symbols. **CO3:** Understand the nuances of the written language and write technical reports effectively. **CO4:** Participate in Group discussions and successfully face interviews.	**Quantitative Aptitude & Reasoning II** **CO1:** Prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements. **CO2:** Evaluate various real life situations by resorting to Analysis of key issues and factors. **CO3:** Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
IV B.TECH.(R16)	
I Semester	**II Semester**
POWER SYSTEM OPERATION AND CONTROL **CO1:** Exhibit knowledge of emerging trends in systems used for power system operation and control. **CO2:** Compute optimal hydrothermal scheduling of Generators. **CO3:** Understand the unit commitment problem. **CO4:** Ability to model and design turbine and Automatic Controller. **CO5:** Create simple architectures for single area and two area load frequency control. **CO6:** Understand reactive power control and line power compensation.	**SOFT COMPUTING TECHNIQUES TO ELECTRICAL ENGINEERING** **CO1:** Understand the Learning Process and Learning Task, Supervised Learning – Single and Multi-Layer Network. **CO2:** Understand the back propagation networks and algorithm. **CO3:** Apply the Fuzzy Sets and Membership Functions, Operations on Fuzzy Sets, Fuzzification, Fuzzy Numbers-Operations on Fuzzy Numbers, Fuzzy Relations. **CO4:** Explain the Fuzzy Inference Systems- Architecture of Fuzzy Inference System, Fuzzy Inference Rules and Reasoning, Defuzzification, Applications of Fuzzy Logic. **CO5:** Understand the Genetic algorithms and evolutionary Computation, Applications of Genetic Algorithms. **CO6:** Explain the applications of soft computing techniques.
Switchgear and Protection **CO1:** Understand the principles of arc interruption for Application to high voltage circuit breakers of air, oil, vacuum, SF6 gas type. **CO2:** Understand the working principle and constructional features of different types of electromagnetic protective relays. **CO3:** Acquire in depth knowledge of faults that is observed to occur in high power generator and transformers and Protective schemes used for all protections. **CO4:** Improves the ability to understand various types of protective schemes used for feeders and bus bar protection. **CO5:** Generates understanding of different types of static relays with a view to application in the system. **CO6:** Understand the different types of over voltages appearing in the system, including existing protective schemes required for insulation co–ordination.	**FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS (Professional Elective-V)** **CO1:** Determine power flow control in transmission lines by using FACTS controllers. **CO2:** Explain operation and control of voltage source converter. **CO3:** Discuss compensation methods to improve stability and reduce power oscillations in the transmission lines. **CO4:** Explain the method of shunt compensation by using static VAR compensators. **CO5:** Appreciate the methods of compensations by using series compensators. **CO6:** Explain the operation of modern power electronic controllers
Utilization of Electrical Energy **CO1:** Identify a suitable motor for electric drives and industrial	**POWER SYSTEM DEREGULATION (Professional Elective-V)** **CO1:** Describe importance of power system deregulation and

applications **CO2:** Identify most appropriate heating or welding techniques for suitable applications. **CO3:** Understand various level of luminosity produced by different illuminating sources. **CO4:** Estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view. **CO5:** Determine the speed/time characteristics of different types of traction motors. **CO6:** Understand the terms Tractive effort and Coefficient Adhesion.	restructuring. **CO2:** Understand structure of OASIS and able to compute ATC. **CO3:** Understand transmission congestion management. **CO4:** Compute electricity pricing in deregulated environment. **CO5:** Understand power system operation in deregulated environment. **CO6:** Understand importance of ancillary services.
MODERN CONTROL SYSTEMS (Professional Elective-III) **CO1:** Analyze the characteristics of zero order system **CO2:** How to design in state variable form. **CO3:** Know various non-linear systems and linearization methods. **CO4:** Analyze of nonlinear system using the describing function technique and phase plane analysis **CO5:** Know how to design an optimal controller. **CO6:**Formulate and solve the LQR problem and Riccatti equation.	**SMART GRID (Professional Elective-V)** **CO1:** Differentiate Conventional and Smart Grid. **CO2:** Identify the need of Smart Grid, Micro Grid, Smart metering, and Smart storage, Hybrid Vehicles, Home Automation and Smart Communication. **CO3:** Get introduced to new upcoming concepts in electrical from Utility to Consumers. **CO4:** Able to Remember the concept of Micro grid **CO5:** Comparing and getting acquainted with emerging technologies and current professional issues in electric Grid. **CO6:** Express the necessity of global smart communication system.
VLSI DESIGN (Professional Elective-III) **CO1:** Recall the basic structural and electrical aspects of MOS transistors, architecture of FPGA and CPLD. **CO2:** Compare the properties of NMOS, PMOS, CMOS and Bipolar technologies. **CO3:** Develop the basic logic circuits using MOSFETs **CO4:** Explain the pass transistor, inverters, Latch-up in CMOS circuits and scaling rules of MOS technology. **CO5:** Build the sub systems like adders, 4 -bit processors and ALU. **CO6:** Explain inverter delays, fan-in and fan- out, power calculation and clock mechanism in VLSI design and CMOS Testing. **CO7:** Illustrate various design rules and design issues in the VLSI.	**SWITCHED MODE POWER CONVERTERS (Professional Elective-V)** **CO1:** Understand the concepts, power circuit and steady states analysis of converters **CO2:** Understand the concepts isolated bridges and steady state analysis and soft switching techniques **CO3:** Understand the concepts of resonant circuit parallel, series and types of ZVS **CO4:** Understand the concepts of ZCS and L, M types of ZCS with their performance characteristics. **CO5:** Understand and remembering of the Applications of power supply and control of switch mode DC Supplies **CO6:** Understand the design considerations of practical converter like inductor and capacitor and Transformer.
EMBEDDED SYSTEMS (Professional Elective-III) **CO1:** Illustrate the classification and Characteristics of embedded systems. **CO2:** Recall the basic passive components and core of embedded systems. **CO3:** Summarize various Communication interface in Embedded Systems. **CO4:** Explain the RTOS basics and various Communication &Synchronization techniques. **CO5:** Interpret the IDE and utility tools required to design embedded systems. **CO6:** Demonstrate the application specific and domain specific embedded systems.	
POWER QUALITY (Professional Elective-III) **CO1:** Understand the power quality issues in electrical	

distribution network. **CO2:** Evaluate the severity of voltage sag, voltage swell, harmonics, and transients in distribution networks. **CO3:** Understand the methods to improve the power quality. **CO4:** Design circuits to mitigate power quality issues. **CO5:** Demonstrate the relationship between distributed generation and power quality. **CO6:** Understand the Power quality monitoring, considerations and Application of intelligent systems.	
HVAC&DC TRANSMISSION (Professional Elective-IV) **CO1:** Design the voltage level and ratings of the HVDC system fora given amount of power transfer. **CO2:** Identify the suitable converter and its control scheme in HVDC Transmission. **CO3:** Estimate the amount of reactive power to be compensated for a given HVDC Transmission system. **CO4:** Develop a suitable model for a given AC- DC network. **CO5:** Choose appropriate protecting device for various faults in HVDC stations. **CO6:** Design a suitable filter to eliminate harmonics in the	
PLC AND AUTOMATION (Professional Elective-IV) **CO1:** Describe the Characteristics of Registers, module addressing, holding registers, input registers, output registers and determine its importance in Ladder diagram. **CO2:** Apply the knowledge of programming formats for construction of PLC ladder diagrams in Boolean algebra systems. **CO3:** Develop ladder diagrams for process control. **CO4:** Describe the Analog modules and systems, Analog signal processing, multi bit data processing. **CO5:** Understand various Industrial applications of PLC. **CO6:** Understand PID principles, tuning and functions.	
HIGH VOLTAGE ENGINEERING (Professional Elective-IV) **CO1:** Estimate electric field intensity of different electrode configurations. **CO2:** Understand the Breakdown mechanism of Gas, Liquid And solid insulation. **CO3:**Acquire knowledge about the generation of high voltages and Impulse currents. **CO4:** Acquire knowledge about the Measurement of high voltages and Impulse currents. **CO5:** Understand the testing methods of high voltage equipment. **CO6:** Design the insulation of HV power equipment.	
OPTIMIZATION TECHNIQUES (Professional Elective-IV) **CO1:** Develop an objective function and obtain solution for multivariable optimization problem With equality/ Inequality constraints **CO2:** Apply different techniques to solve transportation and assignment problems.	

CO3: Apply simulation techniques for problem solving **CO4:** Apply nonlinear programming techniques for unconstrained/constrained optimization **CO5:** Apply nonlinear programming techniques constrained optimization **CO6:** Use soft computing techniques to solve optimization problems	
POWER SYSTEMS AND SIMULATION LAB **CO1:** Understand how to measure electrical parameters characteristics of a 3-phase transmission line. **CO2:** Ability to simulate Rectifier, Chopper, Inverter and AC Voltage Controller. **CO3:** Calculate the Load flow solution of power system by iterative methods **CO4:** Perform dynamic stability analysis.	

R20 - B. TECH.(ME) - COURSE OUTCOMES	
I B. TECH	
I Semester	**II Semester**
TECHNICAL AND COMMUNICATIVE ENGLISH-I **CO1:** Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. **CO2:** Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **CO3:** Build grammatically correct sentences using a variety of sentence structures. **CO4:** Enhance word power and usage of lexicons.	**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS** **CO1:** Apply first order ordinary differential equations to real life situations. **CO2:** Identify and apply suitable methods in solving the higher order differential equations. **CO3:** Solve the partial differentiation equations. **CO4:** Interpret the physical meaning of different operators as gradient, curl and divergence. **CO5:** Estimate the work done against a field, circulation and flux using vector calculus.
MATRIX ALGEBRA AND CALCULUS **CO1:** Solve the system of linear equations. **CO2:**Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors. **CO3:** Relate the results of mean value theorems in calculus to Engineering problems. **CO4:** Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering. **CO5:** Identify the area and volume by interlinking them to appropriate double and triple integrals.	**ENGINEERING PHYSICS** **CO 1:** Recognize the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polaraisation in various fields. **CO 2:** Analyze and understand various types of lasers & optical fibers. **CO 3:** Identifies the crystal structures and XRD techniques. **CO 4:** Knowing the applications of magnetic and superconducting materials in engineering field. **CO 5:** Identifies the use of Acoustics and Ultrasonics in engineering field.
ENGINEERING CHEMISTRY **CO1:**Analyze the suitable method of water treatment depending on the quality treatment. **CO2:** Compare different types of polymers, fuels and their importance **CO3:** Utilize the advanced materials as engineering materials and apply them in domestic and industrial life **CO4:** Distinguish electrical energy sources and importance of corrosion science **CO 5:** Identify different types of engineering materials and applications in engineering.	**ENGINEERING DRAWING** **CO1:** Construct the geometrical shapes of regular polygons, Engineering Curves, and scales. **CO2:** Illustrate the orthographic projections, projections of points, and lines inclined to both the planes. **CO3:** Construct the projection of planes inclined to both the planes. **CO4:**Analyze the projection of solids and the development of surfaces for regular solids. **CO5:**Analyze the conversion of isometric views to orthographic views vice versa.
PROBLEM SOLVING USING PYTHON **CO 1:** Outline the computer system concepts and the flowcharts using raptor to solve the given problems. **CO 2:** Summarize the fundamental concepts of python programming. **CO 3:** Interpret object oriented and event driven programming in python. **CO 4:** Apply the suitable data structures to solve the real time situational problems.	**ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGG.** **CO1:**Analyze the behaviour of an electrical circuit. **CO2:** Measure the performance quantities such as losses, efficiency of DC machines **CO3:** Create the construct of transformer and Induction motor **CO4:** Classify the importance and applications of p-n junction diode. **CO5:** Evaluate the configurations and applications of Transistor.
ENGINEERING MECHANICS **CO 1:** Apply the principles of mechanics to determine the resultant of several concurrent forces acting on a particle. **CO 2:**Analyze the trusses using method of joints and method of sections; apply the basic concepts of dry friction and wedges. **CO 3:** Illustrate the centroid and center of gravity bodies and composite sections. **CO 4:** Determine the Area Moment of Inertia and Mass Moment of Inertia of areas bodies and Composite sections. **CO 5:** Apply the work-energy principle to particles and connected systems for engineering Applications.	**MATERIAL SCIENCE AND METALLURGY** **CO1:** Illustrate the knowledge related to the structure and properties of materials, crystal Systems and phase diagrams of alloys. **CO2:** Examine properties of ferrous materials and their engineering applications **CO3:** Explain the basic concepts of Heat treatment processes and their applications **CO4:** Examine nonferrous materials properties and their engineering applications. **CO5:** Choose the various types of ceramics, composite materials and basic steps involved in the Powder Metallurgy process.
SOFT SKILLS AND COMMUNICATION SKILLS LAB -1 **CO1:** Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment. **CO 2:** Listen and comprehend several accents of English Language **CO 3:** Take part in various conversations/discourses using formal and informal expressions. **CO 4:** Adapt soft skills successfully in personal and professional life.	**ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGG. LAB** **CO1:** Determine the efficiency and regulation of 1-phase transformer **CO2:** Compute the performance characteristics of transformers and DC machines through suitable tests. **CO3:** Calculate the ripple factor of half-wave & full-wave rectifiers. **CO4:** Gain practical experience related to electronics circuits; stimulate more interestand Motivation for further studies of electrical circuits.

ENGINEERING CHEMISTRY LAB **CO 1:** Develop and perform analytical chemistry techniques to address the water related problems (hardness, alkalinity, Chlorine, DO). **CO 2:** Explain the functioning of different analytical instruments. **CO 3:** Compare viscosity and surface tension of different oils. **CO 4:** Measure molecular/system properties such as strength of solutions, conductance of solutions and acid number of lubricating oils, etc.	**ENGINEERING PHYSICS LAB** **CO1:** Understand the principle of physics and interpret them in engineering field and compares the results with theoretical calculations. **CO2:** Ability to use modern engineering physics techniques and tools in real time applications in engineering studies. **CO3:** The student will be enabled to know about the characteristics and the behaviour of materials in a practical manner and gain knowledge and its usage.
PROBLEM SOLVING USING PYTHON PROGRAMMING LAB **CO 1:** Create interactive visual programs using Scratch. **CO 2:** Develop flowcharts using raptor to solve the given problems. **CO 3:** Develop Python programs for numerical and text based problems. **CO 4:** Develop graphics and event based programming using Python.	**ENGINEERING WORKSHOP** **CO 1:** Make Use of the various carpentry tools, machines, devices used in engineering practice for preparing different carpentry joints. **CO 2:** Make Use of the various fitting tools, machines, devices used in engineering practice for preparing different Fits. **CO 3:** Develop different components using Tin Smithy and black smithy tools. **CO 4:** Demonstrate the various house wiring connections for different house wiring connections. **CO 5:** Demonstrate the need of PC hardware components, applications and software.
	CONSTITUTION OF INDIA (MC) **CO1:** Examine salient features of Indian Constitution and live accordingly in society & interpret the meaning of Fundamental Rights of State Policy **CO2:** Discover various aspects of Union Government legislation and live up to the expectations of the rules. **CO3:** Examine State Government legislation and improve your living standards by following the rules strictly **CO4:** Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living **CO5:**Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life.

R19 - B. TECH.(ME) - COURSE OUTCOMES

II B. TECH.

I Semester	II Semester
FLUID MECHANICS AND HYDRAULIC MACHINERY **CO1:** Explain about Fluid Properties and hydrostatic forces acting on different surfaces **CO2:** Apply conversation laws to fluid flow problems in engineering applications **CO3:** Compute theory of Boundary layer flows, Identifies dimensionless parameters **CO4:** Illustrate the force required to move the vane using by Jet. **CO5:** Demonstrate the turbines and its functions & Operating conditions of Centrifugal and Reciprocating pumps.	**KINEMATICS OF MACHINERY** **CO1:** Illustrate the various types of kinematic links, kinematic joints & mechanisms. **CO2:** Interpret the various types of lower pair mechanisms. **CO3:** Construct the velocity and acceleration diagram of different mechanisms. **CO4:** Construct the different CAM profiles. **CO5:** Demonstrate the Gears and Gear Trains
MATERIAL SCIENCE & METALLURGY **CO1:** Illustrate the knowledge related to the structure and properties of materials, crystal Systems and phase diagrams of alloys. **CO2:**Examine properties of ferrous materials and their engineering applications **CO3:** Explain the basic concepts of Heat treatment processes and their applications **CO4**: Examine nonferrous materials properties and their engineering applications. **CO5:** Choose the various types of ceramics, composite materials and basic steps involved in the Powder Metallurgy process.	**MANUFACTURING TECHNOLOGY** **CO1:** Explain various manufacturing processes and fundamentals of casting process **CO2:** Outline different types of welding process for fabrication of metals **CO3:** Demonstrate advanced welding processes by make use of sketches **CO4:** Compare the characteristics of cold and hot working processes of Forming, forging and Rolling **CO5:** Explain principles of Extrusion and Drawing processes by make use of sketches

THERMODYNAMICS **CO1**: Illustrate the concepts of heat, work, and forms of energy **CO2:** Classify various thermal systems using thermodynamic laws and principles. **CO3:** Apply the laws of thermodynamics for various thermodynamic systems. **CO4:** Evaluate the performance parameters of pure substances and gas mixtures. **CO5:** Analyze different thermodynamic cycles and estimate work done and performance	**METROLOGY & INSTRUMENTATION** **CO1:** Explain the design tolerances and fits for selected product quality. **CO2:** Illustrate the standards of length, angle measurement. **CO3:** Demonstrate the concepts of limit gauges and optical measurements. **CO4:** Explain of various transducers to measure displacement **CO5:**Analyze various Temperature and pressure transducers for engineering applications
MECHANICS OF SOLIDS **CO1:** Illustrate the concepts of stress and strain and thermal stress in members, strain energy due gradually, suddenly applied loads. **CO2:**Analyze shear force diagrams and bending moment diagrams to the different loads for the different support arrangements. **CO3:** Determine shear stresses induced in the beams which are made with different cross sections like rectangular, circular, I, T sections. **CO4:** Solve the equations of slope and deflection for different support arrangements by double integration method, Macaulay's method. **CO5:** Determine stresses induced in cylinders subjected to internal, external pressures. Know how a cylinder fails.	**APPLIED THERMODYNAMICS** **CO1:** Illustrate the reasons and effects of various losses that occur in the actual engine operation. **CO2:** Analyze the combustion phenomenon and knocking in SI and CI Engines **CO3:** Explain the performance and emission parameters of SI and CI engines **CO4:** Analyze the working of rotary compressors. **CO5**: Analyze the working of axial compressors.
NUMERICAL METHODS AND VECTOR CALCULUS **CO1:** Evaluate approximating roots of polynomials and Transcendental equations by different algorithms. **CO2:** Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals. **CO3:** Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations **CO4:** Select the technique of Laplace transform and apply it to solve differential equations. **CO5:** Relate Fourier series, integral, transforms and they are provided with practice in their application and interpretation in a range of situations.	**OPERATIONS RESEARCH** **CO1:** Illustrate and solve linear programming problems. **CO2:** Solve transportation and assignment problems. **CO3:** Select a suitable sequencing and networking models. **CO4:** Solve waiting line theory problems. **CO5:** Analyze game theory & replacement problems.
MACHINE DRAWING & BASIC DESIGN ENGINEERING SOFTWARE LAB **CO1:** Explain about sectional views, limits, fits and tolerances **CO2:** Construct screw fasteners, Keys, Cotters and Pin joints joints, and assembly machine parts. **CO3:** Create a model machine parts by using software packages such as. CATIA	**APPLIED THERMODYNAMICS LAB** **CO1:** Estimate various fuel characteristics using Internal Combustion Engines **CO2:** Evaluate the performance parameters of refrigeration system & air compressors
FLUID MECHANICS AND HYDRAULIC MACHINERY LAB **CO1:** Experiment with the flow discharge measuring devices used in pipes, channels and tanks. **CO2:** Solve the flow equations to estimate performance of the pump.	**METROLOGY & INSTRUMENTATION LAB** **CO1:** Examine different instruments that are available for linear, angular and roughness measurements and select and use the appropriate measuring instrument according to a specific requirement. **CO2:** Analyze proper measuring instrument and know the requirement of calibration, errors in measurement etc.
MECHANICS OF SOLIDS & METALLURGY LAB **CO1**: Experiment with different materials for the evaluation of material properties through various destructive testing procedures. **CO2:** Examine the microstructures of different materials and also identify the hardness values.	**MANUFACTURING TECHNOLOGY LAB** **CO1:** Experimentation with the sand molds& welding practice. **CO2:** Prepare plastic molding parts, rod bends, washers and aluminum casting.
QUANTITATIVE APTITUDE AND REASONING **CO1:** Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements **CO2:** Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors. **CO3:** Will be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.	**ENGLISH COMMUNICATION SKILLS LAB-II** **CO 1:** Utilize Non-verbal cues and interpret nonverbal symbols. **CO 2:** Develop presentation Skills and make formal presentations using strategies. **CO 3:**Analyze problem solving skills effectively to participate in Group Discussions. **CO 4:** Build interv iew skills for employability.

R16 - B. TECH.(ME) - COURSE OUTCOMES

III B.TECH.

I Semester	II Semester
METAL CUTTING & MACHINE TOOLS **CO1:** Define and explain theory and fundamentals of metal cutting. **CO2:** Illustrate the working of lathe machines and apply machining economics. **CO3:** Explain the working of Shaping, slotting, planning, drilling, boring machines and apply machining economics. **CO4:** Illustrate the working of milling machines and apply machining economics. **CO5:** Illustrate the working of grinding, lapping, honing and broaching processes. **CO6:** Explain working of jigs and fixtures.	**METROLOGY AND INSTRUMENTATION** **CO1:** Understand the design tolerances and fits for selected product quality**.** **CO2:** Illustrate the standards of length, angle measurement. **CO3:** Explain the concepts of limit gauges and optical measurements**.** **CO4:** Understand the basic principles of instrumentation. **CO5:** Explain the concepts of various mechanical measurement devices. **CO6:** Understand the measurement of temperature and explain the types of stress and strain measurements, strain gauge
HEAT POWER ENGINEERING **CO1:** Interpret the steam power plant cycles **CO2:** Demonstrate the basics of combustion **CO3:** Identify different types of nozzles used in steam turbines **CO4:** Classify different turbines based on utility and applications **CO5:** List different types of steam condensers **CO6:** Report different features of gas turbines and jet engines.	**DESIGN OF MECHANICAL COMPONENTS** **CO1:** Apply the design procedure to engineering problems, including the consideration of technical and manufacturing constrains of bearings. **CO2:** Identify the loads and stresses while designing the connecting rod and crank shaft. **CO3:**Analyze stresses on the piston and cylinder depending upon Design and proportions. **CO4:** Identify the loads and machine members subjected and calculate static and dynamic stresses to ensure safe design. **CO5**: Compare capacities of power transmission of Belt, Rope and Chain Drives. CO6: Choose type of Power Screws and Gears for Static and Dynamic loads.
MACHINE DYNAMICS AND VIBRATIONS **CO1:** Apply friction principles to clutches & brakes. **CO2:** Understand and study the types of brakes and dynamometers. **CO3:** Understand the state of balance of multi-cylinder engines. **CO4:** Analyse the response of single degree freedom systems under harmonic excitations. **CO5:** Identify the response of two degree freedom systems under free and forced vibrations. **CO6:** Summarize the frequencies of damped, transverse and torsional vibrations.	**DYNAMICS OF MACHINERY** **CO1:** Analyze the effect of precession motion on the stability of aero plane and naval ship, automobile vehicles under gyroscope. **CO2:** Illustrate friction in clutches, brakes and dynamometers for engineering applications. **CO3:** Analyze the stability of different types of governors under dynamic analysis. **CO4:** Analyze balancing of rotating masses by analytical and graphical methods **CO5:** Analyze balancing of reciprocating masses for primary and secondary forces**.**
PRINCIPLES OF MACHINE DESIGN **CO1:** Define and understand the design considerations and stresses in machine members. **CO2:** Explain and solve the problems related to strength of machine elements. **CO3:** Apply the engineering principles for the design of simple engineering machine members such as riveted joints, welded joints, **CO4:** Apply the engineering principles for the design of keys, cotters, knuckle joints and power transmission of joints. **CO5:** Understand and solve the problems related to shaft coupling. **CO6:** Explain and apply the knowledge for designing the different springs.	**HEAT TRANSFER** **CO1:** Apply basic principles of fluid mechanics, thermodynamics, heat transfer for designing heat and mass transfer systems. **CO2:** Identify heat, mass and momentum transport systems to show predictive correlation. CO3: Calculate various designs for heat and mass transfer and optimize the solution **CO4:** Comprehend the terms of convection heat transfer **CO5:** Use basic equations to device heat exchangers **CO6:** Articulate basics of boiling, condensation and radiation heat transfer.
OPERATIONS RESEARCH **CO1:** Understand and solve linear programming problems. **CO2:** Solve transportation, assignment problems. **CO3:** Solve sequencing and networking problems. **CO4:** Solve waiting line theory problems. **CO5:** Solve game theory problems. **CO6:** Solve replacement and simulation problems.	**AUTOMOBILE ENGINEERING** **CO1:** Identify chassis models for different automobile applications **CO2:** Contrast steering, braking and suspension systems **CO3:** Estimate suitable conventional and automatic transmission system **CO4:** Identify the usage of Electrical vehicles / Hybrid vehicles and power plants **CO5:** Predict the formation of pollution and its control methods **CO6:** Illustrate the techniques of engine maintenance and service
HEAT POWER ENGINEERING LAB **CO1:** Demonstrate the various horse powers, Calorific values, emissions of IC engines. **CO2:** Determine the various efficiencies and energy balance For several types of Internal Combustions Engines and compressors.	**INDUSTRIAL ENGINEERING AND COST ESTIMATION** **CO1:** Explain fundamental knowledge and skill sets required in the Industrial Management and domain knowledge in Industrial engineering. **CO2:** Illustrate the concepts of human resource management, job evaluation and merit rating.

CO3: Classify different types of boilers. **CO4:** List various types of solar flat plate collectors.	**CO3:** Illustrate the concepts of wages and intensive systems. **CO4:** Solve various problems related to estimating and costing of a product. **CO5:** Make use of different techniques to estimate weights and volumes of materials. **CO6:** Make use of different techniques to estimation of welding, forging and foundry cost.
MACHINE TOOLS AND MACHINE DYNAMICS LAB **CO1:** Understand the working of lathe, shaper, planer, drilling, milling and grinding machines. **CO2:** Analyze natural frequencies, procedure of basic balancing and gyroscopic couple concept**.**	**WORK STUDY** **CO1:** Demonstrate the fundamental concepts of work systems and work study. **CO2:** Analyse the movements of workers and materials at work place. **CO3:** Explain work measurement and method study**.** **CO4:** Apply various types of engineering work measurements such as direct time study, predetermined motion time systems (PMTs). **CO5:** Explain work sampling and predetermined time standards. **CO6:** Explain maynard operation sequence technique.
	HEAT TRANSFER LAB **CO1:** Evaluate the amount of heat exchange for plane, cylindrical & spherical geometries **CO2:** Compare the performance of extended surfaces and heat exchangers.
	METROLOGY & INSTRUMENTATION LAB **CO1:** Examine different instruments that are available for linear, angular and roughness measurements and select and use the appropriate measuring instrument according to a specific requirement**.** **CO2:** Select proper measuring instrument and know the requirement of calibration, errors in measurement etc.
IV B.TECH	
I Semester	**II Semester**
FINITE ELEMENT METHODS **CO1:** Derive displacement, stress, strain relations and apply vibrational and weighted residual methods to solve differential equations. **CO2:** Determine the elongation, stresses and strains in one dimensional bar problems. **CO3:** Determine the displacement in Truss and deflections in beams **CO4:** compute stress and strains in two dimensional problems using constant strain triangle and also parametric elements. **CO5:** Evaluate the rate of heat transfer and temperature distribution in thin plates and fin. **CO6:** Determine natural frequencies of free vibration problems.	**MECHATRONICS** **CO1:** Demonstrate knowledge of various mechatronic system components. **CO2:** Describe various sensors and its applications in mechatronics **CO3:** Demonstrate knowledge of process controllers used in mechatronics. **CO4:** Demonstrate knowledge of mechatronic system design **CO5:** Describe the application of mechatronics.
CAD/CAM **CO1:** Illustrate the fundamental concepts of the Product cycle and Design process. **CO2:** Build the mathematical basis in the technique of representation of geometric entities and the technique of transformation of geometric entities using transformation matrix. **CO3:** Develop the 2D and 3D geometries using Modeling packages. **CO4:** Understand the NC, CNC and DNC machines and part programming methods. **CO5:** Describe the use of GT for the product development and also the use of CAPP for the product development. **CO6:** Identify the various elements and their activities in the Computer Integrated Manufacturing Systems.	**REFRIGERATION & AIR CONDITIONING** **CO1:** Understand the difference between refrigeration and air conditioning. **CO2:** Summarize the VCR system on T-S and P-h charts **CO3:** Identify the function of each component of VCR system **CO4:** Observe the function of the refrigerant in a refrigeration system and trace its path. **CO5:** Report different air conditioning methods and its applications **CO6:** Classify different components of air conditioning plant.
ADVANCED MANUFACTURING PROCESS **CO1:** Illustrate advanced casting methods. **CO2:** Understand principles and applications of electron beam, ion beam and laser hybrid welding processes. **CO3:** Explain forming process for thin sections. **CO4:** Understand abrasive and water jet machining. **CO5:** Explain electrical discharge and electro chemical machining processes. **CO6:** Illustrate Plasma, Electron beam and Laser beam machining	**ALTERNATE SOURCES OF ENERGY** **CO1:** Identity different sources of renewable energy **CO2:** Demonstrate different solar collecting/storage devices and its working **CO3:** Discuss different wind energy systems and wind data measurements. **CO4:** Understand the biomass to energy conversion methods **CO5:** Discuss the sources of biofuels that can be used in IC engines **CO6:** Classify different geothermal energy sources and harvesting of

process.	these sources.
ROBOTICS **CO1:** Distinguish between fixed automation and programmable automation. **CO2:** Identify various components of robot. **CO3:** Select appropriate type of actuator for a joint. **CO4:** Illustrate robot applications in manufacturing. **CO5:** Analyse kinematics of a robot. **CO6:** Develop a programme to control a robot for execution of a work cycle.	
PRODUCTION PLANNING AND CONTROL **CO1:** Apply the systems concept for the design of production and service systems. **CO2:** Make use of forecasts in the manufacturing and service sectors using selected quantitative and qualitative techniques. **CO3:** Understand the principles and techniques of inventory management. **CO4:** Choose routing procedure and able to prepare bill of material. **CO5:** Understand the importance and function of scheduling and make use of Gantt chart to solve scheduling problems. **CO6:** Identify dispatching procedure and make use of computer in production planning and control.	
CAD/ CAM LAB **CO1:** To impart the fundamental knowledge on using various analytical tools like ANSYS, FLUENT, etc., for engineering simulation. **CO2:** To know various fields of engineering where these tools can be effectively used to improve the output of a product. **CO3:** To impart knowledge on how these tools are used in Industries by solving some real time problems using these tools.	

R20-B.TECH (ECE)-COURSE OUTCOMES
I- B Tech

I Semester	II Semester
MATRIX ALGEBRA AND CALCULUS **CO1 :** Solve the system of linear equations. **CO2 :** Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors. **CO3 :** Relate the results of mean value theorems in calculus to Engineering problems. **CO4 :** Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering. **CO5 :** Compute the area and volume by interlinking them to appropriate double and triple integrals.	**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS** **CO1 :** Apply first order ordinary differential equations to real life situations. **CO2 :** Identify and apply suitable methods in solving the higher order differential equations. **CO3 :** Solve the partial differentiation equations. **CO4 :** Interpret the physical meaning of different operators as gradient, curl and divergence. **CO5 :** Estimate the work done against a field, circulation and flux using vector calculus.
ENGINEERING CHEMISTRY **CO1 :** Analyze the suitable method of water treatment depending on the quality treatment.-Analyzing **CO2 :** Compare different types of polymers, fuels and their importance-Analyzing **CO3 :** Utilize the advanced materials as engineering materials and apply them in domestic and industrial life-Applying **CO4 :** Distinguish electrical energy sources and importance of corrosion science-Analyzing **CO5 :** Identify different types of engineering materials and applications in engineering.-Applying	**APPLIED PHYSICS** **CO1 :** Interpret the experimental evidence of wave nature of light and interference in thinfilms, Diffraction grating and Polaraisation in various fields. (K2) **CO2 :** Analyse and understand various types of lasers & optical fibers. (K4) **CO3 :** Identify the crystal structures and XRD techniques. (K3) **CO4 :** Apply the magnetic materials in engineering field. (K3) **CO5 :** Identify the various applications of semiconductors in engineering field. (K3)
TECHNICAL AND COMMUNICATIVE ENGLISH - I **CO1 :** Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it (Apply-3). **CO2 :** Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. (Creating-5). **CO3 :** Build grammatically correct sentences using a variety of sentence structures (Apply3). **CO4 :** Enhance word power and usage of lexicons (Apply3).	**PROBLEM SOLVING USING PYTHON** **CO1:** Outline the computer system concepts and the flowcharts using raptor to solve the given problems. **CO2:** Summarize the fundamental concepts of python programming. **CO3:** Interpret object oriented and event driven programming in python. **CO4:** Apply the suitable data structures to solve the real time situational problems.
ENGINEERING GRAPHICS **CO1:** construct the geometrical shapes of regular polygons, Engineering Curves, and scales. **CO2**: illustrate the orthographic projections, projections of points, and lines. **CO3:** construct the projection of planes inclined to both the planes. **CO4:** construct the projection of solids for engineering applications. **CO5:** analyse the conversion of isometric views to orthographic views vice versa.	**NETWORK ANALYSIS** **CO1:** Analyze the basics of electrical circuits with nodal, mesh analysis and network theorems. **CO2:** Apply Laplace Transform for steady state and transient analysis **CO3:** Analyze the phasor representation for ac circuits and magnetic coupled circuits. **CO4**: Describe resonance circuits, two port network parameters and their interconnections.
PROBLEM SOLVING USING C **CO 1:** Develop algorithms and flow charts for simple problems. [K3] **CO 2:** Utilize suitable control structures for developing code in C. [K3] **CO 3:** Make use of functions and arrays in developing modular programs. [K3] **CO 4:** Make use of structures and pointers to write well-structured programs. [K3] **CO 5:** Make use of file Operations in C programming for a given application. [K3]	**DATA STRUCTURES** **CO1 :** Analyze sorting and searching algorithms. [K4] **CO2 :** Analyze elementary data structures such as stacks, queues and linked lists. [K4] **CO3 :** Compare and contrast various forms of trees. [K4] **CO4 :** Build graph data structures and various graph traversal techniques. [K3]
SOFT SKILLS AND COMMUNICATION SKILLS LAB **CO1 :** Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment. **CO2 :** Listen and comprehend several accents of English Language **CO3 :** Take part in various conversations/discourses using formal and informal expressions. **CO4 :** Adapt soft skills successfully in personal and professional life.	**DATA STRUCTURES LAB** **CO1 :** Develop various algorithms using recursive and non-recursive functions. [K3] **CO2 :** Experiment with linear data structures. [K3] **CO3:** Apply Tree traversal techniques in various applications. [K3]
ENGINEERING CHEMISTRY LAB **CO1 :** Develop and perform analytical chemistry techniques to address the water related problems (hardness, alkalinity, Chlorine, DO)-Creating **CO2 :** Explain the functioning of different analytical instruments-Applying	**APPLIED PHYSICS LAB** **CO1 :** Apply the principles of physics in engineering field. (K3) **CO2 :** Utilize the modern engineering physics techniques and tools in real time applications. (K3) **CO3 :** Analyze the characteristics, usage and the behaviour of materials. (K4)

CO3 : Compare viscosity and surface tension of different oils-Analyzing **CO4 :** Measure molecular/system properties such as strength of solutions, conductance of Solutions and acid number of lubricating oils, etc-Evaluating	
PROBLEM SOLVING USING C LAB **CO 1:** Study, analyze and understand logical structure of computer programming and different constructs to develop programs in C Language. [K4] **CO 2:** Compare and contrast various data types and operator precedence. [K2] **CO 3:** Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions. [K4] **CO 4:** Analyze simple data structures, use of pointers and dynamic memory allocation techniques. [K4] **CO 5:** Make use of functions and file I/O operations in developing C Programs. [K3]	**PROBLEM SOLVING USING PYTHON LAB** **CO1 :** Create interactive visual programs using Scratch. [K6] **CO2 :** Develop flowcharts using raptor to solve the given problems. [K6] **CO3 :** Develop Python programs for numerical and text based problems. [K6] **CO4 :** Develop graphics and event based programming using Python. [K6]
	CONSTITUTION OF INDIA **CO1:** Examine salient features of Indian Constitution and live accordingly in society& interpret the meaning of Fundamental Rights of State Policy **CO2:** Discover various aspects of Union Government legislation and live up to the expectations of the rules. **CO3:** Critically examine State Government legislation and improve your living standards by following the rules strictly **CO4:** Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living **CO5:** Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life.

R20-B.TECH (ECE)-COURSE OUTCOMES
II- B Tech

I Semester	II Semester
NUMERICAL METHODS AND TRANSFORMATIONS **CO1 :** Evaluate approximating roots of polynomials and transcendental equations by different algorithms. **CO2 :** Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals. **CO3 :** Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations. **CO4 :** Select appropriate technique of Laplace transforms in solving differential equations. **CO5 :** Relate Fourier series, integral, transforms techniques in their core.	**INTERNET OF THINGS** **CO1 :** Outline the concept of internet of things. **CO2 :** Analyze the requirements, specifications to design IoT applications. **CO3 :** Analyze domain specific applications using Arduino and Raspberry pi. **CO4 :** Make use of python programming to implement Internet of Things **CO5:** Design IoT applications using Raspberry Pi
ELECTRONIC DEVICES AND CIRCUITS **CO1 :** Use P-N diodes in electronic circuits. **CO2 :** Use special diodes and rectifiers in electronic circuits. **CO3 :** Explore the operation of BJT and its applications. **CO4 :** Analyse the thermal stability of BJT. **CO5 :** Explore the operation of FET, other transistors and their applications.	**ANALOG AND DIGITAL COMMUNICATIONS** **CO1 :** Elaborate the basic concepts of Analog Communication Systems. **CO2 :** Analyze the Analog modulated and demodulated systems. **CO3 :** Construct different digital modulation techniques. **CO4 :** Analyze the fundamental concepts of information theorems and capacity. **CO5 :** Assess the right method of error detection and error correction for data transmission
SIGNALS AND SYSTEMS **CO1 :** Define basic signals and its operations. **CO2 :** Identify Trigonometric and Exponential Fourier Series of signals. **CO3 :** Develop Fourier Transforms for various signals. **CO4 :** Solve Laplace Transform and z-Transform for various signals. **CO5 :** Compare LTI system responses for different inputs and illustrate sampling concepts.	**ELECTRONIC CIRCUITS AND PULSE CIRCUITS** **CO1 :** Develop single stage and multistage amplifiers. **CO2 :** Summarize the importance of feedback in amplifiers and oscillators. **CO3 :** Make use of Power Amplifiers in communication systems. **CO4 :** Understand different linear and non-linear wave shaping circuits. **CO5 :** Construct different multivibrators.

SWITCHING THEORY AND LOGIC DESIGN **CO1 :** Classify and work on different types of number systems and codes that are used in the design of digital systems. **CO2 :** Make use of theorems and postulates of Boolean algebra to minimize various Boolean expressions. **CO3 :** Construct basic logic circuits and combinational circuits. **CO4 :** Apply different models of Finite State Machines for design of sequential circuits. **CO5 :** Utilize the concept of PLDs to realize switching functions and code converters.	**ELECTROMAGNETIC WAVES AND TRANSMISSION LINES** **CO1 :** Apply the concepts of Electric and Magnetic Fields in different applications. **CO2 :** Apply Maxwell's equations in electromagnetics. **CO3 :** Understand wave propagation and derive the Wave Equations in Perfect Dielectric and Conducting Media. **CO4 :** Understand wave characteristics - reflection and refraction of Electromagnetic Waves in different media and analyze different transmission lines and applications.
LINEAR CONTROL SYSTEMS **CO 1:** Develop the mathematical model of a system and find its transfer function **CO 2:** Understand the time response analysis and the frequency response analysis **CO 3:** Determine the stability of a system in time domain and frequency domain **CO 4:** Understand the classical control design techniques	**TECHNICAL AND COMMUNICATIVE ENGLISH - II** **CO1 :** Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it (Apply-3). **CO2 :** Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. (Creating-5). **CO3 :** Build grammatically correct sentences using a variety of sentence structures (Apply3). **CO4 :** Enhance word power and usage of lexicons (Apply3).
ELECTRONIC DEVICES AND CIRCUITS LAB **CO1 :** Understand and analyze the behavior of PN junction diode, Zener diode. **CO2 :** Understand the operational difference between half wave and Full wave Rectifiers. **CO3 :** Identify the switching characteristics of transistor. **CO4 :** Analyze the characteristics of transistor. **CO5 :** Identify and analyze the UJT characteristics and its applications.	**INTERNET OF THINGS LAB** **CO1 :** Explain the application areas of IOT · **CO2 :** Influence the revolution of Internet in Mobile Devices, **CO3 :** Discuss about the importance of Cloud in IOT. **CO4 :** Justify about the importance of Sensor Networks. **CO5:** Explain building blocks of Internet of Things and characteristics.
SIGNALS AND SYSTEMS LAB **CO1 :** Build elementary signals and implement Trigonometric Fourier series and Exponential Fourier series. **CO2 :** Construct Fourier, Hilbert and Laplace Transform of a continuous time signal of various signals. **CO3 :** Identify different properties of Fourier & Laplace Transforms. **CO4 :** Develop z-transform of continuous time signal and experiment with different properties of it. **CO5 :** Construct various filters and to draw their magnitude and phase responses.	**ANALOG AND DIGITAL COMMUNICATIONS LAB** **CO1 :** Design and measure performance of AM and FM communication systems. **CO2 :** Choose the different pulse modulation techniques **CO3 :** Compare pre-emphasis and de-emphasis. **CO4 :** Experiment with different digital modulation techniques and observe their results. **CO5 :** Classify various channel encoding schemes for a given data stream.
DIGITAL LOGIC DESIGN LAB **CO1 :** Identify the operation of various logic gates. **CO2 :** Examine basic logical and arithmetic circuit operations. **CO3 :** Illustrate and compare the operation of different flip-flops. **CO4 :** Develop the complex digital logic circuits including both combinational and sequential logics by using computer-aided design tools.	**ELECTRONIC CIRCUITS AND PULSE CIRCUITS LAB** **CO1:** Understand the effect of Frequency response of single stage amplifier. **CO2:** Understand how frequency response varies by applying negative feedback on amplifiers. **CO3:** Determine the efficiency of power amplifiers. **CO4:** Construct high input impedance circuits. **CO5:** Understand different responses for linear and nonlinear wave shaping circuits. **CO6:** Design and working of different multivibrators.
DESIGN OF SYSTEMS USING ARDUINO AND RASPBERRY PI **CO1:** Analyze the requirements, specifications to design home automation applications. **CO2:** Build smart city applications using Arduino. **CO3:** Develop agricultural applications using Raspberry pi. **CO4**: Influence the revolution of Internet in Mobile Devices.	**DESIGN AND SIMULATION OF ELECTRONIC CIRCUITS** **CO1:** To solve problems using Simulation Software **CO2**: To develop, debug and test various electronic circuits **CO3:** To use File I/O techniques. **CO4**: To transfer data among parallel processes. **CO5:** To use Simulation Software to create various applications
ENVIRONMENTAL STUDIES **CO1 :** Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web. **CO2 :** Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources. **CO3 :** Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity. **CO4 :** Distinguish various attributes of the pollution, their impacts	

and measures to reduce or control the pollution along with waste management practices. **CO5 :** Define Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.	

R19- B.Tech (ECE)- COURSE OUTCOMES

III B.Tech

I Semester	II Semester
LINEAR AND DIGITAL IC APPLICATIONS **CO1 :** Recall the basics of FET, MOSFET, amplifiers, standard memories and their characteristics. **CO2 :** Extend the logic gate concept to realize basic combinational and sequential circuits for various Boolean expressions. **CO3 :** Illustrate the operation of IC 555 timer, utilization of filters, VCO, data converters and PLL in the development of various circuits. **CO4 :** Demonstrate the applications of Operational amplifier and IC 555 timer such as Adder, Subtractor, V-I, I-V converter, Differentiator, Integrator, and Triangular, Square wave generators, PWM, PPM generation respectively. **CO5 :** Make use of the computer-aided design tools for development of complex digital logic circuits.	**ANTENNAS AND WAVE PROPAGATION** **CO1 :** Explain radiation mechanism and basic antenna parameters. **CO2 :** Interpret different types of antennas and antenna arrays. **CO3 :** Demonstrate antenna measurements to know antenna's performance. **CO4 :** Identify the characteristics of radio wave propagation. **CO5 :** Illustrate the concepts of wave propagation and its characteristics in atmospheric conditions.
ENTREPRENEURSHIP & INNOVATION **CO1 :** Outline the concepts of Entrepreneurship.[K2] **CO2 :** Create the awareness on creativity and innovation.[K6] **CO3 :** Adopt the Entrepreneurship Development programs[K6] **CO4 :** Evaluate the project planning and feasibility studies.[K5] **CO5 :** Analyze the concept of small and micro enterprises.[K4]	**DIGITAL SIGNAL PROCESSING** **CO1 :** Analyze the signals and system in Time and Frequency domain through transformations **CO2 :** Find DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithm. **CO3 :** Illustrate the significance of various filter structures and responses. **CO4 :** Construct the digital filter circuits for generating desired signal wave shapes (non- sinusoidal) **CO5 :** verify the performance of a variety of filters
PULSE AND DIGITAL CIRCUITS **CO1 :** Apply different linear wave shaping circuits. **CO2 :** Analyze different non-linear wave shaping circuits. **CO3 :** Make use of different diode and transistor switching times to design various Logic families. **CO4 :** Construct different multi-vibrators. **CO5 :** Explain time base generators and sampling gates.	**MICROCONTROLLERS AND EMBEDDED SYSTEMS** **CO1 :** Explain 8051 architecture and the function of on-chip hardware units in 8051. **CO2 :** Develop 8051 embedded C programs for interfacing Matrix Keyboard, LCD, DAC, ADC and 7segment LED Display. **CO3 :** Demonstrate the architecture and function of on-chip peripherals in ARM **CO4 :** Summarize embedded system architecture and its building blocks. **CO5 :** Outline embedded system components, and Embedded Firmware designs
CONTROL SYSTEMS **CO1 :** Develop the mathematical model of a system and find its transfer function **CO2 :** Apply the time response analysis and the frequency response analysis **CO3 :** Determine the stability of a system in time domain **CO4 :** Determine the stability of a system in frequency domain **CO5 :** Analyze the classical control design techniques	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA** **CO1 :** Utilize the basic Object Oriented concepts in writing JAVA programs. **CO2 :** Experiment with programming constructs of Object Oriented Programming. **CO3 :** Make use of inheritance, interfaces, packages and Exception handling concepts. **CO4 :** Apply multi-threading concepts. **CO5 :** Apply applets, AWT and Event Handling concepts in various UI Applications.
COMPUTER ORGANISATION & MICROPROCESSORS **CO 1:** Apply the concepts of computer system and CPU design. **CO 2:** Demonstrate memory organization and I/O processing. **CO 3:** Make use of Instruction set in developing the assembly language programming **CO 4:** Demonstrate the hardware features of 8086 and Pentium processors. **CO 5:** Model an 8086 based microcomputer system by interfacing memory and I/O devices.	**PROFESSIONAL ELECTIVE-I** **ELECTRONIC MEASUREMENTS AND INSTRUMENTATION** **CO1 :** List out Electronic Instruments, their Characteristics and use, Peculiar Errors Associated with the Instruments and how to minimize such Errors. **CO2 :** Experiment with transducers, electrical and electronic instruments. **CO3 :** Review the Principle of Operation of Electronic Measuring Instruments. **CO4 :** Illustrate various concepts of electronic instruments. Computer controlled test systems.

	CO5 : Storage and display instruments for experimenting.
OPEN ELECTIVE **FUNDAMENTALS OF IMAGE PROCESSING(OE)** **CO1:** Interpret the limitations of the computational methods on digital images. **CO2:** Develop Fourier transform for image processing in frequency domain. **CO3:** Illustrate the spatial and frequency domain image transforms on enhancement and restoration of images. **CO4:** Utilize the understanding of image enhancement techniques. **CO5:** Define the need for compression and evaluate the basic compression algorithms.	**DATA COMMUNICATIONS AND COMPUTER NETWORKS** **CO1 :** Describe different types of services, layers and switching techniques in computer networks. **CO2 :** Identify design issues of various layers in the reference model of computer networks. **CO3 :** Explain various network topology, transmission media and ISDN techniques. **CO4 :** Classify protocols used in different layers of the computer network. **CO5 :** Explain concepts of network security, domain name service, network management protocol.
CONSUMER ELECTRONICS(OE) **CO1:** List technical specification of electronics Audio system (microphone and Loud speaker). **CO2**: Demonstrate audio and video recording systems. **CO3:** Contrast working principles of Monochrome TV and Colour TV. **CO4:** Outline Broadcasting techniques of CATV and DTH TV. **CO5:** Illustrate the basic functions of various consumer electronic domestic Appliances.	**EMBEDDED SYSTEM DESIGN WITH ADVANCED PROCESSORS** **CO1:** Illustrate 3 and 5 stage pipelines of ARM core. **CO2:** Able to apply instructions for programming of ARM 7 processor. **CO3**: Build the AMBA bus architecture & Debugging **CO4:** Analyze different advanced ARM cores. **CO5:** Demonstrate the use of ARM core for different SOC applications.
LINEAR & DIGITAL IC APPLICATIONS LAB **CO1 :** Demonstrate the applications of Op-amp such as Adder, Subtractor, Comparator,Integrator and Differentiator Circuits. **CO2 :** Classify the active filters such as LPF, HPF, BPF and Band Reject Filters. **CO3 :** Interpret the operation of Oscillator circuits. **CO4 :** Illustrate the operation of Multivibrator circuits and compare various types of voltage regulators. **CO5 :** Develop the complex digital logic circuits including both combinational and Sequential logics by using computer-aided design tools.	**STATISTICAL METHODS IN AI** **CO1 :** Apply the basics of Artificial Intelligence, Intelligent Agents and its structure for problem solving by various searching techniques **CO2 :** Apply the concept of informed search and Exploration of constraint satisfaction problems and Adversarial Search **CO3 :** Analyze what is reasoning and Knowledge Representation **CO4 :** Analyze the concept of Reasoning with Uncertainty & Probabilistic Reasoning **CO5 :** Apply the basic forms of Machine Learning, decision trees and statistical Learning setting.
ELECTRONIC CIRCUITS & PULSE AND DIGITAL CIRCUITS LAB **CO1 :** Apply the effect of capacitors on frequency response of amplifier. **CO2 :** Compare the efficiency of power amplifiers. **CO3 :** Construct high input impedance circuits. **CO4 :** Experiment with different Sinusoidal and Non sinusoidal circuits. **CO5 :** Construct different digital circuits using Active & Passive Electronic Components.	**MICROPROCESSORS & MICROCONTROLLERS LAB** **CO1:** Build Up the assembly language programs on arithmetic, logical and string operations. **CO2:** Construct an 8086 system by interfacing I/O and other devices. **CO3:** Make Use of Instruction set of 8086 for modular programming and Dos/Bios programming. **CO4:** Distinguish processor based systems and controller system. **CO5:** Model the 8051 based embedded systems for various applications
SKILL LAB **CO1 :** Analyze the requirements, specifications to design home automation applications. **CO2 :** Build smart city applications using Arduino. **CO3 :** Develop agricultural applications using Raspberry pi. **CO4 :** Construct the IOT Devices. **CO5 :** Influence the revolution of Internet in Mobile Devices.	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB** **CO1:** Develop java programs by using OOP concepts [K3]. **CO2:** Make use of interfaces, packages, threads in developing JAVA programmes [K3]. **CO3:** Make use of exception handling in java programming [K3]. **CO4:** Develop Graphical User Interfaces and applets with event handling [K3].
	ADVANCED COMMUNICATION SKILLS LAB **CO1:** Apply the nuances of the written language and write letters, emails and Resume effectively. **CO2:** Know how body language is used in communication and interpret non-verbal symbols **CO3:** Participate in Group Discussions using analytical and problem solving skills. **CO4:** Face job interviews confidently and enhance employability.
	OPEN ELECTIVE-III **INTRODUCTION TO EMBEDDED SYSTEMS** **CO1:** Illustrate the classification and applications of embedded

	systems. **CO2:** Recall the basic memory devices, passive components and core of embedded systems. **CO3:** Summarize various Communication interface in Embedded Systems. **CO4:** Demonstrate characteristics of embedded systems. **CO5:** Explain the RTOS basics and various Communication & Synchronization techniques.
	GLOBAL POSITIONING SYSTEM **CO1:** Identify the importance of Space segment, Control segment and User segment in GPS. **CO2:** Analyze the GPS observables like code, phase pseudo ranges, Doppler data and Biases. **CO3:** Estimate surveying with GPS. **CO4:** Categorize the different application areas of GPS. **CO5:** Recommend the Hardware and Software improvements for future GPS.

R16-B.TECH (ECE)-COURSE OUTCOMES
IV- B Tech

IV B. TECH. - I SEMESTER	IV B. TECH. -I I SEMESTER
Object Oriented Programming through Java **CO1:** Summarize the basic Object Oriented concepts. **CO2:** Illustrate various programming constructs of Object Oriented Programming. **CO3:** Analyze inheritance, packages and Exception handling concepts. **CO4:** Apply multi-threading concepts. **CO5:** Apply applets, Event Handling and AWT concepts in various UI Applications.	**Cellular and Mobile Communications** **CO1:** Illustrate fundamental concept of Cellular Radio System Operation and Design: Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor (Q), Desired C/I From a Normal Case in a Omni Directional and directional Antenna System, Cell Splitting, and Cell Sectoring. **CO2:** Compare Measurement of C/I value in Omnidirectional & Directional Antenna System, Co-channel, Non Co-channel interference, and Adjacent Channel Interference. **CO3:** Interpret cell coverage for signal and traffic, diversity techniques and mobile antennas. **CO4:** Demonstrate Frequency management and Channel assignment. **CO5:** Classify different types of handoffs. **CO6:** Summarize GSM architecture-channels, TDMA architecture-channels and CDMA architecture-channels.
Microcontrollers and Embedded Systems **CO1:** Explain 8051 architecture and the function of on-chip hardware units in 8051. **CO2:** Develop 8051 embedded C programs for interfacing Matrix Keyboard, LCD, DAC, ADC and 7segment LED Display. **CO3:** Demonstrate the architecture and function of on-chip peripherals in ARM **CO4:** Summarize embedded system architecture and its building blocks. **CO5:** Outline embedded system components, and Embedded Firmware designs **CO6:** Illustrate RTOS Concepts	**Professional Elective - IV:** **Low power IC design** **CO1**: Illustrate the concepts of Low-Power Design Approaches. **CO2**: Apply Power reduction techniques possible at circuit level and logic level. **CO3**: Interpret the low voltage technologies and circuits. **CO4**: Model the gate level logic circuits in PSPICE tool. **CO5**: Extend the Low Power and Design to Different Applications. **CO6**: List the Low-Voltage Low-Power Memories and Basics of DRAM.
Computer Networks **CO1:** Describe different types of services, layers and switching techniques in computer networks. protocol, www, e-mail and multimedia. **CO2:** Identify design issues of various layers in the reference model of computer networks. **CO3:** Explain various network topology, transmission media and ISDN techniques. **CO4:** Interpret routing and congestion algorithms. **CO5:** Classify protocols used in different layers of the computer network. **CO6:** Explain concepts of network security, domain name service, network management	**Wireless Sensor Networks** **CO1:** Interpret wireless sensor networks and the key components. **CO2:** Illustrate various physical and wireless MAC layers. **CO3:** Analyze different Ad hoc routing protocols. **CO4:** Recall about transport layer protocols and challenges for providing QOS. **CO5:** Demonstrate the security issues in wireless sensor networks and WSN applications. **CO6:** Model real time applications based on concepts of wireless sensor networks

Professional Elective - II: **Digital IC design** **CO1:** Explain the concepts of MOS Design. **CO2:** Outline the concepts of Combinational MOS Circuits. **CO3:** Construct Sequential MOS Circuits **CO4:** Classify the Digital IC Design to Different Applications. **CO5:** Illustrate the impact of interconnect parasitics on circuit performance. **CO6:** List the Concepts of Semiconductor Memories, Flash Memory, RAM array organization	**System-On-Chip** **CO1:** Infer basics of System Architecture and Processor Architecture. **CO2:** List different Types of Processors like VLIW Processors, Superscalar Processors etc., and Basic concepts in Processor Micro Architecture. **CO3:** Interpret Cache memory, Multilevel Caches, SOC external memory and data encryption algorithm for the security needs. **CO4:** Outline the Concept of Inter Connect Architectures, SOC Standard Buses and Reconfiguration Technologies. **CO5:** Classify bus architectures use in SOC design and approach. **CO6:** Recognize several SOC application studies in various areas like image compression with an example.
. **Satellite Communications** **CO1:** Illustrate the orbital and functional principles of satellite communication systems **CO2:** Architect, interpret, and select appropriate technologies for implementation of specified satellite communication systems **CO3:** Analyse and evaluate a satellite link and suggest enhancements to improve the link performance. **CO4:** Select an appropriate modulation, multiplexing, coding and multiple access schemes for a given satellite communication link. **CO5:** Specify, design, prototype and test analog and digital satellite communication systems as per given specifications. **CO6:** Apply the concepts of satellite navigation and global positioning system.	**PC based Instrumentation** **CO1:** Recall the main functional units in a PC and be able to explain how they interact. **CO2:** Interpret the standard serial and parallel interfacing buses and able to distinguish account for different generations of PCs. **CO3:** Infer the basics of PLC and its programming. **CO4:** Demonstarte different PLC functions to applications. **CO5:** Illustrate the basics of SCADA. **CO6:** Develop DAQ using I/O systems.
Network Security and Cryptography **CO1:** Summarize the fundamentals of Cryptography. **CO2:** Analyze how security is achieved and attacks can be countered by using symmetric/asymmetric algorithms. **CO3:** Apply Number Theoretic concepts in developing cryptographic algorithms to counter attacks. **CO4:** Interpret the role of hash functions and Digital Signatures in Information Security. **CO5:** Compare different network security designs using available secure solutions **CO6:** Illustrate the use of encryption techniques to secure data in transit across data networks.	**Speech Processing (PE-IV)** **CO1:** Describe human speech generation system **CO2:** Apply standard digital signal processing tools to analyze speech signals **CO3:** Employ signal processing techniques to analyze speech in time and frequency domains **CO4:** Experiment on different type of speech samples to extract some features and illustrate the results in MATLAB **CO5:** Design speech and speaker recognition systems for computer applications **CO6:** Develop software to implement text to speech and speech to text applications
Bio Medical Instrumentation **CO1:** Compare the different bio potential characteristics and recording methods so as to enable to record various bio signals. **CO2:** Create an understanding of the nonelectrical parameters measurements so as to enable to record various non-electrical parameters **CO3:** Identify the patient safety issues related to biomedical instrumentation. **CO4:** Build and operate bio potential amplifiers **CO5:** Illustrate the role of bio potential electrodes and the different medical imaging systems. **CO6:** Apply the knowledge for the research, design and development of new medical devices.	**Professional Elective - V:** **FPGA Design** **CO1:** Recall combinational and sequential digital circuits, Logic Families, LSI and VLSI Components. **CO2:** Classify the various memory architectures. **CO3:** Explain the Programmable Logic Devices on FPGA logic blocks. **CO4:** Build the architecture of digital IC logic families for given specifications. **CO5:** Develop test benches to simulate combinational and sequential circuits. **CO6:** Apply the knowledge of FPGA architectures for different applications.

Advanced DSP **CO1:** Classify the system in Time and Frequency domain through its respective tools. **CO2:** Summarize the basics of multi rate digital signal processing. **CO3:** Interpret various digital signal processing systems with interfacing sub systems of different sampling rates. **CO4:** Illustrate the Analysis of the power spectrum by using different non parametric methods. **CO5:** Compare the power spectrum by using different parametric methods like AR, MA, ARMA methods. **CO6:** Define the digital filter circuits for generating desired signal wave shapes (Non-sinusoidal) for different applications like computers, control systems and counting and timing systems.	**Software Defined Radio** **CO1**: Describe the basics of the software defined radios. **CO2**: Design the wireless networks based on the cognitive radios **CO3**: Explain the concepts behind the wireless networks. **CO4**: Compare SDR with traditional Hardware Radio HDR. **CO5**: Illustarte the concept of Cognitive Radio. **CO6**: Develop open projects and explore their capability to build their own communication system.
Professional Elective - III: **Mixed Signal Design** **CO1:** Define the concepts of Switched Capacitor circuits. **CO2:** Interpret the concepts of PLL. **CO3:** Summarize the fundamentals of data converter. .**CO4:** Construct Nyquist Rate A/D Converters. **CO5:** Build the concepts of Oversampling Converters **CO6:** Develop the concept of Continuous-Time Filters	**Distributed Computing** **CO1:** Outline the potential benefits of distributed systems **CO2:** Interpret synchronization techniques in distributed systems. **CO3:** Analyze various distributed deadlock detection and prevention techniques. **CO4:** Summarize process scheduling techniques, threads and fault tolerance in distributed environments. **CO5:** Interpret distributed file system implementations and shared memory**.** **CO6:** Relate distributed system functions in MACH and DCE.
Radar Systems **CO1:** Demonstrate the basic principles of RADAR System. **CO2:** Solve the RADAR Equation and to calculate Transmitter power. **CO3:** Description of CW and Frequency Modulated Radar & FM-CW Radar. **CO4:** Illustrate the principle of each and every block of MTI and Pulse Doppler Radar. **CO5:** Contrast the different methods used for tracking targets. **CO6:** Relate the Noise Figure and Noise Temperature in Radar Receivers and describe antennas used for Radars.	**Data Acquisition and Transmission** **CO1:** Define a data acquisition system. **CO2:** Compare analog and digital data acquisition system. **CO3:** Infer different data transmission systems. **CO4:** Explain different display systems. **CO5:** Infer different types of digital instruments. **CO6:** List different recorders used in data acquisition and transmission.
Cloud Computing **CO1:** Summarize the Virtualization and applications for the state-of-the-art cloud computing **CO2:** Carry out the Cloud Scale and value of Cloud Computing **CO3:** Analyze the infrastructure of cloud computing including public, private and hybrid clouds and various services like PaaS, SaaS, IaaS etc **CO4:** Monitor the Security and Disaster Management **CO5:** Assessment of the economics, financial, and technological implications for selecting cloud computing for own organization **CO6:** Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas	**Embedded System Design** **CO1:** Recall the fundamentals of Core of the Embedded system. **CO2:** Define process models and technologies to design an Embedded system. **CO3**: Demonstrate the customization of Hardware or software. **CO4**: Delineate the unique characteristics of Embedded systems. **CO5**: Make use of system design techniques to develop Hardware/Software for embedded systems. **CO6**: Develop an embedded system with real time constraints.
Analytical Instrumentation **CO1:** Distinguish Different Analyzers in Analytical Instrumentation. **CO2:** State the Knowledge of Different Spectrophotometer's. **CO3:** Select the basic Principles of Spectroscopy and Chromatography Techniques. **CO4:** Relate Different Analytical Techniques to solve Analytical and Bio-analytical Problems. **CO5:** Choose Instrumentation Associated with (NMR) Spectrophotometer and Electron Spin Resonance (ESR). **CO6:** Extend the use of spectro photo meters in various aspects. **CO7:** Write principles of NMR and their use.	
Digital Signal Processors and Architectures **CO1:** Recognize the fundamentals of fixed and floating point architectures of various DSPs. **CO2:** Learn the architecture details and instruction sets of fixed and floating point DSPs **CO3:** Infer about the control instructions, interrupts, and pipeline	

operations. **CO4:** Illustrate the features of on-chip peripheral devices and its interfacing **CO5:** Analyze and learn to implement the signal processing algorithms in DSPs **CO6:** Learn the DSP programming tools and use them for applications **CO7:** Design and implement signal processing modules in DSPs	
VLSI and Embedded Systems Lab **CO1:** Construct and test gates using CMOS using EDA Tool. **CO2:** Construct and test D-Flip flop using CMOS NAND gate using EDA Tools. Timers using 8051. **CO3:** Construct and test Decade Counter using D-Flip Flop using EDA Tool. **CO4:** Construct and test static RAM cell and Differential Amplifier using CMOS using EDA Tool. **CO5:** Develop basic programs in Serial and Parallel Blinking of LEDs, Serial communication implementation and Delay generation using **CO6:** Develop Interrupt handling, Share resource using MUTEX and Allocate resource using semaphores with ARM.	
Object Oriented Programming through Java Lab **CO1:** Develop JAVA programs using Object Oriented Programing concepts. **CO2:** Make use of interfaces, threads, exception handling concepts to develop java programs **CO3:** Construct GUI for developing java	

R20 - B. TECH.(CSE) - COURSE OUTCOMES	
I B. TECH	
I Semester	**II Semester**
TECHNICAL AND COMMUNICATIVE ENGLISH - I **CO1**: Interpret explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. [K3]**.** **CO2**: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **[K6].** **CO3**: Build grammatically correct sentences using a variety of sentence structures**. [K3]** **CO4**: Enhance word power and usage of lexicons [**K3].**	**COMMUNICATIVE ENGLISH - II** **CO1:** Read and comprehend complex texts and summarize. **CO2:** Compose paragraphs, essays as creative writing. **CO3:** Learn grammatical structures and write grammatically correct sentences **CO4:** Enhance word power and usage of lexicons. **CO5:** Compile emails, letters, reports, resume and information transfer.
MATRIX ALGEBRA AND CALCULUS **CO1:** Solve the system of linear equations.[K3] **CO2:**Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.[K4] **CO3:**Apply the mean value theorems in calculus to Engineering problems.[K3] **CO4:**Apply the functions of several variables to evaluate the rates of change with respect to Time and space variables in engineering. [K3] **CO5:** Determine the area and volume by interlinking them to appropriate double and triple integrals. [K5]	**ENGINEERING CHEMISTRY** **CO 1:** Analyze the suitable method of water treatment depending on the quality treatment. [K4] **CO 2:** Compare different types of polymers, fuels and their importance.[K4] **CO 3:**Utilize the advanced materials as engineering materials and apply them in domestic and industrial life.[K3] **CO 4:**Distinguish electrical energy sources and importance of corrosion science.[K4] **CO5:**Identify different types of engineering materials and applications in engineering **[K3]**
APPLIED PHYSICS **CO1 :** Interpret the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polarization in various fields. **[K2]** **CO2 :** Analyze and understand various types of lasers & optical fibers.[**K4]** **CO3 :** Identify the crystal structures and XRD techniques. **[K3]**. **CO4 :** Apply the magnetic materials in engineering field. [**K3]** **CO5 :** Identify the various applications of semiconductors in engineering field. **[K3]**	**PROBLEM SLOVING USING PYTHON** **CO 1:** Summarize the fundamental concepts of python programming. [K2] **CO 2:** Interpret object oriented and event driven programming in python. [K2] **CO 3:** Apply the suitable data structures to solve the real time problems. [K3] **CO 4:** Apply regular expressions for many different situations. [K3]
PROBLEM SOLVING USING C **CO1**: Develop algorithms and flow charts for simple problems. [K3] **CO2**:Utilize suitable control structures for developing code in C. [K3] **CO3**: Make use of functions and arrays in developing modular programs. [K3] **CO4**: Make use of structures and pointers to write well-structured programs. [K3] **CO5**: Make use of file Operations in C programming for a given application. [K3]	**ELECTRONIC DEVICES AND LOGIC DESIGN** **CO1:**Apply P-N diodes and Special diodes in electronic circuits.[K3] **CO2:**Compare different types of transistors (BJT, FET and MOSFET) with their working principles.[K2] **CO3:**Make use of Boolean algebra and K-map and to minimize combinational functions.[K3] **CO4:** Develop combinational circuits and sequential circuits.[K3] **CO5:** Construct different types of registers and counters.[K3]
LINUX PROGRAMMING LAB **CO 1:** Apply the fundamental UNIX utilities. [K3] **CO 2:** Utilize the Unix file system[K3] **CO 3:** Experiment with shell and UNIX filters. [K3] **CO 4:** Analyze the Shell Programming constructs to develop shell scripts. [K4]	**NUMERICAL METHODS AND STATISTICS** **CO1**:Evaluate approximating roots of polynomials and transcendental equations by different algorithms. [**K5**] **CO2**:Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals. [**K3**] **CO3**:Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations.[**K3**] **CO4**: Decide whether to accept or reject a statement about parameter in decision making problems. [**K5**]

SOFT SKILLS & COMMUNICATION SKILLS LAB

CO1: Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment.[K3]

CO2:Listen and comprehend several accents of English Language.[K4]

CO3:Take part in various conversations/discourses using formal and informal expressions.[K4]

CO4:Adapt soft skills successfully in personal and professional life.[K5]

PROBLEM SOLVING USING PYTHON LAB

CO1: Develop interactive visual programs using Scratch.[K3].

CO2: Develop Python programs for numerical and text based problems. [K3].

CO3: Develop graphics and event based programming using Python. [K3].

CO4: Develop Python programs on object oriented programming and regular expressions. [K3].

APPLIED PHYSICS LAB

CO1: Apply the principle of physics in engineering field **(K3)**

CO2: Utilize the modern engineering physics techniques and tools in real time applications. **(K3)**

CO3: Analyse characteristics, usage and the behaviour of materials**. (K4)**

ENGINEERING CHEMISTRY LAB

CO1: Develop and perform analytical chemistry techniques to address the water related problems(hardness, alkalinity, Chlorine, DO). [K6]

CO2: Explain the functioning of different analytical instruments.[K5]

CO3: Compare viscosity and surface tension of different oils.[K4]

CO4: Measure molecular/system properties such as strength of solutions, conductance of solutions and acid number of lubricating oils, etc.[K5]

PROBLEM SOLVING USING C LAB

CO1: Study, analyze and understand logical structure of computer programming and different constructs to develop programs in C Language. [K4]

CO2: Compare and contrast various data types and operator precedence. [K2]

CO3: Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions. [K4]

CO4: Analyze simple data structures, use of pointers and dynamic memory allocation techniques. [K4]

CO5: Make use of functions and file I/O operations in developing C Programs. [K3]

CSE WORKSHOP

CO1: Demonstrate the need of PC hardware components, applications and softwares.[K2]

CO2: Explain the knowledge of networks, internet and World Wide Web, Search engines, Netiquette. [K2]

CO3: Install and use different software like Windows XP, Linux.

CO4: Identify and fix the defective PC and software related issues.[K3]

CO5: Formalise with parts of windows word, Excel and Power point.

R PROGRAMMING LAB

CO1 : Apply the all basic operators on various data types.[K3]

CO2 : Develop programs using Conditional Statements and various types of loops.[K3]

CO3 : Develop programs using Matrices, Lists and Frames.[K3]

CO4 : Develop programs using Functions, Math functions and Statistical functions in R.[K3]

CO5 : Analyze the real word datasets presented in different formats using R libraries to perform exploratory data analysis and visualization.[K3]

ENVIRONMENTAL STUDIES

CO1: Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.

CO2: Analyse the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.

CO3: Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity.

	CO4: Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices. **CO5:** Define Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.

R19 - B. TECH.(CSE) - COURSE OUTCOMES

II B. TECH.

I Semester	II Semester
BUSINESS MANAGEMENT CONCEPTS FOR ENGINEERS **CO1:** Summarize fundamentals of Managerial economics for decision making. [K2)] **CO2:** Apply concepts of Financial Accounting and BEP for business decisions. [K3]. **CO3:** Evaluate fundamental concepts and principles of management [K5]. **CO4:** Discuss functional areas of management like HR, marketing and finance [K6]. **CO5:** Apply project management techniques for project planning and evaluation [K3].	**DATABASE MANAGEMENT SYSTEMS** **CO1 :** Interpret the fundamentals of DBMS [K2]. **CO2 :** Analyse DB design methodology and normalization process [K4]. **CO3 :** Develop Queries in RDBMS [K3]. **CO4 :** Compare and Contrast various transaction and concurrency management techniques [K2]. **CO5 :** Analyse various file organizations and indexing techniques [K4].
FRONT END WEB TECHNOLOGIES **CO1**: Interpret a webpage and identify its elements and attributes.[K2]. **CO2**: Build webpages using HTML5 [K3]. **CO3**: Make use of Cascading Style Sheets on webpages [K3]. **CO4**: Make use of Java Script to write Interactive webpages [K3]. **CO5**: Build dynamic webpages with JQuery [K3]. **CO6**: Make use of JQuery UI to develop dynamic webpages [K3].	**FORMAL LANGUAGES AND AUTOMATA THEORY** **CO1:** Interpret the core concepts relating to the theory of computation, formal languages, Regular Expressions [K2]. **CO2:** Analyse the functioning of Finite-State Machines, Pushdown Automata and Turing Machines to solve problems [K4]. **CO3:** Build grammars and Normal forms for given grammars for different language classes and able to prove and disprove theorems establishing key properties of formal languages and automata [K3]. **CO4:** Identify formal language classes and their membership properties [K2].
OOPS THROUGH JAVA **CO1:** Interpret the syntax and semantics of java programming language and OOPs concepts [K2]. **CO2:** Make use of different predefined classes and packages to develop programmes using OOPs concepts [K3]. **CO3:** Apply exception handling and multithreading on java programs [K3]. **CO4:** Develop Java Programmes using collection frame work & I/O [K3]. **CO5:** Make use of Applets, AWT and event-handling to develop GUI [K3].	**DESIGN AND ANALYSIS OF ALGORITHMS** **CO1:** Apply asymptotic notations to measure the performance of algorithms [K3] **CO2:** Apply divide-and-conquer paradigm when an algorithmic design situation calls for it [K3]. **CO3:** Identify all feasible solutions to get optimal solutions using greedy method [K3]. **CO4:** Apply dynamic-programming approach, to solve real world problems [K3]. **CO5:** Apply fundamental graph traversal techniques to solve various applications using Backtracking [K3]. **CO6:** Analyse least cost and FIFO branch and bound paradigms [K4].
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE **CO1:** Apply the logical statements, connectivity among the statements and forms different types of normal forms. [K3] **CO2:** Analyse the theory of Inference for statement calculus. [K4] **CO3:** Classify the types of graphs and trees to formulate computational problems.[K4] **CO4:** Apply DNF and CNF on Boolean algebraic functions to simplify the digital (logic) circuits. [K3] **CO5:** Solve mathematical problems with recurrence relations using different methods. [K3]	**SOFTWARE ENGINEERING** **CO1 :** Compare and contrast basic software engineering methods and practices. [K2]. **CO2 :** Analyse the project management essentials [K4]. **CO3 :** Analyse the software process models. [K4]. **CO4 :** Outline the importance of software testing and quality control approaches [K2].

DATA STRUCTURES **CO1:** Apply Searching, Sorting and Hashing techniques to solve problems [K3]. **CO2:** Analyse basic data structures such as Stacks, Queues and Linked List [K4]. **CO3:** Solve problems involving Advanced concepts of Trees [K3]. **CO4:** Analyse variety of Graph data structures that are used in various applications [K4].	**WEB DEVELOPMENT USING MEAN STACK TECH** **CO1**: Apply Angular8 to develop web applications. [K3] **CO2:** Make use of Forms and Services. [K3] **CO3:** Utilize Node.js to create Server Side Applications. [K3] **CO4:** Make use of Express to deploy web applications. [K3] **CO5:** Experiment with NoSQL using MongoDB. [K3]
COMPUTER ORGANIZATION **CO1:** Interpret the computer system from user's perspective and can explain how Arithmetic Logic Unit works [K2]. **CO2:** Explain of basic components of the system and illustrate data paths and control flow for sequencing in CPUs [K2]. **CO3:** Interpret the Micro operations and Microprogramming for design of control unit of CPU. [K2] **CO4:** Develop Main Memory Interfacing Circuit and can apply various cache memory mapping techniques. **CO5:** Apply algorithms to perform arithmetic operations on binary representation of fixed point data **[**K3]. **CO6:** Interpret various I/O interface devices [K2].	**MOBILE APPLICATION DEVELOPMET LAB** **CO1 :** Demonstrate various components of Android Framework. [K2]. **CO2 :** Develop user Interfaces for the Android Application.[K3]. **CO3 :** Develop Android Applications using Android API and Services. [K3]. **CO4 :** Develop Android Applications which access data from Internet. [K3].
DATA STRUCTURES LAB **CO1:** Analyse algorithms, Searching, Sorting and hashingTechniques [K4]. **CO2:** Make use of elementary data structures such as stacks, Queues and linked list to develop their applications. **CO3**: Examine different tree traversal techniques. **CO4**: Experiment with different graph traversal techniques.	**ENGLISH COMMUNICATION SKILLS LAB-II** **CO1:** Know the importance of Non-verbal communication and interpret nonverbal symbols. **CO2**: Make formal presentations using strategies. **CO3**: Participate in Group Discussions using analytical and problem solving skills effectively. **CO4**: Face job interviews confidently for employability.
FRONT END WEB TECHNOLOGIES LAB **CO1:** Develop static html pages [K3]. **CO2:** Develop Interactive Web Pages with different styles and client side validations [K3]. **CO3:** Make use of Query programming to develop Web pages [K3]. **CO4:** Apply Query UI to HTML pages [K3].	**DATABASE MANAGEMENT SYSTEMS LAB** **CO1 :** Apply SQL commands like DDL, DML, DCL to perform different Database operations [K3]. **CO2 :** Develop PL/SQL block statements, control statements and cursors [K3]. **CO3 :** Develop PL/SQL programs using functions and procedures [K3]. **CO4 :** Develop PL/SQL programs using packages and Triggers [K3].
JAVA PROGRAMMING **CO1 :** Develop java programs by using OOP concepts [K3]. **CO2 :** Make use of interfaces, threads, applets in developing JAVA programmes [K3]. **CO3 :** Make use of exception handling and collections in Java Programming [K3]. **CO4 :** Develop java components [K3].	**QUANTITATIVE APTITUDE AND REASONING** **CO1:** Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements **CO2:** Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors. **CO3:** Will be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

R16 - B. TECH.(CSE) - COURSE OUTCOMES

III B.TECH.

I Semester	II Semester
DESIGN AND ANALYSIS OF ALGORITHMS **CO1 :** Apply asymptotic notations to analyze and compare performance of algorithms. **CO2 :** Apply divide-and-conquer paradigm when an algorithmic design situation calls for it. **CO3 :** Solve problems using greedy approach and whenever it is needed. **CO4 :** Apply dynamic-programming, approach to solve suitable problems efficiently. **CO5 :** Analyze backtracking and branch and bound paradigms	**CRYPTOGRAPHY & NETWORK SECURITY** **CO1 :** Summarize the fundamentals of Cryptography. **CO2 :** Analyze how security is achieved and attacks can be countered by using symmetric/asymmetric algorithms. **CO3 :** Apply Number Theoretic concepts in developing cryptographic algorithms to counter attacks. **CO4 :** Interpret the role of hash functions and Digital Signatures in Information Security. **CO5 :** Compare different network security designs using available secure solutions **CO6 :** Illustrate the use of encryption techniques to secure data in transit across data networks
OOAD THROUGH UML **CO1 :** Illustrate the conceptual model of UML in software development life cycle. **CO2 :** Outline Common Modeling Techniques of Structural Modeling.	**DATA WAREHOUSING AND DATA MINING** **CO1 :** Interpret the data mining terminology and types of data to be mined. **CO2 :** Outline the need and importance of preprocessing techniques.

CO3 : Analyze, design and document the requirements through use case driven approach. **CO4 :** Identify, analyze and model the behavioral concepts of a system and Apply Unified Modeling Language (UML) towards analysis and design **CO5 :** Apply the concepts of architectural design for deploying the code for software	**CO3 :** Interpret data warehousing concepts and operations. **CO4 :** Compare and contrast different dominant Data Mining Algorithms. **CO5 :** Analyze the performance Association Rules
COMPILER DESIGN **CO1 :** Summarize different phases and passes of a compiler. **CO2 :** Compare and Contrast various Top-Down and Bottom-Up Parsing techniques. **CO3 :** Interpret different types of Intermediate Code representations. **CO4 :** Illustrate the effective usage of register allocation and various Code-generation techniques. **CO5 :** Apply different code-optimization techniques to optimize the target code.	**ADVANCED JAVA AND WEB TECHNOLOGIES** **CO1 :** Interpret Servlet Life Cycle and web servers. **CO2 :** Illustrate JSP Life cycle. **CO3 :** Apply Session Management for JSP applications. **CO4 :** Analyze the usage of JDBC in JSP applications. **CO5 :** Analyze the web based applications in PHP.
COMPUTER NETWORKS **CO1 :** Summarize basic concepts of Data Communication and Networking. **CO2 :** Compare and Contrast OSI and TCP/IP reference models. **CO3 :** Interpret data link layer services and multiple access protocols. **CO4 :** Analyze different routing protocols. **CO5 :** Illustrate the essential principles of different transport layer protocols. **CO6 :** Summarize various application layer protocols.	**WIRELESS NETWORKS AND MOBILE COMPUTING** **CO1 :** Compare the various types of Wireless Networks from teaching perspective. **CO2 :** Interpret the applications and architecture of Mobile Computing and multiplexing techniques **CO3 :** Analyze the Mobile IP issues **CO4 :** Analyze the various Mobile TCP Variants **CO5 :** Analyze the various routing protocols in MANET
NETWORK MANAGEMENT SYSTEMS **CO 1:** Interpret different Network Management standards. **CO 2:** Compare and contrast Network Management in different SNMP Models. **CO 3:** Outline Network Management architecture and Protocols. **CO 4:** Summarize the functions of different remote monitoring protocols. **CO 5:** Outline the knowledge about various Network Management tools and Systems.	**FREE OPEN SOURCE SOFTWARE (FOSS) PYTHON LAB** **CO1 :** Develop python applications using strings, functions and Files. **CO2 :** Demonstrate the use of Python lists and dictionaries. **CO3 :** Make use of Object Oriented Programing concepts to develop python programs. **CO4 :** Experiment with GUI based python programs.
OPERATING SYSTEMS & COMPILER DESIGN LAB **CO1 :** Apply various scheduling, page replacement and Deadlock avoidance algorithms for effective utilization of the CPU. **CO2 :** Demonstrate various Memory Management Techniques. **CO3 :** Develop a Lexical Analyzer for a given language. **CO4 :** Develop LALR bottom up Parser for a given language by using YACC tool.	**ADVANCED JAVA AND WEB TECHNOLOGIES LAB** **CO1 :** Experiment with the installation of Web Servers. **CO2 :** Make use of servlets in dynamic web pages. **CO3 :** Develop web applications using JSP for effective data management. **CO4 :** Construct the web based applications in PHP using effective data base access with rich client interaction.
UML LAB **CO1 :** Build use case diagrams that specify requirements for a software system. **CO2 :** Develop class diagrams that demonstrate design model of a software system. **CO3 :** Make use of interaction diagrams to model the dynamic aspects of a software system. **CO4 :** Develop various applications using unified modelling language.	**DATA MINING LAB** **CO1 :** Apply data preprocessing techniques on the given data. **CO2 :** Construct classification model for the given data. **CO3 :** Identify Association Rules for the given data. **CO4 :** Apply the clustering techniques on the given data.
NETWORK & UNIX PROGRAMMING LAB **CO1 :** Demonstrate different network layer routing protocols. **CO2 :** Implement different Services offered by Data Link Layer. **CO3 :** Experiment with the fundamental UNIX utilities. **CO4 :** Develop shell scripts to perform complex tasks.	**MINI PROJECT – II** **CO1:** Acquire practical knowledge within the chosen area of technology for project development. **CO2:** Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach. **CO3:** Contribute as an individual or in a team in development of technical projects. **CO4:** Develop effective communication skills for presentation of project related activities.
MINI PROJECT – I **CO1:** Acquire practical knowledge within the chosen area of technology for project development. **CO2:** Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach. **CO3:** Contribute as an individual or in a team in development of technical projects.	**ADVANCED COMMUNICATION SKILLS** **CO1 :** Use English language fluently, accurately and appropriately. **CO2 :** Know how body language is used in communication and interpret non-verbal symbols **CO3 :** Understand the nuances of the written language and write technical reports effectively. **CO4 :** Participate in Group discussions and interviews.

CO4: Develop effective communication skills for presentation of project related activities.	
QUANTITATIVE APTITUDE AND REASONING – II **CO1 :** Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements **CO2 :** Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors. **CO3 :** Will be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.	
IV B.TECH	
I Semester	**II Semester**
INTERNET OF THINGS **CO1 :** Outline the concepts of Internet of Things. **CO2 :** Analyze the requirements, specifications to design IoT applications. **CO3 :** Analyze domain specific applications using Arduino and Raspberry pi. **CO4 :** Interpret cloud storage models and communication APIs for IoT.	**SOFTWARE QUALITY ASSURANCE AND TESTING** **CO1 :** Outline different aspects of software quality assurance and standards. **CO2 :** Apply various software testing strategies. **CO3 :** Develop test plans, schedules and testing techniques for software project. **CO4 :** Apply features of software testing automation tools. **CO5 :** Summarize different steps in software testing process. **CO6 :** Identify the status of testing results and testing methodologies.
BIG DATA ANALYTICS **CO1:** Interpret the architectural elements of big data and Hadoop framework. **CO2:** Analyse various big data applications using map reduce programming module. **CO3:** Analyse Spark capabilities such as distributed datasets, in-memory caching, and the interactive shell. **CO4:** Summarize Spark's powerful built-in libraries, including Spark SQL, Spark Streaming. **CO5:** Analyze Hadoop data with PIG and Hive.	**NON CONVENTIONAL ENERGY RESOURCES** **CO1:** Analyse the significance of renewable energy. **CO2:** Understand the principles of solar radiation. **CO3 :** Know the functioning of basic components of wind energy **CO4:** Understand the utilization of biomass in power generation. **CO5:** Understand the working principles of geothermal, ocean, tidal and wave energy techniques. **CO6:** Know the functioning of direct energy conversion techniques.
SOFTWARE TESTING METHODOLOGY **CO1 :** Outline the software testing terminology. **CO2 :** Compare and contrast various behavioural testing methodologies. **CO3 :** Summarize various dynamic testing techniques and validation activities. **CO4 :** Interpret software testing and quality management. **CO5 :** Analyze debugging techniques and testing tools.	**PRACTICAL TRAINING / INTERNSHIP** **CO1:** Gain practical experience within the business environment. **CO2:** Acquire knowledge of the industry in which the internship is done. **CO3:** Apply knowledge and skills learned in the classroom in a work setting. **CO4:** Develop and refine oral and written communication skills. **CO5:** Identify areas for future knowledge and skill development
MOBILE AD HOC AND SENSOR NETWORKS **CO1 :** Analyse the routing protocols in MANET. **CO2 :** Outline the data transmission in MANET. **CO3 :** Interpret the TCP over Ad-hoc Networks. **CO4 :** Interpret the data transmission and data acquisition in WSN. **CO5 :** Outline the tools and network platforms of WSN.	**MAJOR PROJECT** **CO1:** Acquire practical knowledge within the chosen area of technology for project development. **CO2:** Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach. **CO3:** Contribute as an individual or in a team in development of technical projects. **CO4:** Develop effective communication skills for presentation of project related activities.
CLOUD COMPUTING **CO1 :** Interpret various types of Virtualization. **CO2 :** Outline the Cloud Application Architectures and Infrastructure Models. **CO3 :** Analyze the Data center to cloud. **CO4 :** Analyze various services of Cloud Computing. **CO5 :** Analyze the Security and Disaster Management in Cloud.	
MOBLILE APPLICATION DEVELOPMET LAB **CO1 :** Demonstrate various components of Android Framework. **CO2 :** Develop user Interfaces for the Android Application. **CO3 :** Develop Android Applications using Android API and Services.	
ORACLE DATABASE ADMINISTRATION **CO1 :** Create oracle database instance **CO2 :** Manage and configure oracle network environment. **CO3 :** Implement security features in database. **CO4 :** Take and restore backup and recovery	

CO5 : Perform database recovery.	
IOT LAB **CO1:** Analyse the requirements, specifications to design home automation applications. **CO2:** Build smart city applications using Arduino. **CO3:** Develop agricultural applications using Raspberry pi. **CO4:** Utilize AutoBahn, Xively Cloud communication API's to exchange data.	
BIG DATA ANALYTICS LAB **CO1:** Experiment with installation of Hadoop and develop applications using Map Reduce framework. **CO2:** Experiment with installation of Spark and develop applications**.** **CO3:** Analyse Hadoop data with PIG. **CO4:** Develop NoSQL structures like Hive for processing and aggregating logs in the database.	
MASSIVE OPEN ONLINE COURSES (MOOCs) **CO1:** Identify suitable course required for their carrier **CO2:** Adapt effectively for changing conditions. **CO3:** Develop and refine oral communication skills. **CO4:** Take part in lifelong learning	

R20 - B. TECH.(IT) - COURSE OUTCOMES	
I B. TECH	
I Semester	**II Semester**
TECHNICAL AND COMMUNICATIVE ENGLISH - I **CO1**: Interpret explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. [K3]**.** **CO2**: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **[**K6]. **CO3**: Build grammatically correct sentences using a variety of sentence structures**.** [K3] **CO4**: Enhance word power and usage of lexicons **[K3].**	**NUMERICAL METHODS AND STATISTICS** **CO1**:Evaluate approximating roots of polynomials and transcendental equations by different algorithms. [**K5**] **CO2**:Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals. [**K3**] **CO3**:Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations.[**K3**] **CO4**: Decide whether to accept or reject a statement about parameter in decision making problems. [**K5**]
LINEAR ALGEBRA AND CALCULUS **CO1:** Solve the system of linear equations.[K3] **CO2:**Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.[K4] **CO3:**Apply the mean value theorems in calculus to Engineering problems.[K3] **CO4:**Apply the functions of several variables to evaluate the rates of change with respect to Time and space variables in engineering. [K3] **CO5:** Determine the area and volume by interlinking them to appropriate double and triple integrals. [K5]	**ENGINEERING CHEMISTRY** **CO 1:** Analyze the suitable method of water treatment depending on the quality treatment. [K4] **CO 2:** Compare different types of polymers, fuels and their importance.[K4] **CO 3:**Utilize the advanced materials as engineering materials and apply them in domestic and industrial life.[K3] **CO 4:**Distinguish electrical energy sources and importance of corrosion science.[K4] **CO5:** Identify different types of engineering materials and applications in engineering. **[K3]**
APPLIED PHYSICS **CO1 :** Interpret the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polarization in various fields. **[K2]** **CO2 :** Analyze and understand various types of lasers & optical fibers.[**K4]** **CO3 :** Identify the crystal structures and XRD techniques. **[K3]**. **CO4 :** Apply the magnetic materials in engineering field. [**K3]** **CO5 :** Identify the various applications of semiconductors in engineering field. **[K3]**	**PROBLEMSLOVINGUSINGPYTHON** **CO 1:** Summarize the fundamental concepts of python programming. [K2] **CO2:** Interpret object oriented and event driven programming in python. [K2] **CO 3:** Apply the suitable data structures to solve the real time problems. [K3] **CO 4:**Applyregular expressions formanydifferent situations.[K3]
PROBLEM SOLVING USING C **CO1**:Develop algorithms and flow charts for simple problems. [K3] **CO2**:Utilize suitable control structures for developing code in C. [K3] **CO3**:Make use of functions and arrays in developing modular programs. [K3] **CO4**: Make use of structures and pointers to write well-structured programs. [K3] **CO5**: Make use of file Operations in C programming for a given application. [K3]	**ELECTRONIC DEVICES AND LOGIC DESIGN** **CO1:**Apply P-N diodes and Special diodes in electronic circuits.[K3] **CO2:**Compare different types of transistors (BJT, FET and MOSFET) with their working principles.[K2] **CO3:**Make use of Boolean algebra and K-map and to minimize combinational functions.[K3] **CO4:** Develop combinational circuits and sequential circuits.[K3] **CO5:** Construct different types of registers and counters.[K3]
SOFT SKILLS & COMMUNICATION SKILLS LAB **CO1:**Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment.[K3] **CO2**:Listen and comprehend several accents of English Language.[K4] **CO3**:Take part in various conversations/discourses using formal and informal expressions.[K4] **CO4**:Adapt soft skills successfully in personal and professional	**ENGINEERING CHEMISTRY LAB** **CO1:**Develop and perform analytical chemistry techniques to address the water related problems(hardness, alkalinity, Chlorine, DO). [K6] **CO2:** Explain the functioning of different analytical instruments.[K5] **CO3:**Compare viscosity and surface tension of different oils.[K4] **CO4:**Measure molecular/system properties such as strength of solutions, conductance of

life.[K5] .	solutions and acid number of lubricating oils, etc.[K5]
PROBLEM SOLVING USING C LAB **CO1:** Study, analyze and understand logical structure of computer programming and different constructs to develop programs in C Language. [K4] **CO2:** Compare and contrast various data types and operator precedence. [K2] **CO3:** Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions. [K4] **CO4:** Analyze simple data structures, use of pointers and dynamic memory allocation techniques. [K4] **CO5:** Make use of functions and file I/O operations in developing C Programs. [K3]	**R PROGRAMMING LAB** **CO1 :** Apply the all basic operators on various data types.[K3] **CO2 :** Develop programs using Conditional Statements and various types of loops.[K3] **CO3 :** Develop programs using Matrices, Lists and Frames.[K3] **CO4 :** Develop programs using Functions, Math functions and Statistical functions in R.[K3] **CO5 :** Analyze the real word datasets presented in different formats using R libraries to perform exploratory data analysis and visualization.[K3]
APPLIED PHYSICS LAB **CO1:** Apply the principle of physics in engineering field **(K3)** **CO2:** Utilize the modern engineering physics techniques and tools in real time applications. **(K3)** **CO3:** Analyse characteristics, usage and the behaviour of materials**. (K4)**	**LINUX PROGRAMMING LAB** **CO 1:** Apply the fundamental UNIX utilities. [K3] **CO 2:** Utilize the Unix file system[K3] **CO 3:** Experiment with shell and UNIX filters. [K3] **CO 4:** Analyze the Shell Programming constructs to develop shell scripts. [K4]
CSE WORKSHOP **CO1:**Demonstrate the need of PC hardware components, applications and softwares.[K2] **CO2:**Explain the knowledge of networks, internet and World Wide Web, Search engines, Netiquette. [K2] **CO3:** Install and use different software like Windows XP, Linux. **CO4:**Identify and fix the defective PC and software related issues.[K3] **CO5:** Formalise with parts of windows word, Excel and Power point.	**PROBLEM SOLVING USING PYTHONLAB** **CO1:** Develop interactive visual programs using Scratch.[K3]. **CO2:** Develop Python programs for numerical and text based problems. [K3]. **CO3:** Develop graphics and event based programming using Python. [K3]. **CO4:** Develop Python programs on object oriented programming and regular expressions. [K3].
	ENVIRONMENTAL STUDIES **CO1:** Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web. **CO2:** Analyse the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources. **CO3:** Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity. **CO4:** Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices. **CO5:** Define Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.
R19 - B. TECH.(IT) - COURSE OUTCOMES II B. TECH.	
I Semester	**II Semester**

BUSINESS MANAGEMENT CONCEPTS FOR ENGINEERS

CO1: Summarize fundamentals of Managerial economics for decision making. [K2)]

CO2: Apply concepts of Financial Accounting and BEP for business decisions. [K3].

CO3: Evaluate fundamental concepts and principles of management [K5].

CO4: Discuss functional areas of management like HR, marketing and finance [K6].

CO5: Apply project management techniques for project planning and evaluation [K3].

DATABASE MANAGEMENT SYSTEMS

CO1 : Interpret the fundamentals of DBMS [K2].

CO2 : Analyse DB design methodology and normalization process [K4].

CO3 : Develop Queries in RDBMS [K3].

CO4 : Compare and Contrast various transaction and concurrency management techniques [K2].

CO5 : Analyse various file organizations and indexing techniques [K4].

FRONT END WEB TECHNOLOGIES

CO1: Interpret a webpage and identify its elements and attributes.[K2].

CO2: Build webpages using HTML5 [K3].

CO3: Make use of Cascading Style Sheets on webpages [K3].

CO4: Make use of Java Script to write Interactive webpages [K3].

CO5: Build dynamic webpages with JQuery [K3].

CO6: Make use of JQuery UI to develop dynamic webpages [K3].

FORMAL LANGUAGES AND AUTOMATA THEORY

CO1: Interpret the core concepts relating to the theory of computation, formal languages, Regular Expressions [K2].

CO2: Analyse the functioning of Finite-State Machines, Pushdown Automata and Turing Machines to solve problems [K4].

CO3: Build grammars and Normal forms for given grammars for different language classes and able to prove and disprove theorems establishing key properties of formal languages and automata [K3].

CO4: Identify formal language classes and their membership properties[K2].

OOPS THROUGH JAVA

CO1: Interpret the syntax and semantics of java programming language and OOPs concepts [K2].

CO2: Make use of different predefined classes and packages to develop programmes using OOPs concepts [K3].

CO3: Apply exception handling and multithreading on java programs [K3].

CO4: Develop Java Programmes using collection frame work & I/O [K3].

CO5: Make use of Applets, AWT and event-handling to develop GUI [K3].

COMPUTER NETWORKS

CO 1: Summarize basic concepts of Data Communication and Networking. [K2]

CO 2: Compare and Contrast OSI and TCP/IP reference models. [K2]

CO 3: Interpret data link layer services and multiple access protocols. [K2]

CO 4: Analyse different routing protocols. [K4]

CO 5: Illustrate the essential principles of different transport layer protocols. [K2]

CO 6: Summarize various application layer protocols. [K2]

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

CO1: Apply the logical statements, connectivity among the statements and forms different types of normal forms. [K3]

CO2: Analyse the theory of Inference for statement calculus. [K4]

CO3: Classify the types of graphs and trees to formulate computational problems.[K4]

CO4: Apply DNF and CNF on Boolean algebraic functions to simplify the digital (logic) circuits. [K3]

CO5: Solve mathematical problems with recurrence relations using different methods.[K3]

INTERNETOFTHINGS

CO1: Choosethecomponents of Internet of Things for Domain Application.[K3]

CO2: Applythe requirements, specifications to design IoT applications.[K3]

CO3: Identifythe IOT Physical devices for IOT Applications[K3]

CO4: AnalyzecloudstoragemodelsandcommunicationAPIsfor IoT.[K4]

CO5: DesignIoTDomain applications using Arduino or RaspberryPi [K6]

DATA STRUCTURES

CO1: Apply Searching, Sorting and Hashing techniques to solve problems [K3].

CO2: Analyse basic data structures such as Stacks, Queues and Linked List [K4].

CO3: Solve problems involving Advanced concepts of Trees [K3].

CO4: Analyse variety of Graph data structures that are used in various applications [K4].

ENGLISH COMMUNICATION SKILLS LAB-II

CO1: Know the importance of Non-verbal communication and interpret nonverbal symbols.

CO2: Make formal presentations using strategies.

CO3: Participate in Group Discussions using analytical and problem solving skills effectively.

CO4: Face job interviews confidently for employability.

COMPUTER ORGANIZATION

CO1: Interpret the computer system from user's perspective and can explain how Arithmetic Logic Unit works [K2].

CO2: Explain of basic components of the system and illustrate data paths and control flow for sequencing in CPUs [K2].

CO3: Interpret the Micro operations and Microprogramming for design of control unit of CPU. [K2]

CO4: Develop Main Memory Interfacing Circuit and can apply various cache memory mapping techniques.

CO5: Apply algorithms to perform arithmetic operations on binary representation of fixed point data **[**K3].

CO6: Interpret various I/O interface devices [K2].

DATABASE MANAGEMENT SYSTEMS LAB

CO1 : Apply SQL commands like DDL,DML,DCL to perform different Database operations [K3].

CO2 : Develop PL/SQL block statements, control statements and cursors [K3].

CO3 : Develop PL/SQL programs using functions and procedures [K3].

CO4 : Develop PL/SQL programs using packages and Triggers [K3].

DATA STRUCTURESLAB **CO1:** Analyse algorithms, Searching, Sorting and hashingTechniques [K4]. **CO2:** Make use of elementary data structures such as stacks, Queues and linked list to develop their applications. **CO3**: Examine different tree traversal techniques. **CO4**: Experiment with different graph traversal techniques.	**IoT LAB** **CO1:**Explaintheapplicationareasof IOT · **CO2:**Know the revolution of Internet in Mobile Devices, Cloud & Sensor Networks **CO3:** Explain building blocks of Internet of Things and characteristics.
FRONT END WEB TECHNOLOGIES LAB **CO1:** Develop static html pages [K3]. **CO2:** Develop Interactive Web Pages with different styles and client side validations [K3]. **CO3:** Make use of Query programming to develop Web pages [K3]. **CO4:** Apply Query UI to HTML pages [K3].	**QUANTITATIVE APTITUDE AND REASONING** **CO1:** Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements **CO2:** Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors. **CO3:** Will be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
JAVA PROGRAMMING **CO1 :** Develop java programs by using OOP concepts [K3]. **CO2 :** Make use of interfaces, threads, applets in developing JAVA programmes [K3]. **CO3 :** Make use of exception handling and collections in Java Programming[K3]. **CO4 :** Develop java components [K3].	

I MBA (R19)

I MBA - I SEMESTER	I MBA - II SEMESTER
MANAGEMENT THEORY AND ORGANIZATIONAL BEHAVIOUR CO1: Examine the Management concepts and functions. [K4] CO2: Apply the concepts of planning, decision making. [K3] CO3: Apply the concepts of delegation of authority, decentralisation and depart mentation in real life situations. [K3] CO4: Analyse the controlling principles and practices, Ethics and corporate social responsibility. [K4] CO5: Adapt the effective organisational behaviour and climate. [K6] CO6: Evaluate the basic concepts of organisational conflicts and climate. [K5]	**FINANCIAL MANAGEMENT** CO1: Outline the basic concepts of Financial Management. [K1] CO2: Comprehend the various methods of Investment Analysis and apply various techniques of capital budgeting. [K3] CO3: Adapt the concepts of leverage, capital structure and its effect on the long term survival of the firm. [K6] CO4: Appraise various methods of computation of cost of capital. [K5] CO5: Appraise the valuation methods of dividends and the dividend policies of Indian corporates. [K5] CO6: Assess the working capital requirement of a firm and comprehend the nitty-gritty of current assets management. [K5]
ECONOMICS FOR MANAGERS CO1: Describe the importance of managerial economics and its contribution to decision making in different types of business organizations by the managerial economist. [K2] CO2: Apply the basic principles of managerial economics. [K3] CO3: Apply demand analysis concept in the real life business situations. [k3] CO4: Contrast on the usefulness of the production function and cost function in analysing the firm's production activity. [K6] CO5: Classify different types of costs associated with cost function which affect the profitability of the organisations. [K4] CO6: Determining the prices of products under different market structures. [K5]	**HUMAN RESOURCE MANAGEMENT** CO1: Outline the functions and challenges of HRM. [K4] CO2: Apply different concepts of HR Planning, Recruitment, Selection, Training, Interviewing Techniques and Executive Development Programs. [K3] CO3: Apply the uses of job analysis, job description, job specification, ergonomics in industry and the methods of job evaluation. [K3] CO4: Utilize the various methods of performance appraisal. [K3] CO5: Develop a sound compensation mechanism at global level, determinants of payment of wages and incentive plans. [K6] CO6: Examine the role of trade unions, Grievance Handling Procedures, Industrial Disputes Resolution Mechanisms and stress management at work place. [K4]
ACCOUNTING FOR MANAGERS CO1: Outline the basic knowledge of accounting, bookkeeping, accounting Principles, accounting cycle. [K2] CO2: Apply the concepts of journal, ledger and Trail balance. [K3] CO3: Identify the nature of expenditure and revenue for preparation of financial statements of business. [K3] CO4: Examine the role of accounting policies like depreciation. [K4] CO5: Analyze the need for inventory valuation and accounting standards. [K6] CO6: Apply financial analysis technique of ratio analysis for the assessment of financial performance of the company. [K3]	**MARKETING MANAGEMENT** CO1: Interpret the concepts of marketing and its information system. [K2] CO2: Analyse the segmentation, targeting and positioning in marketing. [K4] CO3: Analyse various phases of product life cycle. [K4] CO4: Evaluate various methods of pricing and identify the best pricing strategy. [K5] CO5: Examine marketing communication strategies. [K5] CO6: Formulate the controlling techniques of marketing. [K6]
MANAGERIAL COMMUNICATIONS & SOFT SKILLS CO1: Apply the basic concepts of communication for business correspondence. [K3] CO2: Distinguish different forms of communication. [K4] CO3: Evaluate different types of communication. [K5] CO4: Adapt report writing skills of different types on need basis. [K6] CO5: Acquire presentation skills along with the interview techniques. [K2] CO6: Pursue the emerging issues in communication with respect to the impact. [K2]	**PRODUCTION AND OPERATIONS MANAGEMENT** CO1: Apply the basic concepts of production and operations management and identify types of manufacturing processes. [K3] CO2: Assess the need for production planning and control in the manufacturing units. [K5] CO3: Analysing the effectiveness of plant location and plant layout. [K3] CO4: Design strategies to improve productivity. [K6] CO5: Evaluate purchasing function and inventory management function. [K5] CO6: Develop the quality control system and quality control strategies. [K6]

BUSINESS ENVIRONMENT CO1: Outline the basic concepts of business environment and its components. [K2] CO2: Analyse the structure of Indian economy. [K4] CO3: Appraise the effectiveness of components of fiscal policy and balance of payments on the economy. [K6] CO4: Evaluate different trade related policies. [K5] CO5: Measure the impact of legal environment act like – MRTP, RTP and RTI. [K5] CO6: Assess the impact of concepts relating to Socio-cultural environment. [K6]	**BUSINESS RESEARCH METHODOLOGY** CO1: Adapt the fundamentals of Business research methodology. [K6] CO2: Identify research problem. [K3] CO3: Apply sample and census survey and measuring techniques. [K3] CO4: Design data collection techniques. [K6] CO5: Develop data processing procedures and apply tools. [K6] CO6: Draft thesis/report writing. [K2]
QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS CO1: Recall the fundamentals in Mathematics and Statistics. [K1] CO2: Demonstrate the methods to solve Linear Programming Problems. [K2] CO3: Choose decision making in a competitive situation. [K3] CO4: Solve transportation Problem with minimum cost of transport of commodities. [K3] CO5: Adapt substitution of new one for better usage. [K6] CO6: Develop a realistic schedule and monitor the progress of the project. [K6]	**BUSINESS LAWS** CO1: Analyze the Indian Contract Act. [K4] CO2: Evaluate Sales of Goods Act and the machinery for redressal of consumer grievances. [K5] CO3: Elaborate rights and duties of agent and principal, Principal's liability for the acts of agent and the procedure for termination of agency. [K6] CO4: Examine the rights and duties of partners, dissolution of partnership firm. [K4] CO5: Examine the formation of company, amendments act in 2013. [K4] CO6: Explain the kinds of Negotiable Instruments and Goods and Services Act. [K5]
IT FOR MANAGERS-I CO1: Identify computer hardware components, assemble and dissemble computer components. [K3] CO2:Create Attractive Documents [K6] CO3: Apply Various Mathematical & Statistical Operations Using MS-Excel. [K3] CO4: Create various advanced MS-Excel functions & applications. [K6] CO5: Create Effective basic power point Presentations. [K6] CO6: Create effective professional presentations. [K6]	**IT FOR MANAGERS-II** CO1: Outline the basic concepts of SQL. [K2] CO2: Apply different types of operators of SQL. [K3] CO3: Formulate the Constraints in SQL. [K6] CO4: Apply different types of functions on tables & Queries. CO5: Infer the basics of PL/SQL. [K2] CO6: Develop the real time applications on ERP. [K6]
II MBA – III SEMESTER	**II MBA. – IV SEMESTER**
STRATEGIC MANAGEMENT CO1: Develop vision, mission and objectives of the organization. [K3] CO2: Analyse industry and develop techniques of competitive analysis. [K4] CO3: Appraise strategic leadership styles and actions. [K5] CO4: Formulate effective strategies in business. [K6] CO5: Develop a frame work for the implementation strategies in business. [K3] CO6: Evaluate the strategy controls by measuring performance of organization. [K5]	**LOGISTICS AND SUPPLY CHAIN MANAGEMENT** CO1: Outline the basic concepts of Logistics and Supply Chain. (K1) CO2: Analyze different logistics strategies to get competitive advantage. (K4) CO3: Assess the profitability by measuring the logistics performance and maintaining supply chain relationships. (K5) CO4: Adapt new and global strategies to compete with the rivals by selecting effective source of suppliers and pricing of the products. (K6)

BUSINESS ETHICS AND CORPORATE GOVERNANCE CO1: Outline fundamentals of Values and ethics. [K2] CO2: Evaluate the global issues with respect to business ethics. [K6] CO3: Analyse manager's responsibilities in business ethics. [K4] CO4: Apply Corporate Governance Theories into Practice. [K6] CO5: Apply the Corporate Governance Scenario in India. [K6] CO6: Elaborate of Media in Indian Corporate Governance. [K6]	**ENTREPRENEURSHIP DEVELOPMENT** CO1: Identify the importance of entrepreneurship. [K2] CO2: Analyse entrepreneurship development programs in India and contents for training for entrepreneurial competencies. [K4] CO3: Develop creativity in entrepreneurship. [K6] CO4**:** Design the project reports & make project evaluation. [K6] CO5: Analyse the policies and procedures of small and micro enterprises. [K4] CO6: Appraise the institutional support to small and medium enterprises. [K5]
BUSINESS ANALYTICS CO1: Outline fundamentals of Business Analytics. [K2] CO2: Demonstrate different classifications of Business Analytics. [K2] CO3: Analyse and prepare reports on Business Analytics. [K4] CO4: Apply Business Analytics in different areas like Finance, HR and Marketing. [K3]	**FINANCIAL RISK MANAGEMENT & DERIVATIVES** CO1: Analyse the different types of risks and its impact on financial institutions. [K4] CO2: Measure different type's risks by applying various tools and techniques. [K5] CO3: Appraise the role and importance of derivatives. [K5] CO4: Evaluate the forward and future contracts and its pricing. [K4] CO5: Minimise the risk of financial institutions by using Swaps. [K6] CO6: Build the option strategies in order to minimise the risk. [K6]
INVESTMENT AND PORTFOLIO MANAGEMENT CO1: Analyse various investment alternatives for effective investment decision [K4]. CO2: Discuss the importance of security analysis in investment decision process [K6]. CO3: Design bond management strategies to realise good return on bond investment [K6]. CO4: Apply different equity valuation methods for the valuation of securities [K3]. CO5: Construct optimal portfolio for higher return at lower risk [K6]. CO6: Analyse different schemes of mutual funds for better investment decision [K4].	**FINANCIAL INSTITUTIONS & SERVICES** CO1: Outline the overview of financial system. [K2] CO2: Assess the performance of various types of financial institutions. [K5] CO3: Analyse the commercial banks and its roles. [K4] CO4: Appraise the activities of various non-banking financial institutions. [K5] CO5: Analyse the impact of insurance regulations on the Insurance Industry. [K4] CO6: Create awareness on different financial services. [K6]
CORPORATE TAXATION CO1: Conclude the fundamentals of Taxation [K5]. CO2: Discuss taxation methods of companies [K6]. CO3: Analyse income sources from business through taxation [K4]. CO4: Determine taxation techniques to reduce tax burden to the company [K5]. CO5: Evaluate Tax management strategies [K5]. CO6: Develop procedure for filing the tax for individuals and corporate [K6].	**INTERNATIONAL FINANCIAL MANAGEMENT** CO1: Evaluate the functioning of international financial system and monetary system [K5]. CO2: Analyse the international financial markets and the various international financial instruments [K4]. CO3: Analyse the advantages of foreign exchange market [K4]. CO4: Evaluate foreign direct investments [K3]. CO5: Develop strategies to deal with different types of risks associated with MNC's [K6]. CO6: Deign strategies to deal with international tax environment [K6].

BANKING & INSURANCE

CO1: Analyse the Indian financial system and role of commercial banks [K2]

CO2: Develop better understanding on different types of deposits, their benefits as well as on advances [K6]

CO3: Analyze the regulations in banking system. [K4]

CO4: Make up on new banking innovations. [K6]

CO5: Develop skills to facilitate the basic concepts of Risk and Insurance. [K6]

CO6: Outline the principles of Insurance and classifications of Insurance. [K2]

STRATEGIC INVESTMENT AND FINANCIAL DECISIONS

CO1: Analyse the concept of investment decisions & its process. [K2]

CO2: Applying the various investment decisions under different situations. [K3]

CO3: Evaluating the different types of investment & decisions. [K5]

CO4: Analyse different kinds of investment decisions. [K4]

CO5: Evaluate strategic analysis of selected investment decisions. [K5]

CO6: Distinguish on various theories of international capital structures. [K4]

PERSONAL FINANCIAL PLANNING

CO1: List out steps in financial planning process [K4].

CO2: Design the process for preparation and filing of tax returns [K6].

CO3: Evaluate investment decisions in capital goods [K5].

CO4: Analyse various insurance policies which are suitable for investor needs [K4].

CO5: Develop effective investment strategies related to various financial securities [K6].

CO6: Evaluate alternate investment options [K5].

INTERNATIONAL HUMAN RESOURCE MANAGEMENT

CO1: Identify the challenges of global HRM& strategic role of Global HRM. [

CO2: Adapt different methods of selection and process of Expatriate and Repatriate. [K6]

CO3: Analyze the cross-cultural management problems and build skill buil methods in cross culture teams. [K4]

CO4: Make use of factors affecting on compensation and metho compensation. [K3]

CO5: Measure the Global HRD climate and frame strategies to overc challenges. [K5]

CO6: Develop the global labour relations and international standard organizations. [K6]

MANAGEMENT OF INDUSTRIAL RELATIONS

CO1: Analyse the basic concepts and importance of industrial relations management. [K4]

CO2: Identify the concept of Trade Unions. [K3]

CO3: Appraise the collective bargaining power. [K5]

CO4: Evaluate the benefits of quality of work life. [K5]

CO5: Analyse the concepts of labour safety measures. [K4]

CO6: Design the grievance management procedures. [K6]

LEADERSHIP

CO1: Identify the leadership qualities to run an organization successfully. [K3]

CO2: Appraise the various behavioural concepts. [K5]

CO3: Develop the organisational structures in decision making. [K3]

CO4: Analyse the interpersonal behaviour and barriers of communication in leadership styles. [K4]

CO5: Assess the impact of group conflicts in the organisation. [K5]

CO6: Adopt different kinds of inspirational leadership styles to lead teams in effective way. [K6]

COMPENSATION AND REWARD MANAGEMENT

CO1: Outline basic concepts, framework and theories of compensation. [K2]

CO2: Develop a strategic plan for making compensation as a competitive advantage to the organization. [K6]

CO3: Contrast different types of incentive plans and determine which plan suit best to organization. [K2]

CO4: List the different types of employee benefits. [K1]

CO5: Design different methods of wage determination applicable to different cadres of employees. [K6]

CO6: Evaluate the mechanism of wage boards and its role in fixation of wage. [K5]

HUMAN RESOURCE DEVELOPMENT

CO1: Analyze the fundamental concepts of HRM and functions of HRD. [K4]

CO2: Elaborate various perspectives of HRD. [K6]

CO3: Develop sub-systems of HRD. [K3]

CO4: Apply training and development practices. [K3]

CO5: Identify the issues in employee counseling and wellness. [K3]

CO6: Evaluate recent trends of HRD. [K5]

PERFORMANCE MANAGEMENT CO1: Adapt the basics of performance management system. [K6] CO2: Identify the performance system best fit to organization. [K3] CO3: Develop a mechanism to meet the performance expectations se the organization. [K6] CO4: Apply the monitoring principles. [K3] CO5: Design the audit system for all types of jobs existed in different organizations. [K6] CO6: Analyze performance appraisal system and determining the best system of appraisal for the needs of the organization. [K4]	**INDUSTRIAL JURISPRUDENCE & LABOUR LEGISLATIONS** CO1: Examine the basic concepts and importance of employee legislations in India. [K4] CO2: Apply the concept of industrial disputes Act. [K3] CO3: Illustrate the importance of payment of bonus Act. [K2] CO4: Evaluate the benefits provided by the payment of Gratuity Act to the employees. [K5] CO5: Analyse the legal formalities under minimum wages Act. [K4] CO6: Determine the various provisions of the Factories Act. [K5] .
EMPLOYEE ENGAGEMENT & RETENTION MANAGEMENT CO1: Analyse the fundamentals of Employee engagement practices. [K6] CO2: Develop the employee engagement strategies. [K6] CO3: Analyze the employee turnover rates in different sectors. [K4] CO4: Evaluate the employee retention and retention success mantras. [K5] CO5: Apply the retention strategies. [K3] CO6: Develop practices to retain talent/skilled employee. [K6]	**SERVICES MARKETING** CO1: Analyse the basic concepts of services marketing. [K4] CO2: Identify the customer needs and expectations. [K2] CO3: Develop market segmentation process in services marketing. [K6] CO4: Assess the pricing strategies of services marketing. [K5] CO5: Analysing the impact of marketing communication in service promotion. [K4] CO6: Evaluate the consumer grievance recovery strategies. [K5]
CUSTOMER RELATIONSHIP MANAGEMENT & CONSUMER BEHAVIOUR CO1: Illustrate the basic concepts of Customer Relationship Management. [K2] CO2: Appraise the customer profile and perception of customer behaviour in relationship perspectives. [K4] CO3: Analyse strategies for customer acquisition models of CRM. [K4] CO4: Evaluate the consumer behaviour and business strategies. [K5] CO5: Apply the various consumer behaviour models. [K3] CO6: Build the psychological process and develop the effective strategy in terms of impact on consumer behaviour. [K6]	**DIGITAL MARKETING** CO1: Outline the basic concepts of Digital Marketing. [K2] CO2: Analyze different channels of digital marketing according to the changing requirements of the markets. [K4] CO3: Construct different digital marketing plans on situational basis. CO4: Adapt changes through market research for attainment of news goals. [K6] CO5: Compare different avenues of social media for marketing and advertising products for effective sales. [K4]
EVENT MANAGEMENT CO1: Outline of the role and purpose of various events in the organizations. [K2] CO2: Analyzing the techniques and strategies required to plan successful events. [K4] CO3: Develop competencies required to promote, implement and conduct distinct events. [K6] CO4: Develop knowledge and competencies required to assess the quality and success of different events. [K6]	**BRAND MANAGEMENT** CO1: Analyse the importance of brand image in marketing [K4]. CO2: Formulate brand vision which communicates better the organisations' policy on Branding [K6]. CO3: Analyse brand promotion methods in brand communication [K4]. CO4: Analyse factors influencing brand extension decisions [K4]. CO5: Design brand marketing programmes and for better brand performance [K6]. CO6: Evaluate emerging trends in brand management [K5].

RETAIL MARKETING CO1: Outline fundamentals of Retailing. [K2] CO2: Identify the general strategies of retailing. [K3] CO3: Formulate location strategies of retailing. [K6] CO4: Develop layout designs. [K6] CO5: Analyse various pricing strategies and develop location strategies. [K4] CO6: Formulate different types of franchising and its impact on the business. [K6]	**ADVERTISEMENT MANAGEMENT** CO1: Outline the basic concepts of advertising for better understanding the challenges and opportunities in advertising [K6]. CO2: Analyse the relations of advertising with segmentation and budget decision [K4]. CO3: Design better advertising strategies for the company [K6]. CO4: Identify media options which are suitable for the company for better promotion [K3]. CO5: Develop an effective advertising campaign for the company [K6]. CO6: Evaluate the role of AD agencies for the successful advertising management [k5].
RURAL MARKETING CO1: Assess the problems in rural marketing. [K4] CO2: Analyse the lifestyle, personality and rural marketing strategies. [K4] CO3: Apply brand building strategies in rural areas. [K3] CO4: Categorize the various channels of distribution in rural marketing. [K4] CO5: Adapt marketing communication in rural marketing. [K6] CO6: Evaluate the recent trends in rural marketing. [K5]	**BUSINESS INTELLIGENCE** CO1: Interpret the concepts and components of Business Intelligence (BI). CO2: Relate the business strategies applied over different areas of business. CO3: Identify the requirements needed to design a Business Intelligence model. CO4: Analyze a behavioral model to assess the behavior of the customer. .
DECISION SUPPORT SYSTEMS CO1: Define the role of information systems in DSSs. [K1] CO2: Define the role of managers in making decisions within IT organizations. [K1] CO3: Design and formulate management problems using DSSs models. [K6] CO4: Apply linear and integer programming techniques for scheduling and optimization problems that require decision making using MSEXCEL. [K3]	**ENTERPRISE RESOURCE PLANNING** **CO1:** Make basic use of Enterprise software, and its role in integrating business functions **CO2:** Analyse the strategic options for ERP identification and adoption. **CO3:** Design the ERP implementation strategies. **CO4:** Create reengineered business processes for successful ERP implementation.
DATA WAREHOUSING & DATA MINING CO1: Organize raw data to make it suitable for various data mining algorithms. [K2] CO2: Measure interesting patterns from different kinds of databases. [K5] CO3: Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data. [K3]	**INFORMATION SYSTEMS AUDIT** CO1: Outline audit standards. [K2] CO2: Determine Audit Process. [K5] CO3: Compile Computer assistance Audit tools, Managing Audit tools. [K6] CO4: Formulate Strategy and Standards for Auditing. [K6]
SOFTWARE PROJECT MANAGEMENT CO1: Outline the issues and challenges faced while doing the Software project Management. [K1] CO2: Identify the software projects fails and that failure probability can be reduced effectively. [K3] CO3: Student will be able to do the Project Scheduling, tracking, Risk analysis and Quality management. [K] CO4: Cost estimation using different techniques. [K5]	**CYBER LAW & SECURITY** CO1: Outline key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft. [K2] CO2: Determine computer technologies, digital evidence collection, and evidentiary reporting in forensic acquisition. [K5] CO3: Defend both clean and corrupted systems, protecting personal data, securing simple computer networks, and safe Internet usage. [K5] CO4: Create approaches for incident analysis and response. [K6]

E-BUSINESS **CO1:** Compare and evaluate alternative e-business strategies and technologies. [K4] **CO2:** Justify and promote strategic initiatives, such as adopting a new business system. [K4] **CO3:** Demonstrate systems architecture and technologies for systems integration. [k2] **CO4:** Plan and deliver senior management reports and presentations. [K3]	

R20 - MCA - COURSE OUTCOMES	
I MCA	
I Semester	**II Semester**
C PROGRAMMING AND DATA STRUCTURES: **CO 1:** Demonstrate the basic knowledge of computer hardware and software [K3]. **CO 2:** Ability to problem solving and logical skills in programming [K3] **CO 3:** Implement modular programming using functions [K3] **CO 4:** Interpret dynamic memory allocation using pointers and Organize data into files [K3]	**COMPUTER NETWORKS:** After completion of this course, the students should be able to **CO 1:** Interpret the basic computer network technology [K3] **CO 2:** Identify the different types of network topologies and protocols[K2] **CO 3:** Explain the layers of the OSI and TCP/IP model and the functions of each layer [K2] **CO 4:** Design and implement data link or network layer protocols within a simulated networking environment [K6]
COMPUTER ORGANIZATION: After completion of this course student will be able to **CO 1:** The basic components of a computer, including CPU, memories, and input/output, and their organization representation of data, addressing modes, instructions sets [K2] **CO 2:** Discriminate different register transfer micro operations, Principles of hardwired and micro programmed control [K4] **CO 3:** Demonstrate various fixed and floating point arithmetic operations, performing the Arithmetic operations of binary number systems and formulating the arithmetic functions and solve scientific problems by means of a numerical analysis method [K3] **CO 4:** Extrapolate memory organization and input, output organizations [K4] **CO 5:** Generalize pipe line and vector processing, multi processors and its applications [K6]	**Object Oriented Programming Using java:** **CO 1:** To be able to analyses the real world problems in an Object Oriented way [K4] **CO2:** Apply Encapsulation, Inheritance and Polymorphism features of Java appropriately to solve problems [K3] **CO 3:** To be able to create Java console, GUI and Web applications in Java [K6] **CO 4:** To be able to create lightweight multithreaded applications with synchronization [K6]
Database management systems: **CO 1:** Able to master the basic concepts and understand the applications of database systems [K2] **CO 2:** Able to construct an Entity-Relationship (E-R) model from specifications and to transform to relational model [K6] **CO 3:** Able to construct unary/binary/set/aggregate queries in Relational Algebra [K6] **CO 4:** Understand and apply database normalization principles [K3]	**Software Engineering:** After completion of this course the students should be able to **CO 1:** Identify generic models of software development process [K2] **CO 2:** Understand fundamental concepts of Requirements Engineering and Analysis Modeling [K2] **CO 3:** Compare different design techniques and their implementation [K4] **CO 4:** List out various testing and maintenance measures [K1]
Operating Systems: At the end of the course the student will be able to **CO 1:** Classify different types of systems like distributed system, special purpose system and the working principle of system calls[K4] **CO 2:** Compute the waiting time and turnaround time of different CPU scheduling algorithms and comparison among all the CPU scheduling algorithms [K2] **CO 3:** Examine the page faults for different Page Replacement algorithms and comparison among all the Page Replacement algorithms, and methods to handle deadlocks [K4] **CO 4:** Differentiate among different File System implementation and directory implementation [K4] **CO 5:** Assess different types of disk scheduling algorithms, distinguish different protection and security mechanisms [K5]	**Design analysis and algorithms:** After completion this course, the student should be able to: **CO 1:** Analyze worst-case running times of algorithms using asymptotic analysis [K4] **CO 2:** Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it [K2] **CO 3:** Describe the greedy, dynamic-programming paradigm and explain when an algorithmic design situation calls for it [K2] **CO 4:** Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate [K4]
Mathematical and Statistical Foundations: Upon completion of the course student will be able to	**Artificial intelligence:** After successful completion of this course, the students will be able to: **C01:** Outline the fundamentals of artificial intelligence and characteristics of problems [K2]

CO1: Demonstrate skills in solving mathematical problems [K3] **CO2:** Comprehend mathematical principles and logic [K4] **CO3:** Formulate null, alternative hypothesis and test its validity based on random sample [K4] **CO4:** Apply queuing models to find the optimum service rate [K3]	**C02**: Analyse different search techniques and predicate logic in artificial Intelligence [K4] **CO3:** Interpret knowledge representation and symbolic reasoning using different rules [K3] **CO4:** Interpret Statistical reasoning and filler structures [K3] **CO5:** Apply various problem planning systems and different learning methodologies [K3] **CO6:** Apply different language processing schemes while solving the real world problems [K3]
Database management systems Lab: After Completion of this course student must be able to **CO1:** Understand, analyse and apply SQL commands like DDL, DML, DCL to perform different Database operations [K2] **CO2:** Understand and practice PL/SQL block, control statements and cursors [K2] **CO3:** Develop PL/SQL programs using functions & procedures [K6] **CO4:** Develop PL/SQL programs using packages and Triggers [K6]	**Advance Unix Programming:** At the end of this course student will be able to **CO 1:** Utilize various utilities in Unix operating system [K3] **CO 2:** Implement various OS functionalities using system calls [K3] **CO 3:** Implement Inter Process Communication [K3] **CO 4:** Implement network programming using sockets [K3] **CO 5:** Implement Remote Procedure Call [K3]
C PROGRAMMING AND DATA STRUCTURES Lab: **CO1:** Study, analyse and understand logical structure of computer programming and different constructs to develop programs in C Language [K2] **CO2:** Know how to write, compile and debug programs in C Language [K2] **CO3:** Understand and analyse data types, typecasting and operator precedence [K2] **CO4:** Analyse the use of conditional and looping statements to solve problems associated with conditions and repetitions [K4]	**Data Warehousing and mining:** After completion of this course, students should be able to **CO 1:** Examine the types of data to be mined and extract knowledge using Data Mining Techniques [K1] **CO 2:** Analyze the different operations and techniques involved in Data Warehouse [K4] **CO 3:** Identify components in typical Data Warehouse architectures [K1] **CO 4:** Compare and contrast different dominant Data Mining Algorithms for classification, Association Analysis and Clustering [K4]
Operating Systems and Linux Lab: At the end of the course, student will be able to • Implement various CPU scheduling algorithms and compare results [K3] • Implement various disk scheduling algorithms and compare results [K3] • Implement page replace algorithms [K3] • Implement various memory management techniques [K3] • Execute basic Linux commands List of Experiments [K3]	**Object Oriented Programming Using java Lab:** After completion of this course, the students would be able to **CO1:** Demonstrate his or her ability to write, compile & execute basic java program and also the use of OOP concept i.e. data abstraction & data hiding, encapsulation, inheritance, polymorphism [K3] **CO2:** Create and use interfaces, threads [K6] **CO3:** Handle exceptions and write applets [K6] **CO4:** Knowledge of GUI for developing java components [K1]
	EMPLOYABILITY SKILLS LAB: After successful completion of this course, the students will be able to: **CO 1:** Write effective Resume for employment [K6] **CO 2**: Make formal presentations using relevant technical style of communication and appropriate strategies for both academic and professional purpose [K6] **CO 3**: Participate in Group Discussions using analytical and problem solving skills [K5] **CO 4**: Face job interviews confidently and enhance employability [K4]

III Semester	IV Semester
MACHINE LEARNING WITH PYTHON: **CO1:** Identify machine learning techniques suitable for a given problem [K1] **CO2:** Solve the problems using various machine learning techniques [K3] **CO3:** Apply dimensionality reduction techniques [K3] **CO4:** Design application using machine learning techniques [K6]	**BLOCKCHAIN TECHNOLOGY:** After successful completion of this course, the students should be able to: **CO 1:** Interpret the working procedure of Bitcoins [K2] **CO 2:** Analyze the Transactions in Bitcoin Network [K4] **CO 3:** Analyze the Block Chain and Bitcoin Network [K4] **CO 4:** Analyze the Mining and Consensus in Block Chain [K4]
WEB TECHNOLOGIES: After completion of this course, the students should be able to **CO 1:** Acquaint with necessary fundamental skills for creating web applications [K6] **CO 2:** Install and manage web server software and study server side scripting languages like servlets and JSP [K3] **CO 3:** Acquire the concepts of java beans [K5] **CO 4:** Understand database access and use it in JSP and servlets [K2]	**DESIGN PATTERNS:** **CO1:** Identify the appropriate design patterns to solve object oriented design problems [K1] **CO2:** Develop design solutions using creational patterns [K6] **CO3:** Apply structural patterns to solve design problems [K3] **CO4:** Construct design solutions by using behavioural patterns [K6] **CO5:** Demonstrate about Advanced Patterns like Pattern Catalogs [K3]
NETWORK SECURITY & CRYPTOGRAPHY: At the end of this course, the student should be able to **CO1:** Analyze the vulnerabilities in any computing system and hence be able to design a Security solution [K4] **CO2:** Identify the security issues in the network and resolve it [K1] **CO3:** Evaluate security mechanisms using rigorous approaches, including theoretical [K5] **CO4:** Compare and Contrast different IEEE standards and Electronic mail security [K4] **CO5:** Understand and use Security & Privacy mechanisms in EDI like E-mail [K2]	**E-COMMERCE:** After completion of this course, the students should be able to **CO 1:** Demonstrate an understanding of the foundations and importance of E-commerce [K3] **CO 2:** Demonstrate an understanding of retailing in E-commerce [K3] **CO 3:** Analyse the impact of E-commerce on business models and strategy [K4] **CO 4:** Describe Internet trading relationships including Business to Consumer, Business- to-Business & Intra-organizational [K1]
CLOUD COMPUTING: After Completion of this course the student should be able to **CO 1:** Understand the Virtualization and applications for the state-of-the-art cloud computing [K2] **CO 2:** Carry out the Cloud Scale and value of Cloud Computing [K1] **CO 3:** Analyze the infrastructure of cloud computing including public, private and hybrid clouds and various services like PaaS, SaaS, IaaS etc.[K4] **CO 4:** Monitor the Security in cloud [K2]	**BIG DATA ANALYTICS:** At the end of this course, the student should be able to **CO 1:** Preparing for data summarization, query, and analysis [K6] **CO 2:** Applying data modelling techniques to large data sets [K3] **CO 3:** Creating applications for Big Data analytics [K6] **CO 4:** Building a complete business data analytic solution [K6]
DIGITAL IMAGE PROCESSING: By the end of the course the students will be able to **CO1:** Process, quantize and to perform sampling on given images [K4] **CO2:** Transform and filter the digital image for improving the image quality [K3] **CO3:** Generate Color images by applying different image characteristics using different color models [K5] **CO4:** Compress the digital images by applying different lossless and lossy compression techniques [K3] **CO5:** Identify different representations and restoration of digital images [K1]	**CYBER SECURITY:** At the end of this course, student should be able to **CO 1:** Possess a fundamental knowledge of Cyber Security [K2] **CO 2:** Understand what vulnerability is and how to address most common vulnerabilities [K2] **CO 3:** Know basic and fundamental Computer Forensics principles as it relates to Cyber Security [K1] **CO 4:** Have the knowledge needed to practice safer computing and safeguard your information [K1] **CO 5:** Understand basic technical controls in use today, such as firewalls and Intrusion Detection systems [K2]
INTERNET OF THINGS: **CO 1:** Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things [K4] **CO 2:** Conceptually identify vulnerabilities involving the Internet of Things [K1] **CO 3:** Develop critical thinking skills [K6]	

CO 4: Conceptually identify recent security attacks [K1]	
UNIFIED MODELING LANGUAGE: After completion this course, the student should be able to **CO1:** Analyze software requirements and document those using Use Cases [K4] **CO2:** Utilize the notation of the UML diagrams such as Use Case, Class, Sequence, Activity, State chart, Deployment and Package Diagrams [K3] **CO3:** Acquire the knowledge of Library Files,executable files, Processors and Devices for a system [K1] **CO4:** Build the Forward and Reverse Engineering using UML notations [K6]	
HUMAN MANAGEMENT: The student is able to **CO1:** Outline the functions and challenges of HRM. [K4] **CO2:** Apply different concepts of HR Planning, Recruitment, Selection, Training, Interviewing Techniques and Executive Development Programs. [K3] **CO3:** Apply the uses of job analysis, job description, job specification, ergonomics in industry and the methods of job evaluation. [K3] **CO4:** Utilize the various methods of performance appraisal. [K3] **CO5:** Develop a sound compensation mechanism at global level, determinants of payment of wages and incentive plans. [K6] **CO6:** Examine the role of trade unions, Grievance Handling Procedures, Industrial Disputes Resolution Mechanisms and stress management at work place. [K4]	
WEB TECHNOLOGY LAB: After Completion of this course, the student should be able to: **CO 1:** Get practical exposure on HTML, XHTML, CSS, JavaScript, XML and other web technologies [K3] **CO 2:** Get practical exposure to develop XML Technologies such as XML Schemas,XSLT [K3] **CO 3:** Get practical exposure to develop Server-Side Programming using ServletsandJSP's. [K3] **CO 4:** Develop a web page & web site using AJAX and PHP.[K6]	
NSC&UML LAB: After completion this course, the student should be able to **CO 1:** Understand how to model requirements with Use Cases [K2] **CO 2:** Utilize the principles to design packages for large scale software projects [K3] **CO 3:** Design the Dynamic Behaviour and Structure of the design [K6] **CO 4:** Apply the pragmatic approach to Software Design and Development [K3]	
EMPLOYABILITY SKILLL-2: After completion this course, the student should be able to **CO1:** Effectively use UML for Analysis of a given problem [K3]	

CO2: Effectively use UML for Design of a given problem [K3] **CO3:** Effectively use Android Studio for the development of Android application [K3] **CO4:** Automate testing using Selenium or any other tool [K3]	