AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Approved by AICTE, Recg. By Govt of T.S & Affiliated to JNTUH, Hyderabad)
NAAC "B++" Accredited Institute
Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

BASIC SCIENCE & HUMANITIES I & II SEM Course Outcomes For the A.Y 2023-24

S.no	Year/Sem	Course Name	Course Outcomes
1	I-I	MATRICES & CALCULUS	CO1 :Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
			CO2: Find the Eigenvalues and Eigen vectors
			CO3: Reduce the quadratic form to canonical form using orthogonal transformations
			CO4: Solve the applications on the mean value theorems
			CO5: Evaluate the improper integrals using Beta and Gamma functions
2	I-I	ENGINEERING CHEMISTRY	CO1: Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control
			C02: The students are able to understand the basic properties of water and its usage in domestic and industrial purposes
			CO3: They can learn the fundamentals and general properties of polymers and other engineering materials.
			CO4: They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs
3	I-I	PROGRAMMING FOR PROBLEM SOLVING	CO1: To write algorithms and to draw flowcharts for solving problems
			CO2: To convert the algorithms/flowcharts to C programs
			CO3: To code and test a given logic in the C programming language
			CO4: To decompose a problem into functions and to develop modular reusable code
			CO5: To use arrays, pointers, strings and structures to write C programs
			CO6: Searching and sorting problems
4	I-I	BASIC ELECTRICAL	CO1: Understand and analyze basic Electrical circuits
			CO2: Study the working principles of Electrical Machines and Transformers

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		ENGINEERING	CO3: Introduce components of Low Voltage Electrical Installations
5	I-I	COMPUTER AIDED ENGINEERING GRAPHICS	CO1: Apply computer aided drafting tools to create 2D and 3D objects
			CO2: sketch conics and different types of solids
			CO3: Appreciate the need of Sectional views of solids and Development of surfaces of solids
			CO4: Read and interpret engineering drawings
			CO5: Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting
6	I-I	ENGINEERING CHEMISTRY LABORATORY	CO1: Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions
			CO2: Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases
			CO3: Students are able to prepare polymers like bakelite and nylon-6
			CO4: Estimations saponification value, surface tension and viscosity of lubricant oils
7	I-I	PROGRAMMING FOR PROBLEM SOLVING LABORATORY	CO1: formulate the algorithms for simple problems
			CO2: translate given algorithms to a working and correct program
			CO3: correct syntax errors as reported by the compilers
			CO4: identify and correct logical errors encountered during execution
			CO5: represent and manipulate data with arrays, strings and structures
8	I-I	BASIC ELECTRICAL ENGINEERING LABORATORY	CO1: Verify the basic Electrical circuits through different experiments.
			CO2: Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods
			CO3: Analyze the transient responses of R, L and C circuits for different input conditions

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9	I-I	ELECTRICAL CIRCUIT ANALYSIS -I	CO1:Understand network analysis, techniques using mesh and node analysis.
			CO2:Evaluate steady state and transient behavior of circuits for DC and AC excitations.
			CO3:Analyze electric circuits using network theorems and concepts of coupled circuits.
10	I-II	ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS	CO1: Identify whether the given differential equation of first order is exact or not
			CO2: Solve higher differential equation and apply the concept of differential equation to real world problems
			CO3: Use the Laplace transforms techniques for solving ODE's.
			CO4: Evaluate the line, surface and volume integrals and converting them from one to another
11	I-II	APPLIED PHYSICS	CO1: Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids
			CO2: Identify the role of semiconductor devices in science and engineering Applications
			CO3: Explore the fundamental properties of dielectric, magnetic materials and energy for their applications
			CO4: Appreciate the features and applications of Nanomaterial's
			CO5: Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.
12	I-II	ENGINEERING WORKSHOP	CO1: Study and practice on machine tools and their operations
			CO2: Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding
			CO3: Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling
			CO4: Apply basic electrical engineering knowledge for house wiring practice.
13	I-II	ENGLISH FOR SKILL ENHANCEMENT	CO1: Understand the importance of vocabulary and sentence structures
			CO2: Choose appropriate vocabulary and sentence structures for their oral and written communication
			CO3: Demonstrate their understanding of the rules of functional grammar
			CO4: Develop comprehension skills from the known and unknown passages
			CO5: Acquire basic proficiency in reading and writing modules of English

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14	I-II	ELECTRONIC DEVICES AND CIRCUITS	CO1: Acquire the knowledge of various electronic devices and their use on real life.
			CO2: Know the applications of various devices.
			CO3: Acquire the knowledge about the role of special purpose devices and their applications.
15	I-II	APPLIED PHYSICS LABORATORY	CO1: Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment
			CO2: Appreciate quantum physics in semiconductor devices and optoelectronics.
			CO3: Gain the knowledge of applications of dielectric constant.
			CO4: Understand the variation of magnetic field and behavior of hysteresis curve.
			CO5: Carried out data analysis
16	I-II	PYTHON PROGRAMMING LABORATORY	CO1: Develop the application specific codes using python.
			CO2: Understand Strings, Lists, Tuples and Dictionaries in Python
			CO3: Verify programs using modular approach, file I/O, Python standard library
			CO4: Implement Digital Systems using Python
17	I-II	ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY	CO1: Understand the nuances of English language through audio- visual experience and group activities
			CO2: Neutralise their accent for intelligibility
			CO3: Speak with clarity and confidence which in turn enhances their employability skills
18	I-II	IT WORKSHOP	CO1: Perform Hardware troubleshooting
			CO2: Understand Hardware components and inter dependencies
			CO3: Safeguard computer systems from viruses/worms
			CO4: Document/ Presentation preparation
			CO5: Perform calculations using spreadsheets

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19	I-II	ELECTRICAL CIRCUIT ANALYSIS – II	CO1: Observe the response of various R, L and C circuits for different excitations.
			CO2: Examine the behavior of circuits using Fourier, Laplace transforms and transfer function of single port network.
			CO3: Obtain two port network parameters and applications and design of various filters.

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Electrical & Electronics Engineering I & II SEM Course Outcomes For the A.Y 2023-24

S.no	Year/Sem	Course Name	Course Outcomes
1	II-I	Engineering Mechanics	CO1: Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
			CO2: Solve problem of bodies subjected to friction
			CO3: Find the location of centroid and calculate moment of inertia of a given section
			CO4: Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
			CO5:Solve problems using work energy equations for translation, fixed axis rotation and plane
			CO6:motion and solve problems of vibration.
2	II-I	Electrical Circuit Analysis	CO1: Apply network theorems for the analysis of electrical circuits
			CO2; Obtain the transient and steady-state response of electrical circuits.
			CO3: Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
			CO4: Analyze two port circuit behavior
3	II-I	Analog Electronics	CO1: Know the characteristics, utilization of various components
			CO2: Understand the biasing techniques Design and analyze various rectifiers, small signal amplifier circuits
			CO3: Design sinusoidal and non-sinusoidal oscillators
			CO4:A thorough understanding, functioning of OP-AMP, design OP-AMP based circuits with linear integrated circuits

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4	II-I	Electrical Machines-I	CO1: Identify different parts of a DC machine & understand its operation Carry out different testing methods to predetermine the efficiency of DC machines
			CO2:Understand different excitation and starting methods of DC machines
			CO3:Control the voltage and speed of a DC machines
			CO4:Analyze single phase and three phase transformers circuits
5	II-I	Electro Magnetic Field	CO1: Understand the basic laws of electromagnetism
			CO2: Obtain the electric and magnetic fields for simple configurations under static conditions
			CO3: Analyze time varying electric and magnetic fields
			CO4: Understand Maxwell's equation in different forms and different media
			CO5: Understand the propagation of EM waves
6	II-I	ELECTRICAL MACHINES LAB	CO1:to Start and control the Different DC Machines
			CO2;Assess the performance of different machines using different testing methods
			CO3:Identify different conditions required to be satisfied for self - excitation of DC Generators
			CO4:Separate iron losses of DC machines into different components
7	II-I	ANALOG ELECTRONICS LAB	CO1: Know the characteristics, utilization of various components
			CO2 :Understand the biasing techniques
			CO3:Design and analyze various rectifiers, small signal amplifier circuits
			CO4:Design sinusoidal and non-sinusoidal oscillators
			CO5:A thorough understanding, functioning of OP-AMP, design OP-AMP based circuits with linear integrated circuits
8	II-I	ELECTRICAL CIRCUITS LAB	CO1:Analyze complex DC and AC linear circuits
			CO2:Apply concepts of electrical circuits across engineering
			CO3:Evaluate response in a given network by using theorems

9	II-II	LAPLACE TRANSFORMS, NUMERICAL METHODS AND COMPLEX VARIABLES	CO1:Use the Laplace transforms techniques for solving ODE's
			CO2:Find the root of a given equation.
			CO3:Estimate the value for the given data using interpolation
			CO4:Find the numerical solutions for a given ODE's
			CO5:Analyze the complex function with reference to their analyticity, integration using Cauchy's
			CO6:integral and residue theorems Taylor's and Laurent's series expansions of complex function
10	II-II	ELECTRICAL MACHINES - II:	CO1: Understand the concepts of rotating magnetic fields
			CO2:Understand the operation of ac machines.
			CO3:Analyze performance characteristics of ac machines
11	II-II	DIGITAL ELECTRONICS	CO1:Understand working of logic families and logic gates
			CO2:Design and implement Combinational and Sequential logic circuits
			CO3:Understand the process of Analog to Digital conversion and Digital to Analog conversion
			CO4:Be able to use PLDs to implement the given logical problem.
12	II-II	CONTROL SYSTEMS	CO1:Understand the modeling of linear-time-invariant systems using transfer function and statespace representations
			CO2:Understand the concept of stability and its assessment for linear-time invariant systems
			CO3:Design simple feedback controllers.

13	II-II	POWER SYSTEM - I	CO1:Understand the concepts of power systems
			CO2:Understand the operation of conventional generating stations and renewable sources of electrical power.
			CO3:Evaluate the power tariff method
			CO4:Determine the electrical circuit parameters of transmission lines
			CO5:Understand the layout of substation and underground cables and corona
			CO1:Understand working of logic families and logic gates

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14	II-II	DIGITAL ELECTRONICS LAB	CO2:Design and implement Combinational and Sequential logic circuits
			CO3:Understand the process of Analog to Digital conversion and Digital to Analog conversion
			CO4:Be able to use PLDs to implement the given logical problem.
15	II-II	ELECTRICAL MACHINES LAB - II	CO1: Assess the performance of different machines using different testing methods
			CO2: Convert the Phase from three phase to two phase and vice versa
			CO3: Compensate the changes in terminal voltages of synchronous generator after estimating
			CO4:the change by different methods Control the active and reactive power flows in synchronous machines
			CO5:Start different machines and control the speed and power factor
16	II-II	CONTROL SYSTEMS LAB	CO1:How to improve the system performance by selecting a suitable controller and/or a compensator for a specific application
			CO2:Apply various time domain and frequency domain techniques to assess the system
			CO3:performance Apply various control strategies to different applications (example: Power systems, electrical drives etc)
			CO4:Test system controllability and observability using state space representation and applications of state space representation to various systems
17	III-I	POWER ELECTRONICS	CO1:Understand the differences between signal level and power level devices
			CO2:Analyze controlled rectifier circuits
			CO3:Analyze the operation of DC-DC choppers
			CO4:Analyze the operation of voltage source inverters
18	III-I	POWER SYSTEM - II	CO1: Analyze transmission line performance
			CO2:Apply load compensation techniques to control reactive power
			CO3:Understand the application of per unit quantities
			CO4:Design over voltage protection and insulation coordination
			CO5:Determine the fault currents for symmetrical and unbalanced fault

19	III-I	MEASUREMENTS AND INSTRUMENTATION	CO1:Understand different types of measuring instruments, their construction, operation
			CO2:characteristics Identify the instruments suitable for typical measurements
			CO3:Apply the knowledge about transducers and instrument transformers to use them effectively
			CO4:Apply the knowledge of smart and digital metering for industrial applications
20	III-I	COMPUTER ARCHITECTURE(Professional Elective - I)	CO1:Understand the concepts of microprocessors, their principles and practices
			CO2:Write efficient programs in assembly language of the 8086 family of microprocessors
			CO3: Organize a modem computer system and be able to relate it to real examples
			CO4: Develop the programs in assembly language for 80286, 80386 and MIPS processors in real
			CO5: and protected modes. Implement embedded applications using ATOM processor.
21	III-I	HIGH VOLTAGE ENGINEERING Professional Elective - I)	CO1:the basic physics related to various breakdown processes in solid, liquid
			CO2:gaseous insulating materials. Knowledge of generation and measurement of C., A.C
			CO3:Impulse voltages. Knowledge of tests on H. V. equipment and on insulating materials, as per the standards
			CO4: Knowledge of how over-voltages arise in a power system, and protection against these overvoltages
22	III-I	ELECTRICAL MACHINE DESIGN Professional Elective - I)	CO1: Understand the construction and performance characteristics of electrical machines
			CO2:Understand the various factors which influence the design: electrical, magnetic and thermal
			CO3: loading of electrical machines Understand the principles of electrical machine design and carry out a basic design of an acmachine
			CO4:Use software tools to do design calculations.
23	III-I	BUSINESS ECONOMICS AND FINANCIAL ANALYSIS	CO1:The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost Market Structure , Pricing

24	III-I	POWER SYSTEM SIMULATION LAB	CO1:Perform various transmission line calculations
			CO2:Understand Different circuits time constants
			CO3:Analyze the experimental data and draw the conclusions.
25	III-I	POWER ELECTRONICS LAB	CO1:operating principles of various power electronic converters
			CO2:Use power electronic simulation packages
			CO3:hardware to develop the power converters
			CO4:Analyze and choose the appropriate converters for various applications
26	III-I	MEASUREMENTS AND INSTRUMENTATION LAB	CO1 :Describe measuring instruments.
			CO2:Understand and explain working of waveform generators, waveform analyzers, and transducers.
			CO3: To operate various measuring instruments.
			CO4:To analyze performance of waveform generators, waveform analyzers, transducers.
27	III-I	ADVANCED COMMUNICATION SKILLS LAB	CO1:To improve the students' fluency in English, through a well-developed vocabulary and enable
			CO2:them to listen to English spoken at normal conversational speed by educated English
			CO3:speakers and respond appropriately in different socio-cultural and professional contexts
			CO4:Further, they would be required to communicate their ideas relevantly and coherently in writing
			CO5:To prepare all the students for their placements
28	III-II	OPTIMIZATION TECHNIQUES Professional	CO1:need of optimization of engineering systems
			CO2:understand optimization of electrical and electronics engineering problems
			CO3:apply classical optimization techniques, linear programming, simplex algorithm, transportation

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		Elective - III	CO4;problem apply unconstrained optimization and constrained non-linear programming and dynamic
			CO5;programming Formulate optimization problems
29	III-II	POWER SEMICONDUCTOR DRIVES	CO1:Identify the drawbacks of speed control of motor by conventional methods
			CO2:Differentiate Phase controlled and chopper-controlled DC drives speed- torque characteristics
			CO3: merits and demerits Understand Ac motor drive speed-torque characteristics using different control strategies its
			CO4: merits and demerits Describe Slip power recovery schemes
30	III-II	WIND AND SOLAR ENERGY SYSTEMS Professional Elective - II	CO1:Understand the energy scenario and the consequent growths of the power generate renewable energy sources
			CO2:Understand the basic physics of wind and solar power generation
			CO3:Understand the power electronic interfaces for wind and solar generation
			CO4:Understand the issues related to the grid-integration of solar and wind energy Systems
31	III-II	SIGNALS AND SYSTEMS	CO1: to Differentiate various signal functions
			CO2:Represent any arbitrary signal in time and frequency domain
			CO3:Understand the characteristics of linear time invariant systems
			CO4:Analyze the signals with different transform technique
32	III-II	MICROPROCESSORS & MICROCONTROLLERS	CO1:Understands the internal architecture, organization and assembly language programming of 8086 processors
			CO2:Understands the internal architecture, organization and assembly language programming of 8051/controllers
			CO3:Understands the interfacing techniques to 8086 and 8051 based systems
			CO4:Understands the internal architecture of ARM processors and basic concepts of advanced ARM processors
33	III-II	POWER SYSTEM PROTECTION	CO1:Compare and contrast electromagnetic, static and microprocessor-based relays
			CO2:Apply technology to protect power system components
			CO3:Select relay settings of over current and distance relays

			CO4:Analyze quenching mechanisms used in air, oil and vacuum circuit breakers
34	III-II	POWER SYSTEM OPERATION AND CONTROL	CO1:Understand operation and control of power systems
			CO2:Analyze various functions of Energy Management System (EMS) functions
			CO3:Analyze whether the machine is in stable or unstable position
			CO4:Understand power system deregulation and restructuring
35	III-II	POWER SYSTEM LAB	CO1: Perform various load flow techniques
			CO2:Understand Different protection methods
			CO3:Analyze the experimental data and draw the conclusions
36	III-II	SIGNALS AND SYSTEMS LAB	CO1:Understand the concepts of continuous time and discrete time systems
			CO2:Analyse systems in complex frequency domain
			CO3:Understand sampling theorem and its implications
37	III-II	DIGITAL CONTROL SYSTEMS (Professional Elective - II)	CO1: the ability to Obtain discrete representation of LTI systems
			CO2:Analyze stability of open loop and closed loop discrete-time systems
			CO3:Design and analyze digital controllers
			CO4:Design state feedback and output feedback controllers
38	IV-I	ELECTRICAL AND HYBRID VEHICLES	CO1:demonstrate the ability to Understand the models to describe hybrid vehicles and their performance
			CO2:Understand the different possible ways of energy storage
			CO3:Understand the different strategies related to energy storage systems
39	IV-I	HVDC TRANSMISSION	CO1:to Compare EHV AC and HVDC system and to describe various types of DC links
			CO2:Analyze Graetz circuit for rectifier and inverter mode of operation

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			CO3:Describe various methods for the control of HVDC systems and to perform power flow analysis
			CO4:in AC/DC systems Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters
40	IV-I	POWER SYSTEM RELIABILITY	CO1: able to Estimate loss of load and energy indices for generation systems model
			CO2:Describe merging generation and load models
			CO3:Apply various indices for distribution systems
			CO4:Evaluate reliability of interconnected systems
41	IV-I	FUNDAMENTALS OF MANAGEMENT FOR ENGINEERS	CO1: The students understand the significance of Management in their Profession.
			CO2: Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area
42	IV-I	ELECTRICAL & ELECTRONICS DESIGN LAB	CO1:Get practical knowledge related to electrical
			CO2:Fabricate basic electrical circuit elements/networks
			CO3:Trouble shoot the electrical circuits Design filter circuit for application
			CO4:Get hardware skills such as soldering, winding etc
43	IV-II	POWER QUALITY AND FACTS	CO1:Know the severity of power quality problems in distribution system
			CO2:Understand the concept of voltage sag transformation from up-stream (higher voltages
			CO3:devices Choose proper controller for the specific application based on system requirements
			CO4:Understand various systems thoroughly and their requirements
			CO5:Understand the control circuits of Shunt Controllers SVC& STATCOM for various functions viz

			CO6:Transient stability Enhancement, voltage instability prevention and power oscillation
44	IV-II	SMART GRID TECHNOLOGIES	CO1:Understand the features of small grid in the context of Indian grid
			CO2:Understand the role of automation in transmission and distribution
			CO3:Apply evolutionary algorithms for smart grid
			CO4:Understand operation and maintenance of PMUs, PDCs, WAMs, and voltage and frequency control in micro grid
45	IV-II	ELECTRICAL DISTRIBUTION SYSTEMS	CO1:to distinguish between transmission, and distribution line and design the feeders
			CO2:compute power loss and voltage drop of the feeders
			CO3:design protection of distribution systems
			CO4:understand the importance of voltage control and power factor improvement
46	IV-II	NON-CONVENTIONAL SOURCES OF ENERGY	CO1: Understand the basic concepts and operation of renewable energy systems
			CO2 : Remember the ideas and statistics of current RES availability and usage.
			CO3 :Analyze the problems in RES installation in real time
			CO4:Identify the other NCES and available sources improvement
			CO5 :Apply the renewable energy systems in real time applications.

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Electronics and Communication Engineering I & II SEM Course Outcomes For the A.Y 2023-24

S.no	Year/Sem	Course Name	Course Outcomes
1	II-I	Electronic Devices circuits	CO1: Know the characteristics of various components.
			CO2: Understand the utilization of components.
			CO3: Understand the biasing techniques
			CO4: Design and analyze small signal amplifier circuits.
2	II-I	Network Analysis and transmission lines	CO1: Gain the knowledge on basic RLC circuits behavior.
			CO2: Analyze the Steady state and transient analysis of RLC Circuits
			CO3: Know the characteristics of two port network parameters
			CO4: Analyze the transmission line parameters and configurations.
3	II-I	Digital System Design	CO1: Understand the numerical information in different forms and Boolean Algebra theorems
			CO2: Postulates of Boolean algebra and to minimize combinational functions
			CO3: Design and analyze combinational and sequential circuits
			CO4: Known about the logic families and realization of logic gates.
4	II-I	Signals and Systems	CO1: Differentiate various signal functions
			CO2:Represent any arbitrary signal in time and frequency domain.
			CO3:Understand the characteristics of linear time invariant systems.
			CO4:Analyze the signals with different transform technique

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5	II-I	Probability Theory Stochastic Processes	**CO1**: Understand the concepts of Random Process and its Characteristics
			CO2: Understand the response of linear time Invariant system for a Random Processes.
			CO3: Determine the Spectral and temporal characteristics of Random Signals
			CO4: Understand the concepts of Noise in Communication systems.
6	II-I	Electronic Devices circuits lab	CO1:Ability to analyze PN junctions in semiconductor devices under various conditions.
			CO2:Ability to design and analyze simple rectifiers and voltage regulators using diodes.
			CO3:Ability to describe the behavior of special purpose diodes.
			CO4:Ability to design and analyze simple BJT and MOSFET circuits.
7	II-I	Digital System Design lab	CO1: Apply the concept of Boolean algebra to verify the truth table ofvarious expressions using logic gates in Hardware Description Language.
			CO2 :Make use of dataflow, structural and behavioral modeling styles of HDL for simulating the combinational logic circuits.
			CO3:Analyze the SR flip flop, JK flip flop, D flip flop, T flip flops forfunctional simulation and timing analysis.
			CO4:Build the universal shift registers, counters using the flip flops
			CO5:Examine a finite state machine for detection of sequence.
			CO6:Design the real time applications like traffic light controller, chess clock controller FSM, elevator operations using FPGA kit.
8	II-I	Basic Simulation lab	CO1:Acquainted with MATLAB commands, functions and programming
			CO2:Generate various signals and sequences in MATLAB and perform operations on them.
			CO3:Determine the Convolution and Correlation between Signals and Sequences.
			CO4:Verify the properties of a given Continuous/Discrete System and Sampling theorem
			CO5:Determine the Laplace and Fourier Transform of the given signal.
			CO6: Determine LTI system response.

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9	II-I	Constitution of India	CO1:To realise the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
			CO2:To identify the importance of fundamental rights aswell as fundamental duties
			CO3:To understand the functioning of Union, State and Local Governments in Indian federal system
			CO4:To learn procedure and effects of emergency, composition and activities of election commission and amendment procedure
10	II-II	LAPLACE TRANSFORMS, NUMERICAL METHODS AND COMPLEX VARIABLES	CO1: Use the Laplace transforms techniques for solving ODE's
			CO2:Estimate the value for the given data using interpolation
			CO3:Estimate the value for the given data using interpolation
			CO4: CO4:Find the numerical solutions for a given ODE's
			CO5:Analyze the complex function with reference to their analyticity, integration using Cauchy's
			CO6:integral and residue theorems Taylor's and Laurent's series expansions of complex function
11	II-II	Electromagtic fields and waves	CO1:Get the knowledge of Basic Laws, Concepts and proofs related to Electrostatic Fields and
			CO2:Distinguish between the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions
			CO3:Analyze the Wave Equations for good conductors, good dielectrics and evaluate the UPW Characteristics for several practical media of interest.
			CO4:To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical problems
12	II-II	ANALOG AND DIGITAL COMMUNICATION	CO1:Analyze and design of various continuous wave and angle modulation and demodulation techniques
			CO2:Understand the effect of noise present in continuous wave and angle modulation techniques.
			CO3:Attain the knowledge about AM , FM Transmitters and Receivers
			CO4:Analyze and design the various Pulse Modulation Techniques
			CO5:Understand the concepts of Digital Modulation Techniques and Baseband transmission

13	II-II	ELECTRONIC CIRCUIT ANALYSIS	CO1:Design the multistage amplifiers and understand the concepts of High Frequency Analysis of Transistors.
			CO2:Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations
			CO3:Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications
			CO4:Design Multivibrators and sweep circuits for various applications
14	II-II	LINEAR IC APPLICATIONS	CO1:A thorough understanding of operational amplifiers with linear integrated circuits
			CO2:Attain the knowledge of functional diagrams and applications of IC 555 and IC 565
			CO3:Acquire the knowledge about the Data converters

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15	II-II	ANALOG AND DIGITAL COMMUNICATION LAB	CO1: Design and implement various Analog modulation and demodulation Techniques and observe the time and frequency domain characteristics
			CO2: Design and implement various Pulse modulation and demodulation Techniques and observe the time and frequency domain characteristics
			CO3: Apply different types of Sampling with various Sampling rates and duty Cycles
			CO4:Design and implement various Digital modulation and demodulation Techniques and observe the waveforms of these modulated Signals practically
16	II-II	IC APPLICATION LAB	CO1:Design and implementation of various analog circuits using 741 Ics
			CO2:Design and implementation of various Multivibrators using 555 timer.
			CO3:Design and implement various circuits using digital Ics
			CO4:Design and implement ADC, DAC and voltage regulators.
17	II-II	ELECTRONIC CIRCUIT ANALYSIS LAB	CO1:The ability to analyze and design single and multistage amplifiers at low, mid and high frequencies.
			CO2: Designing and analyzing the transistor at high frequencies.
			CO3:Determine the efficiencies of power amplifiers
			CO4:Designing the Oscillators using transistors
			CO5:Determine Frequency response and design of tuned amplifiers.
			CO6:Able to Analyze all the circuits using simulation software and Hardware.

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18	II-II	GENDER SENSITIZATION LAB	CO1:Students will have developed a better understanding of important issues related to gender in contemporary India.
			CO2:Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
			CO3:Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
			CO4:Students will acquire insight into the gendered division of labour and its relation to politics and economics
			CO5:Men and women students and professionals will be better equipped to work and live together as equals.
19	III-I	MICROPROCESSORS AND MICRO CONTROLLERS	CO1:Understands the internal architecture, organization and assembly language programming of 8086 processors.
			CO2:Understands the internal architecture, organization and assembly language programming of 8051/controllers
			CO3:Understands the interfacing techniques to 8086 and 8051 based systems
			CO4:Understands the internal architecture of ARM processors and basic concepts of advanced ARM processors.

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20	III-I	DATA COMMUNICATIONS AND NETWORKS	CO1:Know the Categories and functions of various Data communication Networks
			CO2:Design and analyze various error detection techniques.
			CO3:Demonstrate the mechanism of routing the data in network layer
			CO4:Know the significance of various Flow control and Congestion control Mechanisms
			CO5:Know the Functioning of various Application layer Protocols.
21	III-I	CONTRPOL SYSTEMS	representations.
			CO2:Understand the concept of stability and its assessment for linear-time invariant systems.
			CO3:Design simple feedback controllers.
22	III-I	BUSINESS ECONIOMICS AND FINANCIAL ANALYSIS	CO1:The students will understand the various Forms of Business and the impact of economic variables on the Business.
			CO2: The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt.
			CO3:The Students can study the firm's financial position by analysing the Financial Statements of a Company.
23	III-I	COMPUTER ORGANIZATION AND OPERATING SYSTEMS	CO1:Able to visualize the organization of different blocks in a computer.
			CO2: Able to use micro-level operations to control different units in a computer.
			CO3:TAble to use Operating systems in a computer.
24	III-I	ERROR CORRECTING CODES	CO1:Able to transmit and store reliable data and detect errors in data through coding.
			CO2: Able to understand the designing of various codes like block codes, cyclic codes, convolution codes, turbo codes and space codes

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25	III-I	ELECTRONIC MEASUREMENT AND INSTRUMENTATION	CO1:Measure electrical parameters with different meters and understand the basic definition of measuring parameters.
			CO2: Use various types of signal generators, signal analyzers for generating and analyzing various
			CO3:Operate an Oscilloscope to measure various signals.
			CO4: Measure various physical parameters by appropriately selecting the transducers.
26	III-I	MICROPROCESSORS AND MICRO CONTROLLERS LAB	CO1:The student will learn the internal organization of popular 8086/8051 microprocessors/microcontrollers.
			CO2:The student will learn hardware and software interaction and integration.
			CO3:To apply the concepts in the design of microprocessor/microcontroller based systems in real time applications
27	III-I	DATA COMMUNICATIONS AND NETWORKS LAB	CO1:Understand the structure and organization of computer networks; including the division into network layers, role of each layer, and relationships between the layers.
			CO2:Understand the basic concepts of application layer protocol design; including client/server models, peer to peer models, and network naming.
			CO3:In depth understanding of transport layer concepts and protocol design; including connection oriented and connection-less models, techniques to provide reliable data delivery and algorithms for congestion control and flow control.
28	III-I	ADVANCED COMMUNICATION SKILLS LAB	CO1:To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers
			CO2:Further, they would be required to communicate their ideas relevantly and coherently in writing.
			CO3:To prepare all the students for their placements

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29	III-I	INTELLECTUAL PROPERTY RIGHTS	CO1:It allows students how to prepare and protect the Inventions , start up ideas and rights of patents and copy rights etc.,
			CO2:Students get the knowledge on Trademarks and Trade Secrets.
			CO3This subject brings awareness to the students on the various types of Unfair Competition and the Students gets well versed with exposure to licensing and transfer of Copyrights and Patents
			CO4:Student gets. Awareness of Cyber laws and Cyber Crime, to protect the data from Cyber crime.
			CO5:Summarize the Intellectual property rights globally and exposure to the emerging trends In IPR.
30	III-II	ANTENSAS AND PROPAGATION	CO1:Characterize the antennas based on frequency, configure the geometry and establish the radiation patterns of VHF, UHF and Microwave antennas and also antenna arrays
			CO2:Specify the requirements for microwave measurements and arrange a setup to carry out the antenna far zone pattern and gain measurements in the laboratory
			CO3:Classify the different wave propagation mechanisms, determine the characteristic features of different wave propagations, and estimate the parameters involved.
31	III-II	DIGITAL SIGNAL PROCESSING	CO1:Understand the LTI system characteristics and Multirate signal processing.
			CO2:Understand the inter-relationship between DFT and various transforms
			CO3:Design a digital filter for a given specification.
			CO4:Understand the significance of various filter structures and effects of round off errors.

32	III-II	VLSI DESIGN	CO1:Acquire qualitative knowledge about the fabrication process of integrated circuits using MOS transistors
			CO2:Draw the layout of any logic circuit which helps to understand and estimate parasitic effect of any logic
			CO3:Design building blocks of data path systems, memories and simple logic circuits using PLA, PAL, FPGA and CPLD.
			CO4:Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system.
33	III-II	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	CO1:Develop Applications for Range of Problems Using Object-Oriented Programming Techniques
			CO2:Design Simple Graphical User Interface Applications.
34	III-II	MOBILE COMMUNICATIONS AND NETWORKS	CO1:Known the evolution of cellular and mobile communication system.
			CO2:The student will be able to understand Co-Channel and Non-Co-Channel interferences.
			CO3:Understand impairments due to multipath fading channel and how to overcome the different fading effects.
			CO4:. Familiar with cell coverage for signal and traffic, diversity, techniques, frequency management, Channel assignment and types of handoff
			CO5: Know the difference between cellular and Adhoc Networks and design goals of MAC Layer protocol.
35	III-II	EMBEDDED SYSTEM DESIGN	CO1:To understand the selection procedure of Processors in the embedded domain
			CO2:Design Procedure for Embedded Firmware.
			CO3:To visualize the role of Real time Operating Systems in Embedded Systems.
			CO4:To evaluate the Correlation between task synchronization and latency issues

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36	III-II	DIGITAL SIGNAL PROCESSING LAB	CO1:Apply discrete Fourier transforms for spectral analysis of discretesignals.
			CO2:Apply fast Fourier transform algorithms for reducing computationalcomplexity of discrete Fourier transform
			CO3:Compare IIR digital filter and FIR Digital filters using differentmethods.
			CO4:Analyze the Goertzel algorithm for the generation and detection of dual-tone multi-frequency (DTMF) signaling.
			CO5:Apply multi-rate signal processing methods such as decimation and interpolation for interfacing the digital systems with different sampling rates.
			CO6: Apply the digital signal processing algorithms for designing real time embedded signal processing applications.
37	III-II	e-CAD LAB	CO1:Design entry and simulation of combinational &sequential circuits and functional verification
			CO2:Synthesis, p&r and post p&r simulation for combinational and sequential circuits.
			CO3:Implementation of the combinational &sequential circuits on FPGA hardware
			CO4:Write verilog and VHDL code for different circuits and understanding design styles.
38	III-II	SCRIPTING LANGUAGES LAB	CO1:Ability to understand the differences between Scripting languages and programming languages
			CO2:Able to gain some fluency programming in Ruby, Perl, TCL
39	III-II	ENVIRONMENTAL SCIENCE	CO1:Understanding the importance of ecological balance for sustainable development
			CO2:Understanding the impacts of developmental activities and mitigation measures
			CO3:Understanding the environmental policies and regulations

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40	IV-I	MICROWAVE AND OPTICAL COMMUNICATIONS	CO1:Known power generation at microwave frequencies and derive the performance characteristics
			CO2:realize the need for solid state microwave sources and understand the principles of solid state devices
			CO3:distinguish between the different types of waveguide and ferrite components, and select proper components for engineering applications
			CO4:understand the utility of S-parameters in microwave component design and learn the measurement procedure of various microwave parameters
			CO5:Uunderstand the mechanism of light propagation through Optical Fibres.
41	IV-I	ARTIFICIAL NEURAL NETWORKS (PE-III)	CO1:Understand the similarity of Biological networks and Neural networks
			CO2:Perform the training of neural networks using various learning rules.
			CO3:Understanding the concepts of forward and backward propagations.
			CO4:Understand and Construct the Hopfield models.
42	IV-I	SCRIPTING LANGUAGES (PE-III)	CO1:Known about basics of Linux and Linux Networking
			CO2:Use Linux environment and write programs for automation
			CO3:Understand the concepts of Scripting languages
			CO4:Create and run scripts using PERL/TCl/Python.
43	IV-I	DIGITAL IMAGE PROCESSING (PE-III)	CO1:Explore the fundamental relations between pixels and utility of 2-D transforms in image processer
			CO2:Understand the enhancement, segmentation and restoration processes on an image.
			CO3:Implement the various Morphological operations on an image
			CO4:Understand the need of compression and evaluation of basic compression algorithms.

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44	IV-I	BIOMEDICAL INSTRUMENTATION (PE-IV)	CO1:Understand biosystems and medical systems from an engineering perspective
			CO2: Identify the techniques to acquire record and primarily understand physiological activity of the human body through cell potential, ECG, EEG, BP and blood flow measurement and EMG.
			CO3:Understand the working of various medical instruments and critical care equipment
			CO4: Know the imaging techniques including CT,PET, SPECT and MRI used in diagnosis of various medical conditions
45	IV-I	DATABASE MANAGEMENT SYSTEMS (PE-IV)	CO1:Gain knowledge of fundamentals of DBMS, database design and normal forms
			CO2: Master the basics of SQL for retrieval and management of data
			CO3:Be acquainted with the basics of transaction processing and concurrency control.
			CO4: Familiarity with database storage structures and access techniques
46	IV-I	NETWORK SECURITY AND CRYPTOGRAPHY (PE-IV)	CO1:Describe network security fundamental concepts and principles
			CO2: Master the basics of SQL for retrieval and management of data
			CO3:Analyze key agreement algorithms to identify their weaknesses
			CO4:Identify and assess different types of threats, malware, spyware, viruses, vulnerabilities
47	IV-I	PROFESSIONAL PRACTISE , LAW AND ETHICS	CO1:The students will understand the importance of professional practice, Law and Ethics in their personal lives and professional careers
			CO2: Master the basics of SQL for retrieval and management of data

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48	IV-I	MICROWAVE AND OPTICAL COMMUNICATIONS LAB	CO1:Known power generation atmicrowave frequencies andderive the performance characteristics.
			CO2: realize the need for solid state microwave sources and understand the principles of solid state devices
			CO3:distinguish between the different types of waveguide andferrite components, andselect proper components for engineering applications
			CO4: understand the utility of S-parameters in microwave component design and learn the measurement procedure of various microwave parameters
			CO5:Uunderstand the mechanism of light propagation through Optical Fibres.
49	IV-II	SATELLITE COMMUNICATIONS (PE-V)	CO1:Understand basic concepts and frequency allocations for satellite communication, orbital mechanics and launch vehicles.
			CO2: Envision the satellite sub systems and design satellite links for specified C/N.
			CO3:Understand the various multiple access techniques for satellite communication systems and earth station technologies.
			CO4: Known the concepts of LEO, GEO Stationary Satellite Systems and satellite navigation
50	IV-II	RADAR SYSTEMS(PE-V)	CO1:Derive the complete radar range equation
			CO2:Understand the need and functioning of CW, FM-CW and MTI radars
			CO3:Known various Tracking methods.
			CO4: Derive the matched filter response characteristics for radar receivers.

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51	IV-II	WIRELESS SENSOR NETWORKS(PE-V)	CO1:Analyze and compare various architectures of Wireless Sensor Networks
			CO2:Understand Design issues and challenges in wireless sensor networks
			CO3:Analyze and compare various data gathering and data dissemination methods
			CO4: Design, Simulate and Compare the performance of various routing and MAC protocol
52	IV-II	SYSTEM ON CHIP ARCHITECTURE (PE-V)	CO1:Expected to understand SOC Architectural features
			CO2:To acquire the knowledge on processor selection criteria and limitations
			CO3:To acquires the knowledge of memory architectures on SOC.
			CO4: To understands the interconnection strategies and their customization on SOC
53	IV-II	TEST AND TESTABILITY (PE-VI)	CO1:To acquire the knowledge of fundamental concepts in fault and fault diagnosis
			CO2:Test pattern generation using LFSR and CA
			CO3: Design for testability rules and techniques for combinational circuits
			CO4: Introducing scan architectures
54	IV-II	LOW POWER VLSI DESIGN (PE-VI)	CO1:Understand the need of Low power circuit design.
			CO2:Attain the knowledge of architectural approaches.
			CO3:Analyze and design Low-Voltage Low-Power combinational circuits.
			CO4: Known the design of Low-Voltage Low-Power Memories

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NAAC "B++" Accredited Institute
Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

COMPUTER SCIENCE ENGINEERING II&I SEM COURSE OUTCOMES FOR THE ACADEMIC YEAR 2023-24

S.NO	YEAR/SEM	COURSE NAME	COURSE OUTCOMES
1	II -I	Analog and Digital Electronics	**CO1** : Know the characteristics of various components
			CO2 : Understand the utilization of components.
			CO3 : Design and analyze small signal amplifier circuits
			CO4 : Learn Postulates of Boolean algebra and to minimize combinational functions
			CO5 : Design and analyze combinational and sequential circuits
			CO6 : Know about the logic families and realization of logic gates
2	II -I	Data Structures	**CO1** : Ability to select the data structures that efficiently model the information in a problem
			CO2 : Ability to assess efficiency trade-offs among different data structure implementations or combinations.
			CO3 : Implement and know the application of algorithms for sorting and pattern matching
			CO4 : Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
3	II-I	Computer Oriented Statistical Methods	**CO1** : Apply the concepts of probability and distributions to some case studies
			CO2 : Correlate the material of one unit to the material in other units
			CO3 : Resolve the potential misconceptions and hazards in each topic of study.

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4	II-I	Computer Organization and Architecture	**CO1** : Understand the basics of instructions sets and their impact on processor design.
			CO2 : Demonstrate an understanding of the design of the functional units of a digital computer system
			CO3 : Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
			CO4 : Design a pipeline for consistent execution of instructions with minimum hazards.
			CO5 : Recognize and manipulate representations of numbers stored in digital computers
5	II - I	Object Oriented Programming using C++	**CO1** : Able to develop programs with reusability
			CO2 : Develop programs for file handling
			CO3 : Handle exceptions in programming
			CO4 : Develop applications for a range of problems using object-oriented programming techniques
6	II-I	Analog and Digital Electronics Lab	**CO1** : Know the characteristics of various components.
			CO2 : Understand the utilization of components.
			CO3 : Design and analyze small signal amplifier circuits.
			CO4 : Postulates of Boolean algebra and to minimize combinational functions
			CO5 : Design and analyze combinational and sequential circuits
			CO6 : Known about the logic families and realization of logic gates
7	II-I	Data Structures Lab	**CO1** : Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists
			CO2 : Ability to Implement searching and sorting algorithms

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8	II -I	IT Workshop Lab	**CO1** : Distinguish software's and their installation
			CO2 : Design word documents by learning word processing
			CO3 : Create presentations by using different styles.
			CO4 : Introduce different way of hooking the PC on to the internet from home and Workplace and effectively usage of the internet
			CO5 : Define usage of web browsers, email, news groups and discussion forums would be covered
			CO6 : List of tools & modules would enable the students in crafting professional word document.
9	II-I	C++ Programming Lab	**CO1** : Ability to creating simple programs using classes and objects in C++.
			CO2 : Develop applications using stream I/O and file I/O.
			CO3 : Implement simple graphical user interfaces.
			CO4 : Implement Object Oriented Programs using templates and exceptional handling concepts.
10	II-I	Gender Sensitization Lab	**CO1** : Students will have developed a better understanding of important issues related to gender in contemporary India.
			CO2 : Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film
			CO3 : Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
			CO4 : Students will acquire insight into the gendered division of labour and its relation to politics and economics.
			CO5 : Men and women students and professionals will be better equipped to work and live together as equals.
			CO6 : Students will develop a sense of appreciation of women in all walks of life.

11	II-II	Discrete Mathematics	**CO1** : Ability to understand and construct precise mathematical proofs
			CO2 : Ability to use logic and set theory to formulate precise statements
			CO3 : Ability to analyze and solve counting problems on finite and discrete structures
			CO4 : Ability to describe and manipulate sequences
			CO5 : Ability to apply graph theory in solving computing problems
12	II-II	Business Economics & Financial Analysis	**CO1** : Understand the elasticity of the demand of the product, different types, and measurement of elasticity of demand and factors influencing on elasticity of demand.
			CO2 : Recognize the Production function, features of Iso-Quants and Iso-Costs, different types of internal economies, external economies and law of returns with appropriate examples.
			CO3 : Illustrate the features, merits and demerits of different forms of business organizations existing in the modern business.
			CO4 : Enumerate the concept of capital budgeting and allocations of the resources through capital budgeting methods and compute simple problems for project management.
13	II-II	Operating Systems	**CO1** : Will be able to control access to a computer and the files that may be shared
			CO2 : Demonstrate the knowledge of the components of computer and their respective roles in computing.
			CO3 : Ability to recognize and resolve user problems with standard operating environments.
			CO4 : Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively

14	II-II	Database Management Systems	**CO1** : Gain knowledge of fundamentals of DBMS, database design and normal forms
			CO2 : Master the basics of SQL for retrieval and management of data.
			CO3 : Be acquainted with the basics of transaction processing and concurrency control.
			CO4 : Familiarity with database storage structures and access techniques
15	II-II	Java Programming	**CO1** : Able to solve real world problems using OOP techniques
			CO2 : Able to understand the use of abstract classes.
			CO3 : Able to solve problems using java collection framework and I/o classes
			CO4 : Able to develop multithreaded applications with synchronization
			CO5 : Able to develop applets for web applications
			CO6 : Able to design GUI based applications
16	II-II	Operating Systems Lab	**CO1** : Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management
			CO2 : Able to implement C programs using Unix system calls
17	II-II	Database Management Systems Lab	**CO1** : Design database schema for a given application and apply normalization
			CO2 : Acquire skills in using SQL commands for data definition and data manipulation
			CO3 : Develop solutions for database applications using procedures, cursors and triggers

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18	II-II	Java Programming Lab	**CO1** : Able to write programs for solving real world problems using java collection frame work.
			CO2 : Able to write programs using abstract classes.
			CO3 : Able to write multithreaded programs.
			CO4 : Able to write GUI programs using swing controls in Java.
19	II-II	Constitution of India	**CO1** : know the importance of Constitution and Government
			CO2 : become Good Citizens and know their fundamental rights, duties and principles
			CO3 : learn about the role of PM, President, Council of Ministers and Local Administration.
			CO4 : understand the importance of Election Commission.
			CO5 : Will know about Secularism, Federalism, Democracy, Liberty, Freedom of Expression, Special Status of States etc.
20	III-I	Formal Languages & Automata Theory	**CO1** : Able to understand the concept of abstract machines and their power to recognize the languages.
			CO2 : Able to employ finite state machines for modeling and solving computing problems.
			CO3 : Able to design context free grammars for formal languages
			CO4 : Able to gain proficiency with mathematical tools and formal methods.
21	III-I	Software Engineering	**CO1** : Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD)
			CO2 : Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
			CO3 : Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

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NAAC "B++" Accredited Institute
Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

22	III-I	Computer Networks	**CO1** : Gain the knowledge of the basic computer network technology **CO2** : Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model. **CO3** : Obtain the skills of subnetting and routing mechanisms **CO4** : Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation
23	III-I	Web Technologies	**CO1** : gain knowledge of client-side scripting, validation of forms and AJAX programming **CO2** : understand server-side scripting with PHP language **CO3** : understand what is XML and how to parse and use XML Data with Java **CO4** : To introduce Server-side programming with Java Servlets and JSP
24	III-I	Information Theory & Coding (Professional Elective - I)	**CO1** : Learn measurement of information and errors **CO2** : Obtain knowledge in designing various source codes and channel codes **CO3** : Design encoders and decoders for block and cyclic codes **CO4** : Understand the significance of codes in various applications
25	III-I	Advanced Computer Architecture (Professional Elective - I)	**CO1** : Computational models and Computer Architectures. **CO2** : Concepts of parallel computer models. **CO3** : Scalable Architectures, Pipelining, Superscalar processors, multiprocessors

26	III-I	Data Analytics (Professional Elective - I)	**CO1** : Understand the impact of data analytics for business decisions and strategy
			CO2 : Carry out data analysis/statistical analysis
			CO3 : To carry out standard data visualization and formal inference procedures
			CO4 : Design Data Architecture
			CO5 : Understand various Data Sources
27	III-I	Image Processing (Professional Elective - I)	**CO1** : Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition, sampling, and quantization
			CO2 : Demonstrate the knowledge of filtering techniques.
			CO3 : Demonstrate the knowledge of 2D transformation techniques
			CO4 : Demonstrate the knowledge of image enhancement, segmentation, restoration and compression techniques
28	III-I	Principles of Programming Languages (Professional Elective - I)	**CO1** : Acquire the skills for expressing syntax and semantics in formal notation
			CO2 : Identify and apply a suitable programming paradigm for a given computing application
			CO3 : Gain knowledge of and able to compare the features of various programming languages
29	III-I	Computer Graphics (Professional Elective - II)	**CO1** : Acquire familiarity with the relevant mathematics of computer graphics.
			CO2 : Be able to design basic graphics application programs, including animation
			CO3 : Be able to design applications that display graphic images to given specifications

30	III-I	Advanced Operating Systems (Professional Elective - II)	CO1 : Understand the design approaches of advanced operating systems
			CO2 : Analyze the design issues of distributed operating systems
			CO3 : Evaluate design issues of multi processor operating systems.
			CO4 : Identify the requirements Distributed File System and Distributed Shared Memory.
			CO5 : Formulate the solutions to schedule the real time applications.
31	III-I	Informational Retrieval Systems (Professional Elective - II)	CO1 : Ability to apply IR principles to locate relevant information large collections of data
			CO2 : Ability to design different document clustering algorithms
			CO3 : Implement retrieval systems for web search tasks.
			CO4 : Design an Information Retrieval System for web search tasks
32	III-I	Distributed Databases (Professional Elective - II)	CO1 : Understand theoretical and practical aspects of distributed database systems.
			CO2 : Study and identify various issues related to the development of distributed database system.
			CO3 : Understand the design aspects of object-oriented database system and related development.
34	III-I	Natural Language Processing (Professional Elective - II)	CO1 : Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
			CO2 : Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
			CO3 : Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.

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35	III-I	Software Engineering Lab	**CO1** : Ability to translate end-user requirements into system and software requirements
			CO2 : Ability to generate a high-level design of the system from the software requirements
			CO3 : Will have experience and/or awareness of testing problems and will be able to develop a simple testing report
36	III-I	Computer Networks & Web Technologies Lab	**CO1** : Implement data link layer farming methods
			CO2 : Analyze error detection and error correction codes.
			CO3 : Implement and analyze routing and congestion issues in network design
			CO4 : Implement Encoding and Decoding techniques used in presentation layer.
37	III-I	Advanced Communication Skills Lab	**CO1** : Accomplishment of sound vocabulary and its proper use contextually.
			CO2 : Flair in Writing and felicity in written expression.
			CO3 : Enhanced job prospects.
			CO4 : Effective Speaking Abilities
38	III-I	Intellectual Property Rights	**CO1** : Distinguish and Explain various forms of IPRs.
			CO2 : Identify criteria's to fit one's own intellectual work in particular form of IPRs.
			CO3 : Apply statutory provisions to protect particular form of IPRs.
			CO4 : Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, Industrial Designetc.
			CO5 : Identify procedure to protect different forms of IPRs national and international level.
			CO6 : Develop skill of making search using modern tools and technics.

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39	III-II	Machine Learning	**CO1** : Understand the concepts of computational intelligence like machine learning
			CO2 : Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
			CO3 : Understand the Neural Networks and its usage in machine learning application
40	III-II	Compiler Design	**CO1** : Demonstrate the ability to design a compiler given a set of language features
			CO2 : Demonstrate the the knowledge of patterns, tokens & regular expressions for lexical analysis
			CO3 : Acquire skills in using lex tool & yacc tool for devleoping a scanner and parser.
			CO4 : Design and implement LL and LR parsers
			CO5 : Design algorithms to do code optimization in order to improve the performance of a program in terms of space and time complexity.
			CO6 : Design algorithms to generate machine code.
41	III-II	Design and Analysis of Algorithms	**CO1** : Ability to analyze the performance of algorithms
			CO2 : Ability to choose appropriate data structures and algorithm design methods for a specified application
			CO3 : Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs
42	III-II	Concurrent Programming (Professional Elective – III)	**CO1** : Ability to implement the mechanisms for communication and co-ordination among concurrent processes.
			CO2 : Ability to understand and reason about concurrency and concurrent objects
			CO3 : Ability to implement the locking and non-blocking mechanisms
			CO4 : Ability to understand concurrent objects

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44	III-II	Scripting Languages (Professional Elective – III)	**CO1** : Comprehend the differences between typical scripting languages and typical system and application programming languages.
			CO2 : Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
			CO3 : Acquire programming skills in scripting language
45	III-II	Mobile Application Development (Professional Elective – III)	**CO1** : Student understands the working of Android OS Practically
			CO2 : Student will be able to develop Android user interfaces
			CO3 : Student will be able to develop Android user interfaces
46	III-II	Software Testing Methodologies (Professional Elective – III)	**CO1** : List a range of different software testing techniques and strategies and be able to apply specific(automated) unit testing method to the projects.
			CO2 : Distinguish characteristics of structural testing methods
			CO3 : Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible.
			CO4 : Discuss about the functional and system testing methods
			CO5 : Demonstrate various issues for object oriented testing
47	III-II	Machine Learning Lab	**CO1** : understand complexity of Machine Learning algorithms and their limitations;
			CO2 : understand modern notions in data analysis-oriented computing;
			CO3 : be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
			CO4 : Be capable of performing experiments in Machine Learning using real-world data.
48	III-II	Compiler Design Lab	**CO1** : Design and develop interactive and dynamic web applications using HTML, CSS, JavaScript and XML.
			CO2 : Apply client-server principles to develop scalable and enterprise web applications.
			CO3 : Ability to design, develop, and implement a compiler for any language
			CO4 : Able to use lex and yacc tools for developing a scanner and a parser.
			CO5 : Able to design and implement LL and LR parsers.

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49	III-II	Network Programming (Professional Elective-III Lab)	**CO1** : To write socket API based programs
			CO2 : To design and implement client-server applications using TCP and UDP sockets
			CO3 : To analyze network programs
50	III-II	Scripting Languages (Professional Elective-III Lab)	**CO1** : Ability to understand the differences between Scripting languages and programming languages
			CO2 : Able to gain some fluency programming in Ruby, Perl, TCL
51	III-II	Mobile Application Development (Professional Elective-III Lab)	**CO1** : Student understands the working of Android OS Practically.
			CO2 : Student will be able to develop user interfaces.
			CO3 : Student will be able to develop, deploy and maintain the Android Applications.
52	III-II	Environmental Science	**CO1** : Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
			CO2 : Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
			CO3 : Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
			CO4 : Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
53	IV-I	Cryptography & Network Security	**CO1** : Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
			CO2 : Ability to identify information system requirements for both of them such as client and server.
			CO3 : Ability to understand the current legal issues towards information security

54	IV - I	Data Mining	**CO1** : Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system
			CO2 : Apply preprocessing methods for any given raw data.
			CO3 : Extract interesting patterns from large amounts of data.
			CO4 : Discover the role played by data mining in various fields.
			CO5 : Choose and employ suitable data mining algorithms to build analytical applications
			CO6 : Evaluate the accuracy of supervised and unsupervised models and algorithms.
55	IV - I	Graph Theory (Professional Elective -IV)	**CO1** : Understand and explore the basics of graph theory.
			CO2 : Analyse the significance of graph theory in different engineering disciplines
			CO3 : Demonstrate algorithms used in interdisciplinary engineering domains.
			CO4 : Evaluate or synthesize any real world applications using graph theory.
56	IV-I	Introduction to Embedded Systems (Professional Elective -IV)	**CO1** : Expected to understand the selection procedure of processors in the embedded domain
			CO2 : Design procedure of embedded firm ware.
			CO3 : Expected to visualize the role of realtime operating systems in embedded systems.
			CO4 : Expected to evaluate the correlation between task synchronization and latency issues
57	IV-I	Artificial Intelligence (Professional Elective -IV)	**CO1** : Ability to formulate an efficient problem space for a problem expressed in natural language
			CO2 : Select a search algorithm for a problem and estimate its time and space complexities.
			CO3 : Possess the skill for representing knowledge using the appropriate technique for a given problem.
			CO4 : Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

58	IV -I	Cloud Computing (Professional Elective -IV)	**CO1** : Ability to understand various service delivery models of a cloud computing architecture
			CO2 : Ability to understand the ways in which the cloud can be programmed and deployed.
			CO3 : Understanding cloud service providers
59	IV - I	Ad-hoc & Sensor Networks (Professional Elective -IV)	**CO1** : Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
			CO2 : Ability to solve the issues in real-time application development based on ASN
			CO3 : Ability to conduct further research in the domain of ASN
60	IV-I	Advanced Algorithms (Professional Elective -V)	**CO1** : Ability to analyze the performance of algorithms
			CO2 : Ability to choose appropriate data structures and algorithm design methods for a specified application
			CO3 : Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

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61	IV-I	Real Time Systems (Professional Elective -V)	CO1 : Be able to explain real-time concepts such as preemptive multitasking, task priorities, priority inversions, mutual exclusion, context switching, and synchronization, interrupt latency and response time, and semaphores.
			CO2 : Able describe how a real-time operating system kernel is implemented
			CO3 : Able explain how tasks are managed.
			CO4 : Explain how the real-time operating system implements time management
			CO5 : Discuss how tasks can communicate using semaphores, mailboxes, and queues.
			CO6 : Be able to implement a real-time system on an embedded processor.
			CO7 : Be able to work with real time operating systems like RT Linux, Vx Works, MicroC /OSII, Tiny Os
62	IV - I	Soft Computing (Professional Elective -V)	CO1 : Interpret the impact and challenges posed by IoT networks leading to new architectural models.
			CO2 : Compare and contrast the deployment of smart objects and the technologies to connect them to network.
			CO3 : Appraise the role of IoT protocols for efficient network communication.
			CO4 : Elaborate the need for Data Analytics and Security in IoT.
			CO5 : Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

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63	IV-I	Internet of Things (Professional Elective -V)	**CO1** : Interpret the impact and challenges posed by IoT networks leading to new architectural models.
			CO2 : Compare and contrast the deployment of smart objects and the technologies to connect them to network.
			CO3 : Appraise the role of IoT protocols for efficient network communication.
			CO4 : Elaborate the need for Data Analytics and Security in IoT.
			CO5 : Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.
64	IV-I	Software Process & Project Management (Professional Elective -V)	**CO1** : Gain knowledge of software economics, phases in the life cycle of software development, project organization, project control and process instrumentation
			CO2 : Analyze the major and minor milestones, artifacts and metrics from management and technical perspective
			CO3 : Design and develop software product using conventional and modern principles of software project management
65	IV-I	Cryptography & Network Security Lab	**CO1** : Understand computer security principles and discuss ethical issues for theft of information. Identify threat models and common computer network security goals
			CO2 : Explain various encryption algorithms, hashing functions, one-way authentication and public key cryptology
			CO3 : Analyze firewalls, DOS attacks and defense types. Dramatize example scenarios in DNS and IPSec applications

66	IV-II	Organizational Behaviour	**CO1** : Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organization behavior.
			CO2 : Critically evaluate the potential effects of important developments in the external environment on organizational behavior
			CO3 : Critically evaluate the potential effects of important developments in the external environment on organizational behavior.
			CO4 : Manage conflict in organizational context and deal with stress.
			CO5 : Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.
67	IV-II	Computational Complexity (Professional Elective – VI)	**CO1** : Introduces to theory of computational complexity classes
			CO2 : Discuss about algorithmic techniques and application of these techniques to problems
			CO3 : Introduce to randomized algorithms and discuss how effective they are in reducing time and space complexity
			CO4 : Discuss about Graph based algorithms and approximation algorithms
			CO5 : Discuss about search trees
68	IV-II	Distributed Systems	**CO1** : Ability to understand Transactions and Concurrency control.
			CO2 : Ability to understand Security issues.
			CO3 : Understanding Distributed shared memory
			CO4 : Ability to design distributed systems for basic level applications.

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69	IV-II	Neural Networks & Deep Learning	CO1 : Ability to understand the concepts of Neural Networks
			CO2 : Ability to select the Learning Networks in modeling real world systems
			CO3 : Ability to use an efficient algorithm for Deep Models
			CO4 : Ability to apply optimization strategies for large scale applications
70	IV-II	Human Computer Interaction	CO1 : Ability to apply HCI and principles to interaction design
			CO2 : Ability to design certain tools for blind or PH people.
71	IV-II	Cyber Forensics	CO1 : Students will understand the usage of computers in forensic, and how to use various forensic tools for a wide variety of investigations.
			CO2 : It gives an opportunity to students to continue their zeal in research in computer forensics

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Mechanical Engineering I & II SEM Course Outcomes For the A.Y 2023-24

S.no	Year/Sem	Course Name	Course Outcomes
1	II-I	Mechanics of Solids	CO1:Analyze the behavior of the solid bodies subjected to various types of Loading
			CO2:Apply knowledge of materials and structural elements to the analysis of simple structures
			CO3:Undertake problem identification, formulation and solution using a range of analytical methods
			CO4:Analyze and interpret laboratory data relating to behavior of structures and the materials
			CO5:are made of, and undertake associated laboratory work individually and in teams. Expectation and capacity to undertake lifelong learning
2	II-I	Production Technology	CO1:Understand the idea for selecting materials for patterns
			CO2:Know Types and allowances of patterns used in casting and analyze the components
			CO3:moulds. Design core, core print and gating system in metal casting processes
			CO4:Understand the arc, gas, solid state and resistance welding processes
			CO5:Develop process-maps for metal forming processes using plasticity principles
3	II-I	ThermoDynamics	CO1 : Analyze the work and heat interactions associated with a prescribed process path
			CO2:Criticize a different operations on steady flow energy equation
			CO3:Define the fundamentals of the first and second laws of thermodynamics and explain their significance to a wide range of systems.
			CO4: Evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations.

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4	II-I	Production Technology Lab	CO1: Understanding the properties of moulding sands and pattern making. Fabricate joints using gas welding and arc welding. Evaluate the quality of welded joints. Basic idea of press working tools and performs moulding studies on plastics
			CO2 :Design and manufacture simple patterns
			CO3 :Control sand properties in foundry
			CO4 :Operate arc welding, gas welding and resistance welding equipment
5	II-I	Machine Drawing and Practice lab	CO1: Preparation of engineering and working drawings with dimensions and bill of material during
			CO2:design and development. Developing assembly drawings using part drawings of machine components. Conventional representation of materials, common machine elements and parts .
			CO3:Types of Drawings – working drawings for machine parts.
			CO4:centers, curved and tapered features. Title boxes, their size, location and details - common abbreviations and their liberal usage
6	II-I	Material Science & Mechanics Of Solids Lab	CO1: The Primary focus of the Metallurgy and Material science program is to provide undergraduates with a fundamental knowledge based associated materials properties, and their selection and application. Upon graduation, students would have acquired and developed the necessary background and skills for successful careers in the materials-related industries. Furthermore, after completing the program, the student should be well prepared for management positions in industry or continued education toward a graduate degree
7	II-II	Basic Electrical & Electronics Engineering	CO1:To analyze and solve electrical circuits using network laws and theorems.
			CO2:To understand and analyze basic Electric and Magnetic circuits
			CO3:To study the working principles of Electrical Machines
			CO4:To introduce components of Low Voltage Electrical Installations
			CO5:To identify and characterize diodes and various types of transistors

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8	II-II	Kinematics Of Machinery	CO1:Understand the principles of kinematic pairs, chains and their classification, DOF, inversions, equivalent chains and planar mechanisms.
			CO2:Analyze the planar mechanisms for position, velocity and acceleration.
			CO3:Design cams and followers for specified motion profiles
			CO4:Evaluate gear tooth geometry and select appropriate gears for the required applications.
			CO5:Synthesize planar four bar and slider crank mechanisms for specified kinematic conditions.
9	II-II	Thermal Engineering -I	**CO1**:At the end of the course, the student should be able to evaluate the performance of IC engines and compressors under the given operating conditions. Apply the laws of Thermodynamics to evaluate the performance of Refrigeration and air-conditioning cycles. Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance
10	II-II	Fluid Mechanics &Hydraulic Machines	CO1: Able to identify type of fluid flow patterns and describe continuity equation
			CO2:To analyze a variety of practical fluid flow and measuring devices and utilize Fluid Mechanics
			CO3:Able to demonstrate boundary layer concepts
			CO4:principles in design. To select and analyze an appropriate turbine with reference to given situation in power plants
11	II-II	Instrumentation & Control Systems	CO1:To identify various elements and their purpose in typical instruments, to identify various errors
			CO2:Analysis of errors so as to determine correction factors for each instrument
			CO3:To understand static and dynamic characteristics of instrument and should be able to determine
			CO4: loading response time. For given range of displacement should be able to specify transducer accurate and loading

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12	II-II	Basic Electrical & Electronics Engineering Lab	CO1:To analyze and solve electrical circuits using network laws and theorems.
			CO2:To understand and analyze basic Electric and Magnetic circuits
			CO3:To study the working principles of Electrical Machines
			CO4:To introduce components of Low Voltage Electrical Installations
			CO5:To identify and characterize diodes and various types of transistors
13	II-II	Fluid Mechanics &Hydraulic Machines Lab	CO1: Able to explain the effect of fluid properties on a flow system
			CO2:Able to identify type of fluid flow patterns and describe continuity equation
			CO3:To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics
			CO4:principles in design. To select and analyze an appropriate turbine with reference to given situation in power plants
			CO5:Able to demonstrate boundary layer concepts
14	II-II	Instrumentation & Control Systems Lab	CO1: At the end of the course, the student will be able to Characterize and calibrate measuring devices. Identify and analyze errors in measurement. Analyze measured data using regression analysis. Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter.
15	III-I	Dynamics Of Machinery	CO1: the study of KOM & DOM are necessary to have an idea while designing the various machine members like shafts, bearings, gears, belts & chains and various I.C. Engine Components & Machine tool parts
			CO2: Analyze stabilization of sea vehicles, aircrafts and automobile vehicles
			CO3:Compute frictional losses, torque transmission of mechanical systems.
			CO4 :Analyze dynamic force analysis of slider crank mechanism and design of flywheel
			CO5 : Understand balancing of reciprocating and rotary masses.
16	III-I	Design Of Machine members-I	CO1: The student acquires the knowledge about the principles of design, material selection
			CO2:component behavior subjected to loads, and criteria of failure.
			CO3:Design on the basis of strength and rigidity and analyze the stresses and strains induced in machine element

17	III-I	Metrology and Machine Tools	CO1:the student would be able to Identify techniques to minimize the errors in measurement
			CO2Identify methods and devices for measurement of length, angle, gear
			CO3;& thread parameters, surface roughness and geometric features of parts. Understand working of lathe, shaper, planer, drilling, milling and grinding machine
			CO4;Comprehend speed and feed mechanisms of machine tools.
			CO5:Estimate machining times for machining operations on machine tools
18	III-I	Business Economics &Financial Analysis	CO1:The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure , Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company
19	III-I	Thermal Engineering -II	CO1:Develop state – space diagrams based on the schematic diagrams of process flow of steam
			CO2: gas turbine plants Apply the laws of Thermodynamics to analyze thermodynamic cycles
			CO3:Differentiate between vapour power cycles and gas power cycles
			CO4:Infer from property charts and tables and to apply the data for the evaluation of performance
20	III-I	Operations Research	CO1 : An ability to apply the knowledge of mathematics, basic sciences and engineering concepts to solve the complex engineering problems
			CO2 : The ability to conduct experiments and to critically analyze and interpret the experimental data to reach at substantial outcomes
			CO3 :An understanding of professional and ethical responsibility.
			CO4 : An ability to communicate effectively with written, oral, and visual means.
			CO5 : An ability to recognize the need to engage in life-long learning

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21	III-I	Kinematics & Dynamics Lab	CO1:Understand types of motion
			CO2:Analyze forces and torques of components in linkages
			CO3:Understand static anc dynamic balance
			CO4:Understand forward and inverse kinematics of open-loop mechanisms
22	III-II	Design Of Machine Members-II	CO1: Estimation of life of rolling element bearings and their selection for given service conditions'
			CO2:Acquaintance with design of the components as per the standard, recommended procedures
			CO3:which is essential in design and development of machinery in industry
23	III-II	Heat Transfer	CO1:Understand and analyze heat transfer through extended surfaces
			CO2:Understand one dimensional transient conduction heat transfer
			CO3:Understand concepts of continuity, momentum and energy equations
			CO4:Interpret and analyze forced and free convective heat transfer
			CO5:Understand the principles of boiling, condensation and radiation heat transfer
24	III-II	CAD/CAM	CO1:: Understand geometric transformation techniques in CAD. Develop mathematical models to represent curves and surfaces. Model engineering components using solid modeling techniques. Develop programs for CNC to manufacture industrial components. To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.
			CO2:Creation of part drawings and 3D models using CAD techniques
			CO3 :Generation of part programs for industrial components using CAM techniques

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25	III-II	Unconventional Machining Process	CO1:Understand the basic techniques of Unconventional Machining processes modeling
			CO2:Estimate the material removal rate and cutting force, in an industrially useful manner, for Unconventional Machining processes
			CO3: Explain the basic types of machines.
			CO4 :Discuss various non-conventional machines and their applications
26	III-II	Machine Tool Design	CO1:At the end of the course, the student will be able to, understand basic motions involved in a machine tool, design machine tool structures, design and analyze systems for specified speeds and feeds, select subsystems for achieving high accuracy in machining, understand control strategies for machine tool operations and apply appropriate quality tests for quality assurance
27	III-II	Production Planning and Control	CO1:At the end of the course, the student will be able to understand production systems and their characteristics. Evaluate MRP and JIT systems against traditional inventory control systems. Understand basics of variability and its role in the performance of a production system. Analyze aggregate planning strategies. Apply forecasting and scheduling techniques to production systems. Understand theory of constraints for effective management of production systems
28	III-II	Finite Element Methods	CO1:At the end of the course, the student will be able to, Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer. Formulate and solve problems in one dimensional structures including trusses, beams and frames. Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, axisymmetric and plate bending problems
			CO2 : Understand the concepts of Nodes and elements
			C03 :Understand use of FEA in Structural and thermal problem
			CO4 : Understand the application of FEA in heat transfer problem
29	III-II	Heat Transfer Lab	CO1: Perform steady state conduction experiments to estimate thermal conductivity of different
			CO2 : materials Perform transient heat conduction experiment
			CO3:Estimate heat transfer coefficients in forced convection, free convection, condensation
			under forced and free

30	III-II	CAD/CAM Lab	CO1: To be able to understand and handle design problems in a systematic manner. To be able to apply CAD in real life applications. To be understand the basic principles of different types of analysis
			CO2 : Model complex shapes including freeform curves and surfaces
			CO3 : Explain the basic concepts of CNC programming and machining
			CO4 : Implement CNC programs for milling and turning machining operations
31	III-II	Refrigeration & Air Conditioning	CO1: At the end of the course, the student should be able to Differentiate between different types of refrigeration systems with respect to application as well as conventional and unconventional refrigeration systems. Thermodynamically analyse refrigeration and air conditioning systems and evaluate performance parameters. Apply the principles of Psychometrics to design the air conditioning loads for the industrial applications
			CO2 :Analyze the reversed Carnot cycle and vapour compression refrigeration cycle (VCR)
			CO3: Select the air-refrigeration systems for aircraft, and vapour absorption refrigeration system for rural and remote areas and select environmental friendly refrigerants considering the International standards.
32	IV-I	Additive Manufacturing	CO1: Describe various CAD issues for 3D printing and rapid prototyping and related operations
			CO2:STL model manipulation. Formulate and solve typical problems on reverse engineering for surface reconstruction
			CO3 :Explain the processes used in additive manufacturing for a range of materials and applications
33	IV-I	Power Plant Engineering	CO1: Understand the concept of Rankine cycle.
			CO2:Understand working of boilers including water tube, fire tube and high pressure boilers and
			CO2:determine efficiencies. Analyze the flow of steam through nozzles
			CO3:Evaluate the performance of condensers and steam turbines
			CO4:Evaluate the performance of gas turbines

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34	IV-I	Renewable Energy Sources	CO1:Understanding of renewable energy sources
			CO2:Knowledge of working principle of various energy systems
			CO3:Capability to carry out basic design of renewable energy systems
35	IV-I	Turbo Machinery	CO1:Ability to design and calculate different parameters for turbo machines
			CO2:Prerequisite to CFD and Industrial fluid power courses
			CO3:Ability to formulate design criteria
			CO4:Ability to understand thermodynamics and kinematics behind turbo machines
36	IV-II	Industrial Robotics	CO1: At the end of the course, the student will be able to understand the basic components of robots. Differentiate types of robots and robot grippers. Model forward and inverse kinematics of robot manipulators. Analyze forces in links and joints of a robot. Programme a robot to perform tasks in industrial applications. Design intelligent robots using sensors.
			CO2 : To learn about knowledge for the design of robotics.
			CO3: Will understand robot kinematics and robot programming.
			CO4: Will understand application of Robots
37	IV-II	Industrial Management	CO1:Able to design the organization structure
			CO2:Able to apply techniques for plant location, design plant layout and value analysis
			CO3 : To learn about force and torque sensing
			CO4 : To learn about application of robot
38	IV-II	Production And Operations Management	CO1:Able to execute operations management functions
			CO2:Able to carry out value analysis
			CO3:Able to carry out aggregate planning and implement MRP Or JIT
			CO5:Able to schedule the jobs so as to complete them in minimum makespan time
			CO6:Able to carry out network analysis

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39	IV-II	Total Quality Management	CO1 : Understand the funcamental principles of Total Quality Management;
			CO2 : , Choose appropriate statistical techniques for improving processes;
			C03 : Develop research skills that will allow them to keep abreast of changes in the field of Total Quality Management

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Gunthapally (V), Abdullapurmet(M), RR Dist, Near Ramoji Film City, Hyderabad -501512.
www.aietg.ac.in email: principal.avanthi@gmail.com

M.TECH VLSI I & II SEM Course Outcomes For the A.Y 2023-24

S.no	Year/Sem	Course Name	Course Outcomes
1	I-I	DIGITAL SYSTEM DESIGN WITH FPGA	CO1 :To exposes the design approaches using FPGAs
			CO2:To provide in depth understanding of Fault models.
			CO3:To understands test pattern generation techniques for fault detection.
			CO4:To design fault diagnosis in sequential circuits.
			CO5:To provide understanding in the design of flow using case studies.
2	I-I	CMOS ANALOG IC DESIGN	CO1:Design basic building blocks of CMOS analog ICs.
			CO2:Carry out the design of single and two stage operational amplifiers and voltage references.
			CO3:Determine the device dimensions of each MOSFETs involved
			CO4:Design various amplifiers like differential, current and operational amplifiers
3		PATTERN RECOGNITION AND MACHINE LEARNING	CO1:Familiar the basics of pattern classes and functionality
			CO2:Construct the various linear models.
			CO3:Use the different kernel methods.
	I-I		CO4:Design the Markov and Mixed models.
4		CMOS MIXED SIGNAL DESIGN	CO1:Designing CMOS analog circuits to achieve performance specifications.
			CO2:Analyzing CMOS based switched capacitor circuits.
			CO3:Designing data converters and know how to use these in specific applications.
	I-I		CO4:Design a mixed-signal circuits with understanding design flow.

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5	I-I	MEMORY TECHNOLOGIES	CO1:Select architecture and design semiconductor memory circuits and subsystems
			CO2:Identify various fault models, modes and mechanisms in semiconductor memories and their testing procedures
			CO3:Know, how of the state-of-the-art memory chip design
6	I-I	ARM MICROCONTROLLERS	CO1:Explore the selection criteria of ARM processors by understanding the functional level trade off issues.
			CO2:Explore the ARM development towards the functional capabilities.
			CO3:Work with ASM level program using the instruction set.
			CO4:Programming the ARM Cortex M.
7	I-I	EMBEDDED REAL TIME OPERATING SYSTEMS	CO1:Be able to explain real-time concepts such as preemptive multitasking, task priorities, priority inversions, mutual exclusion, context switching, and synchronization, interrupt latency and response time, and semaphores
			CO2:Able describe how a real-time operating system kernel is implemented
			CO3:Explain how the real-time operating system implements time management.
			CO4:Be able to work with real time operating systems like RT Linux, Vx Works, MicroC /OS-II, Tiny OS
8		CMOS ANALOG IC DESIGN LAB	CO1:Design analog Circuit using CMOS.
			CO2:Use EDA tools like Cadence, Mentor Graphics and other opensource software tools like Ngspice
9	I-I	RESEARCH METHODOLOGY AND IPR	CO1:Understand research problem formulation.
			CO2:Analyze research related information
			CO3:Follow research ethics
			CO4:Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

			CO5:Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular
10	I-II	VLSI ADVANCED PHYSICAL DESIGN	CO1:Design power mesh for given specifications, analyze IR drop and EM issues and fix them.
			CO2:Implement the low power intent of the design using current industry standard UPF
			CO3:Verify whether the design meets the power intent in UPF
			CO4:Perform physical verification both at LVS & DRC level and fix all issues.
11	I-II	SYSTEM VERILOG TEST BENCHES USING UVM	CO1:Implement test bench programs using system Verilog
			CO2: Develop random stimulus and SVAs using system Verilog
			CO3:Develop a UVM testbench with all its features
12	I-II	IOT ARCHITECTURES AND SYSTEM DESIGN	CO1:Integrate the sensors and actuator depending on the applications
			CO2:Interface the IoT and M2M with value chains
			CO3:Write Python programming for Arduino, Raspberry Pi devices
			C04: Design IoT based systems such as Agricultural IoT, Vehicular IoT etc.,
13	I-II	SOC DESIGN	CO1:Identify and formulate a given problem in the framework of SoC based design approaches
			CO2:Design SoC based system for engineering applications
			CO3:Realize impact of SoC on electronic design philosophy and Macro-electronics thereby incline towards entrepreneurship & skill development.
14	I-II	DESIGN FOR TESTABILITY	CO1:Acquire verification knowledge and test evaluation
			CO2:Design for testability rules and techniques.

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			CO3: Utilize the scan architectures for different digital circuits
			CO4:Acquire the knowledge of design of built-in-self test.
15	I-II	DEVICE MODELLING	CO1:Develop a functional relationship among the terminal electrical variables of the device that is to be modeled.
			CO2:Describe the behavior of all components successfully
			CO3: Perform the simulation and analyze the VLSI circuits
			CO4:Use the FinFET for various applications
16	I-II	RF IC DESIGN	CO1:Analyze the behavior of high frequency components.
			CO2:Calculate the scattering parameters of various RF components and analyze the various filter parameters.
			CO3:Implement component modelling and biasing networks.
			CO4:Design the various RF filters, amplifiers, oscillators and mixers.
17	I-II	HARDWARE AND SOFTWARE CO-DESIGN	CO1:Acquire the knowledge on various models of Co-design.
			CO2:Explore the interrelationship between Hardware and software in a embedded system
			CO3:Acquire the knowledge of firmware development process and tools during Co-design
			CO4: Implement validation methods and adaptability.
18	II-I	ADVANCED COMPUTER ARCHITECTURE	CO1:Familiarize the instruction set, memory addressing of Computer
			CO2:Handle the issues in pipelining and parallelism
			CO3:Familiarize the practical issues in inter network
			CO1:Design a more secure systems by knowing countermeasures of various hardware attacks

19	II-I	HARDWARE SECURITY	CO2:Experiment the impressive efficiency of hardware attacks
			C03:Monitor computation time or power consumption to reveal secrets
			CO4:Design a secure systems which lead to privilege escalation and compromise
20	II-I	NANOMATERIALS AND NANOTECHNOLOGY	CO1:Formulate new engineering solutions for current problems and competing technologies for future applications
			CO2:Made inter disciplinary projects applicable to wide areas by clearing and fixing the boundaries in system development.
			CO3:Gather detailed knowledge of the operation of fabrication and characterization devices to achieve precisely designed systems

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M.Tech Computer Science Engineering I & II SEM Course Outcomes For the A.Y 2023-24

S.no	Year/Sem	Course Name	Course Outcomes
1	I-I	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE (PC-I)	CO1 Ability to understand and construct precise mathematical proofs
			CO2: Ability to use logic and set theory to formulate precise statements
			CO3: Ability to analyze and solve counting problems on finite and discrete structures
			CO4 Ability to describe and manipulate sequences
			CO5: Ability to apply graph theory in solving computing problems.
2	I-I	ADVANCED DATA STRUCTURES (PC-II)	CO1: Ability to select the data structures that efficiently model the information in a problem
			CO2: Ability to understand how the choice of data structures impact the performance of programs
			CO3 Design programs using a variety of data structures, including hash tables, search structures and digital search structures
3	I-I	DATABASE PROGRAMMING WITH PL/SQL (PE-I)	CO1 Understand importance of PL/SQL basics
			CO2: Implement functions and procedures using PL/SQL
			CO3: Understand the importance of triggers in database
4	I-I	DEEP LEARNING (PE-I)	CO1: Implement deep learning algorithms, understand neural networks and traverse the layers of data
			CO2: Learn topics such as convolutional neural networks, recurrent neural networks, training deep networks and high-level interfaces
			CO3: Understand applications of Deep Learning to Computer Vision
			CO4: Understand and analyze Applications of Deep Learning to NLP

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5	I-I	NATURAL LANGUAGE PROCESSING (PE-I)	CO1: Show sensitivity to linguistic phenomena and an ability to model them with formal grammars
			CO2: Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
			CO3: Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods
			CO4: Able to design, implement, and analyze NLP algorithms Able to design different language modeling Techniques
			CO5: Able to design different language modeling Techniques
6	I-I	ADVANCED CRYPTOGRAPHY (PE-II)	CO1: Understand the various cryptographic protocols
			CO2:Analyze key length and algorithm types and modes
			CO3:Illustrate different public key algorithms in cryptosystems
			CO4: Understand special algorithms for protocols and usage in the real world
7	I-I	SOFTWARE QUALITY ENGINEERING (PE-II)	CO1: Understand software quality and its perspectives
			CO2 : Analyze defect prevention and defect reduction in software quality assurance
			CO3:Illustrate software quality engineering activities and its process
8	I-I	QUANTUM COMPUTING (PE-II)	CO1: Understand basics of quantum computing
			CO2:Understand physical implementation of Qubit
			CO3: Understand Quantum algorithms and their implementation
			CO4: Understand The Impact of Quantum Computing on Cryptography

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9	I-I	ADVANCED DATA STRUCTURES LAB	CO1 Ability to select the data structures that efficiently model the information in a problem
			CO2 Ability to assess efficiency trade-offs among different data structure implementations or combinations
			CO3 Implement and know the application of algorithms for sorting and pattern matching
			CO4 Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and B-trees
10	I-I	DATABASE PROGRAMMING WITH PL/SQL LAB	CO1 Understand importance of PL/SQL basics
			CO2 Implement functions and procedures using PL/SQL
			CO3 Understand the importance of triggers in database
11	I-I	DEEP LEARNING LAB	CO1 Learn The Fundamental Principles Of Deep Learning
			CO2 Identify The Deep Learning Algorithms For Various Types of Learning Tasks in various domains
			CO3 Implement Deep Learning Algorithms And Solve Real-world problems
12	I-I	NATURAL LANGUAGE PROCESSING LAB	CO1 Show sensitivity to linguistic phenomena and an ability to model them with formal grammars
			CO2 Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods
13	I-I	RESEARCH METHODOLOGY & IPR	CO1 To understand the research problem
			CO2 To know the literature studies, plagiarism and ethics
			CO3 To get the knowledge about technical writing
			CO4 To analyze the nature of intellectual property rights and new developments
			CO5 To know thepatent rights

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14	I-II	ADVANCED ALGORITHMS (PC-III)	CO1: Analyze the complexity/performance of different algorithms
			CO2 Attain the knowledge of functional diagrams and applications of IC 555 and IC 565
			CO3 Acquire the knowledge about the Data converters
15	I-II	ADVANCED COMPUTER ARCHITECTURE (PC-III)	CO1: Computational models and Computer Architectures
			CO2: Concepts of parallel computer models
			CO3: Scalable Architectures, Pipelining, Superscalar processors
16	I-II	ENTERPRISE CLOUD CONCEPTS (PE-III)	CO1 Understand importance of cloud architecture
			CO2: Illustrating the fundamental concepts of cloud security
			CO3: Analyze various cloud computing mechanisms
			CO4: Understanding the architecture and working of cloud computing
17	I-II	ADVANCED COMPUTER NETWORKS (PE-III)	CO1 Understanding of holistic approach to computer networking
			CO2: Ability to understand the computer network protocols and their applications 3: Ability to design simulation concepts related to packet forwarding in networks
18	I-II	EDGE ANALYTICS (PE-III)	CO1 Understand the concepts of Edge Analytics, both in theory and in practical application
			CO2: Demonstrate a comprehensive understanding of different tools used at edge analytics
			CO3 Formulate, Design and Implement the solutions for real world edge analytics
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19	I-II	BIO INFORMATICS (PE-IV)	CO1 Understand the Central Dogma & XML (Bio XML) for Bioinformatics
			CO2 Analyze Perl (Bioperl) for Bioinformatics
			CO3 Illustrate Databases technology, architecture and its interfaces
			CO4 Understand Sequence Alignment Algorithms, Phylogenetic Analysis
20	I-II	NATURE INSPIRED COMPUTING (PE-IV)	CO1 Familiar with Genetic algorithm and its applications
			CO2 Compare different Ant Colony Optimization algorithmic models
			CO3 Compare different Artificial Bee Colony Optimization algorithmic models
			CO4 Illustrate Particle swarn optimization algorithm with an example
21	I-II	ROBOTIC PROCESS AUTOMATION (PE-IV)	CO1 Describe RPA, where it can be applied and how it's implemented
			CO2 Identify and understand Web Control Room and Client Introduction
			CO3 Understand how to handle various devices and the workload
			CO4 Understand Bot creators, Web recorders and task editors
22	I-II	ADVANCED ALGORITHMS LAB	CO1 The student can able to analyze the performance of algorithms
23	I-II	ENTERPRISE CLOUD CONCEPTS LAB	CO1 Understand importance of cloud architecture
			CO2 Illustrating the fundamental concepts of cloud security
			CO3 Analyze various cloud computing mechanisms
			CO4 Understanding the architecture and working of cloud computing
24	I-II	ADVANCED COMPUTER NETWORKS LAB	CO1 Ability of acquiring the practical exposure to existing protocols

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25	I-II	EDGE ANALYTICS LAB	CO1 Identify the benefits of edge computing
			CO2 Develop the microservices in iofog
			CO3 Develop user defined services in the edge
			CO4 Create use cases in IOT with edge computing
			CO5 Develop services in MEC
			CO6 Implement use cases in MEC
26	II-I	DIGITAL FORENSICS (PE-V)	CO1 Interpret and appropriately apply the laws and procedures associated with identifying, acquiring, examining and presenting digital evidence
			CO2 Create a method for gathering, assessing and applying new and existing legislation and industry trends specific to the practice of digital forensics
27	II-I	HIGH PERFORMANCE COMPUTING	CO1 Understanding the concepts in grid computing
			CO2 Ability to set up cluster and run parallel applications
			CO3 Ability to understand the cluster projects and cluster OS
			CO4 Understanding the concepts of pervasive computing & quantum computing
28	II-I	MINING MASSIVE DATASETS (PE-V)	CO1 Handle massive data using MapReduce
			CO2 Develop and implement algorithms for massive data sets and methodologies in the context of data mining
			CO3 Understand the algorithms for extracting models and information from large datasets
			CO4 Develop recommendation systems
			CO5 Gain experience in matching various algorithms for particular classes of problems

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29	II-I	IPR (OE)	CO1: Understand types of Intellectual Property
			CO2: Analyze trademarks and its functionality
			CO3: Illustrate law of copy rights and law of patents
30	II-I	FAULT TOLERANCE SYSTEMS (OE)	CO1 Become familiar with general and state of the art techniques used in design and analysis of fault tolerant digital systems
			CO2 Be familiar with making system fault tolerant, modeling and testing, and benchmarking to evaluate and compare systems
31	II-I	INTRUSION DETECTION SYSTEMS (OE)	CO1: Possess a fundamental knowledge of Cyber Security
			CO2: Understand what vulnerability is and how to address most common vulnerabilities.
			CO3: Know basic and fundamental risk management principles as it relates to Cyber Security and Mobile Computing
			CO4: Have the knowledge needed to practice safer computing and safeguard your information using Digital Forensics
			CO5: Understand basic technical controls in use today, such as firewalls and Intrusion Detection systems
			CO6 : Understand legal perspectives of Cyber Crimes and Cyber Security.
32	II-I	DIGITAL FORENSICS (OE)	CO1: Interpret and appropriately apply the laws and procedures associated with identifying, acquiring, examining and presenting digital evidence
			CO2: Create a method for gathering, assessing and applying new and existing legislation and industry trends specific to the practice of digital forensics

33	II-I	OPTIMIZATION TECHNIQUES (OE)	CO1: explain the need of optimization of engineering systems
			CO2: understand optimization of electrical and electronics engineering problems
			CO3: apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
			CO4: apply unconstrained optimization and constrained non-linear programming and dynamic programming
			CO5: Formulate optimization problems
34	II-I	CYBER PHYSICAL SYSTEMS (OE)	CO1 : Understand the core principles behind CPS
			CO2: Identify Security mechanisms of Cyber physical systems
			CO3: Understand Synchronization in Distributed Cyber-Physical Systems

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Master of Business Administration I & II SEM Course Outcomes For the A.Y 2023-24

S.no	Year/Sem	Course Name	Course Outcomes
1	I - I	MANAGEMENT AND ORGANIZATION BEHAVIOR	CO1: Gain understanding of the Concepts of Management, its Evolution, Functions and the Theoriescontributed by various Management Thinkers CO2: Learn the process of planning, goal setting and the process of decision making with the help of various models CO3: Learn the processes of Organizing and Controlling with the help of various Organizational Structures. CO4: Appreciate the relevance of Individual and group behaviour in an organization and the role of Culture and dynamics CO5: Identify different Leadership Styles, Skills and the Theories of Motivation
2	I - I	BUSINESS ECONOMICS	CO1: Understand the Concepts and Principles of Business Economics CO2: Learn various concepts and practical applications of Demand and Supply viz. Laws, Types, Elasticity, Forecasting and Equilibrium CO3: Learn concepts and applications related to Production and Cost of a firm CO4: Learn the features of various Market Structures along with the Decision-making with regards to Price and Output in Short and Long Terms. CO5: Understand the concepts of Pricing Practices, Theory of Firm and Managerial & Behavioral Theories of a Firm
3	I - I	FINANCIAL REPORTING & ANALYSIS	CO1: Understand the Concepts and Principles of Accounting CO2:Understand the Accounting Process in detai CO3: Learn various aspects in depreciation, Inventory and Goodwill CO4: Analyze the Working Capital and Flow of Funds and Cash into the Business CO5: Prepare, analyze and Interpret Financial Statements.
4	I - I	RESEARCH METHODOLOGY AND STATISTICAL ANALYSIS	CO1: Gain a conceptual overview of Research and the relevant concepts to Research. CO2: Learn the different types of Research Designs, Data Collection Tools and Procedures. CO3: Use different methods of representing data through Graphs and Tables; gain an overview of Statistics and relevant concepts and conduct Small Sample Tests. CO4: Learn to solve mathematical problems related to ANOVA (One-way and Two-way), Correlation and Regression CO5: Learn the application of Time Series and Index Numbers; appreciate the need for preparing and presenting a structured Research Report.
5	I - I	LEGAL AND BUSINESS ENVIRONMENT	CO1: Understand the Business Laws related to Incorporation of a company. CO2: Learn the Law of Contract & Sale of Goods CO3: Learn the salient features of Negotiable Instruments Act 1881

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			CO4: Learn the Reforms Undertaken by the Government with respect to the challenging business environments.
			CO5: Gain insights of the Regulatory Framework in India.
6	I - I	BUSINESS ETHICS AND CORPORATE GOVERNANCE	CO1: Understand the Need for Business Ethics and Corporate Governance in India.
			CO2: Apply Knowledge of Established Methodologies of Solving Professional Ethical Issues.
			CO3: Learn Codes and Committees in Corporate Governance.
			CO4: Understand the Role of Board in Corporate Governance.
			CO5: Assess the Stakeholder perspective of Corporate Governance.
7	I - I	PROJECT MANAGEMENT	CO1: Understand and appreciate the importance of Project Management
			CO2 : Learn Project Planning, Execution and implementation
			CO3:Apply Project Appraisal Methods to Cash Flows and Corporate Practices of Dividend Payment
			CO4: Understand intricacies of Project Evaluation techniques for better decision making.
			CO5: Appreciate the significance of Organizational & Team Behaviors in projects.
8	I - I	BUSINESS COMMUNICATION LAB	CO1: Appreciate the importance and influence of Business Communication and learn its applications for the purpose of self-development.
			CO2: Learn by practice of writing a variety of formal and informal letters & e-mails and reports and improve the readability of written documents.
			CO3: Identify the intricacies of writing Business Reports and Proposals.
			CO4: Develop verbal (oral) skills by giving presentations and participating in group discussions; appreciate the impact of body language in the process of communication
			CO5: Polish their etiquette, improve telephonic skills and appreciate the need for culture in maintenance of public relations.
9	I - I	STATISTICAL DATA ANALYSIS LAB	CO1: Understand the importance of the main functions of MS- Excel /SPSS.
			CO2: Practice advance Excel Tools for conduction of Data Analysis.
			CO3: Evaluate Data Analysis using Pivot Tables and Pivot Charts.
			CO4: Analyze the Data using Descriptive Statistics
			CO5: Conduct various Parametric and Non-parametric Tests using MS Excel / SPSS
10	I - II	HUMAN RESOURCE MANAGEMENT	CO1: Understand the concepts, role and functions of HRM and appreciate the need of HR to act as a Strategic Business Partner of the Organization.
			CO2: Learn the methods of conducting Job Analysis, process of writing Job Descriptions & Specifications and the processes of recruitment and selection.
			CO3: Gain an understanding of various concepts and practices of Employee Training & Development and Performance Management & Appraisals.
			CO4 : Learn the principles and practices of Employee Compensation and Rewards, with the help of Job Evaluation & Broad-banding etc. and the salient features of Workmen Compensation Act and Minimum Wages Act.
			CO5: Appreciate the need for effective Employee Relations and learn the salient features of Industrial Disputes Act and Factories Act.

11	I - II	MARKETING MANAGEMENT	CO1: Understand the important concepts and principles of Marketing Management and Marketing Research
			CO2 : Learn about the analysis of Market Opportunities and Customer Value with the help of Marketing Mix Elements
			CO3 Learn the significance of designing a customer driven strategy through Marketing Segmentation, Targeting and Positioning
			CO4: Assess Global marketing, green marketing strategies for sustainable development
			CO5: Gain insights of the key aspects of pricing decisions and the role of communication
12	I - II	FINANCIAL MANAGEMENT	CO1:Understand the concept of time value of money
			CO2: Learn about the capital budgeting techniques and cost of capital
			CO3: Learn the significance of Capital structure vs. financial structure
			CO4: Assess dividend policies of Indian companies, determinants of working capital, analysis of investment in inventory
			CO5: Understand the Concepts and Applications of Working Capital Management and Management of Current Assets
13	I - II	QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS	CO1:Understand the origin and application of operations research
			CO2: Learn about the Formulation of Linear Programming Problem for different areas
			CO3: appreciate the significance of variations of assignment problem, methods for finding Initial feasible solution.
			CO4: Learn the aspects of Decision Theory and Network Analysis
			CO5: Gain insights of the theoretical principles and practical applications of different queuing models

14	I - II	ENTREPRENWURSHIP AND DESIGN THINKING	CO1:Understand the approaches to entrepreneurship
			CO2:Learn about the individual entrepreneurial mind-set and Personality
			CO3:Learn the significance of Feasibility Analysis, Industry, competitor analysis, new venture development
			CO4: Understand the principles of implementation of Design Thinking.
			CO5:Appreciate the relevance of Creativity in the process of implementation of Design Thinking
15	I - II	LOGISTICS AND SUPPLY CHAIN MANAGEMENT	CO1: Understand the cyclical perspective of logistics and supply chain process.
			CO2: Learn about the distribution, transportation, warehousing related issues and challenges in supply chain
			CO3:Appreciate the significance of network design in the supply chain
			CO4:Gain knowledge of various models / tools of measuring the Supply Chain Performance
			CO5: Appreciate the role of coordination and technology in supply chain management.
16	I - II	TOTAL QUALITY MANAGEMENT (OE-II)	CO1: Understand the need for Quality
			CO2: Learn the relevant TQM models like PDCA Cycle, 5S, Kaizen, Quality Circles
			CO3: Learn statistical aspects relevant for process control
			CO4:Assess the relevance of Total Productive Maintenance, FMEA, Six Sigma
			CO5: Learn different Quality Management Systems
17	I - II	MARKETING RESEARCH (OE-II)	CO1:Understand the importance of marketing research
			CO2: Learn various aspects in research design
			CO3: Learn sampling design process
			CO4:Understand the characteristics of a good measurement, scaling and sampling methodology.
			CO5: Learn hypothesis testing and data presentation
18	I - II	INTERNATIONAL BUSINESS (OE-II)	CO1: Understand the Concepts, Principles and Approaches of International Business
			CO2:Learn the evolution of International Trade thought process with the help of classical and modern theories of International Trade.
			CO3:Gain insights of the aspects of Business and Economic Integration with the help of various Regional Economic Integrations and Multilateral Trade Agreements
			CO4; Understand the Strategy and Structure of International Business with the help of Value Chain Analysis, Environmental Scanning, Strategic Alliances.
			CO5:Gain knowledge of the contribution of major functional areas of business viz. Production, Finance, Marketing and HRM in International Business Operations

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19	I - II	RURAL MARKETING (OE-II)	CO1:Understand the importance of Indian Rural Economy.
			CO2:Learn various rural marketing strategies
			CO3:Learn challenges of Retail Channel Management
			CO4:Understand the aspects of rural business research
			CO5:Learn e- rural marketing, CSR, IT for rural development, e- Governance for Rural India
20	II-I	PRODUCTION AND OPERATION MANAGEMENT	CO1: Understand the importance concepts of operations management
			CO2: Learn various strategies in product and process design, analysis
			CO3: Learn examine the various aspects of plant location and product layout
			CO4: Understand the aspects of scheduling
			CO5: Gain insights of integrated materials management, e-procurement, materials planning
21	II-I	MANAGEMENT INFORMATION SYSTEMS	CO1:Understand the importance of MIS for strategic advantages
			CO2: Learn various business applications of information systems like e-business, BPR, DSS
			CO3:Learn examine the information system planning
			CO4: Understand alternative methods for building information system.
			CO5: Learn cyber security with inter networks security defenses
22	II-I	BUSINESS ANALYSIS	CO1:Understand the importance of business analytics in practice.
			CO2: Learn various rural marketing strategies
			CO3: Learn challenges of data modelling
			CO4: Understand the aspects data mining.
			CO5: Learn Monte Carlo simulation, risk analysis and decision tree analysis
23	II-II	STRATEGIC MANAGEMETN	CO1: Understand the importance of strategic management process.
			CO2: Learn various market life cycle models for strategic analysis
			CO3: Learn Strategies for competing in global markets and internet economy.
			CO4: Appreciate the need for having appropriate Turnaround and Diversification Strategies
			CO5: Understand the aspects of strategy evaluation and control.
24	II-II	DIGITAL MARKETING	CO1:Understand Evolution of digital marketing, its strategies and platforms.
			CO2: Learn the relevance of digital marketing channels
			CO3: Learn the significance of digital marketing
			CO4 understand the relevance of online advertising
			CO5: Understand the methods of measuring the digital media performance

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25	II-II	SALES AND PROMOTION MANAGEMENT	CO1: Understand Evolution of Sales and Promotion Management.
			CO2: Learn the relevance of various types of Advertising.
			CO3: Learn the significance of personality, attitudes of the consumer
			CO4: Assess the relevance of the different models of Consumer decision making.
			CO5: Appreciate the need for the distribution channels.
26	II-II	CONSUMER BEHAVIOR	CO1: Understand Evolution of consumer behaviour.
			CO2: Learn the relevance various influences on consumer behaviour
			CO3: Learn the significance of personality, attitudes of the consumer
			CO4: Assess the relevance of the different models of Consumer decision making
			CO5: Identify the need for the marketing ethics towards consumers
27	II-II	INTERNATIONAL MARKETING	CO1: Understand the Global Marketing Management
			CO2: Learn the relevance of WTO, EXIM Policy
			CO3:Learn various influences of the Global Consumer
			CO4: Understand the relevance of International Marketing Mix, distribution promotion strategies
			CO5: Identify the need for E-Marketing channels.
28	II-II	SERVICES MARKETING	CO1: Understand Marketing Management of companies offering Services
			CO2: Learn the relevance of services.
			CO3: Learn various influences of the consumer behaviour in services
			CO4: Understand the relevance of service operations.
			CO5: Identify the need for promotion strategies for services.
29	II-II	MARKETING ANALYTICS	CO1: Learn the Concepts of Marketing Analytics and their relevance in business
			CO2:Use MS Excel to deal with Marketing Data at basic level.
			CO3: Appreciate Customer's journey through Product Selection Process and Customer Lifetime Value
			CO4: Conduct Analysis in Determining the Pricing Strategies
			CO5:Understand the Process of Optimizing Clusters and Measure the Effectiveness of Promotion.
30	II-II	SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT	CO1: Understand the Indian financial system and also about Investmen
			CO2:Learn the relevance of risk and returns
			CO3:Learn various influences bond valuation and management.
			CO4:Understand the relevance of equity valuation of cash market and derivatives
			CO5:Identify the need for mutual funds in India.

31	II-II	RISK MANAGEMENT AND FINANICAL DERIVATIVES	CO1: Understand risk management and derivatives
			CO2: Learn the relevance of Basel norms, types of risks.
			CO3 Learn various aspects about Derivatives Market in India
			CO4 Understand the uses of options strategies.
			CO5 Examine the importance of SWAP Market
32	II-II	STRATEGIC COST AND MANAGEMENT ACCOUNTING	CO1: Understand the cost analysis and control
			CO2: Learn the relevance of unit, job, process costing for strategic decisions.
			CO3: Learn various aspects of activity-based management
			CO4 Understand the role of types of budgets and the budgeting process in non-profit organizations.
			CO5: Identify the need for establishing cost standards.
33	II-II	INTERNATIONAL FINANICAL MANAGEMENT	CO1: Understand recent changes and challenges in International Financial Management
			CO2: Learn Factors affecting International Trade flows
			CO3: Learn various aspects about International Stock market
			CO4: Understand the uses of exchange rates.
			CO5: Examine the importance of International Financing
34	II-II	STRATEGIC FINANCIAL MANAGEMENT	CO1: Understand financial strategy and control of a company
			CO2: Learn the relevance of risk and uncertainty in making strategic decisions.
			CO3: Learn various aspects of capital budgeting
			CO4: Understand the capital structure, dividend policy, financial distress, restructuring.
			CO5: Identify the different diversification strategies and mergers and acquisitions.
35	II-II	FINANCIAL ANALYTICS	CO1: Understand techniques of financial statements.
			CO2: Learn the relevance of time value money.
			CO3: Learn various aspects of capital budgeting.
			CO4: Understand industry, technical and economic analysis.
			CO5: Learn duration of bond and immunization strategies.
36	II-II	TALENT AND PERFORMANCE MANAGEMENT SYSTEM	CO1: Understand Talent Management Process along with its key components
			CO2: Learn the significance of performance management and employee development in
			CO3: Learn different approaches to Performance Management System
			CO4: Understand KRA's and KPI's and performance metrics.
			CO5: Identify the importance of reward systems in organizations.
37	II-II	LEARNING AND DEVELOPMENT	CO1: Understand Learning theories with the emphasis on learning outcomes
			CO2: Learn the significance of Training in organization
			CO3: Learn different training methods

			CO4: Understand essentials of management development.
			CO5:dentify the Training needs, Training methods for different sectors.
38	II-II	EMPLOYEE RELATIONS	CO1: Understand the changing nature of Labor/Workforce in India and appreciate the need for knowing and maintaining good relations with Industry and Trade Unions
			CO2: Learn the legal framework/process of Collective Bargaining and the aspects of Negotiation, Social Security and Drafting of Agreements.
			CO3:Learn various aspects of Tripartism, Social Dialogue and the role of Government in Industrial Relations
			CO4: Understand the salient features of various Acts such as Factories Act, Minimum Wages Act, ESI Act etc. and the need for maintenance of good Employee Relations
			CO5: Understand the salient features of Acts such as Industrial Disputes Act, Occupational Safety, Health and Working Conditions Code etc.
39	II-II	INTERNATIONAL HUMAN RESOURCE MANAGEMENT	CO1: Gain an overview of the nature, scope and importance of International Human Resource Management
			CO2: Understand and appreciate the role of International Human Resource Management in development and execution of strategies for success of multinational corporations
			CO3:Learn the role of International Human Resource Management in long-term planning and staffing of manpower globally
			CO4: Gain insights of the strategic role of Training and Development of Expatriates in management of international assignments
			CO5: Acquaint themselves with the process of global performance management and understand the complexities of global compensation
40	II-II	LEADERSHIP ANF CHANGE MANAGEMENT	CO1: Gain an understanding of the concepts and principles of leadership by studying the contributions made by various philosophers and Universities.
			CO2: Learn from the various theories and styles of leadership and their contribution the subject matter of leadership from time to time.
			CO3: Appreciate the role of leader in the ever-changing business scenario and gain knowledge of various models of change.
			CO4: Understand the role of power, politics and conflicts in times of change, management of resistance to change in the process of implementing organizational change.
			CO5: Gain insights of the process organizational development from a consultative perspective.

41	II-II	H R ANALYTICS	CO1: Gain an understanding of the relevance of HR Analytics in the current business scenario CO2: Have an understanding of the models of conducting HR Analytics and understanding of the methods of capturing, examining & purifying data for conduction of HR Analytics. CO3: Use MS Excel for conduction of HR Analytics for key HR Processes CO4:Have an overview of various tools and software technologies used for conduction of Descriptive HR CO5: Appreciate the significance of Predictive and Prescriptive Analytics
42	II-II	STARTUP AND MSME MANAGEMENT	CO1: Understand various Startup opportunities CO2:Learn Business Startup, Ideation, and Venture Choices. CO3: Learn Legal and other requirements for new ventures. CO4: Learn Problems of entrepreneurs. CO5:Understand the Forms of Financial support.
43	II-II	TECHNOLOGY BUSINESS INCUBATION	CO1:Understand various Startup opportunities. CO2:Learn Business Startup, Ideation, and Venture Choices. CO3:Learn Legal and other requirements for new ventures CO4: Learn Problems of entrepreneurs. CO5:Understand Forms of Financial support.
44	II-II	INNOVATION AND ENTERPRENEURSHIP	CO1:Gain an understanding of the concepts and processes of creativity and appreciate the need for improving the quality of creativity CO2: Learn the methods of creative problem solving CO3: Orient themselves on developing creative intelligence and unblock their creative energies CO4: Learn the concepts and methods of innovation and ideation and the theories of outsourcing new product development CO5: Develop a perspective of micro and macro level innovation.
45	II-II	ENTREPRENEURIAL FINANCE	CO1:Understand Financing through venture lifecycle in a company CO2: Learn Startup and First Round Financing Sources. CO3:Learn the significance of Financial Planning throughout the Venture's life cycle. CO4: Understand Mechanics of venture valuation. CO5: Understand the importance of venture capital financing.
46	II-II	ENTREPRENEURIAL MAREKETING	CO1: Understand Marketing mix of an enterprise CO2: Learn the Growth and marketing strategies CO3: Learn Market Development strategies. CO4: Understand entrepreneurial communication. CO5: Understand the importance of entrepreneurial marketing.

47	II-II	FAMILY BUSSINESS MANAGEMENT	CO1: Understand various Startup opportunities.
			CO2: Learn Business Startup, Ideation, and Venture Choices.
			CO3: Learn Legal and other requirements for new ventures.
			CO4: Learn Problems of entrepreneurs.
			CO5 Understand Forms of Financial support.

PRINCIPAL
Avanthi Institute of Engg. & Tech
Gunthapally (V), Abdullapurmet (Mdl) R.R.Dt.