



# AVANTHI

## INSTITUTE OF ENGINEERING & TECHNOLOGY

(Approved by AICTE, Permanently Affiliated to JNT University, Kakinada  
Accredited by NBA & Recognized Under 2(f) and 12(b) by UGC, New Delhi)  
Tamaram, Makavarapalem, Narsipatnam(R.D), Visakhapatnam Dist-531113

### DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

#### COURSE OUTCOME (R-23)

I Year I semester

#### LINEAR ALGEBRA & CALCULUS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201114	Develop matrix algebra techniques that is needed by engineers for practical applications
2	R201114	Develop matrix algebra techniques that is needed by engineers for practical applications
3	R201114	learn important tools of calculus in higher dimensions.
4	R201114	familiarize with functions of several variables which is useful in optimization.
5	R201114	familiarize with double and triple integrals of functions of several variables in two and three dimensions.

#### CHEMISTRY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201115	Compare the materials of construction for battery and electrochemical sensors.
2	R201115	Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.
3	R201115	Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.
4	R201115	Apply the principle of Band diagrams in the application of conductors and semiconductors



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5	R201115	Summarize the concepts of Instrumental methods.
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### INTRODUCTION TO PROGRAMMING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201110	To impart adequate knowledge on the need of programming languages and problem-solving techniques and develop programming skills.
2	R201110	To enable effective usage of Control Structures and Implement different operations on arrays.
3	R201110	To demonstrate the use of Strings and Functions.
4	R201110	To impart the knowledge of pointers and understand the principles of dynamic memory allocation.
5	R201110	To understand structures and unions and illustrate the file concepts and its operations.

### ENGINEERING DRAWING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201104	To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
2	R201104	To impart knowledge on the projection of points, lines and plane surfaces
3	R201104	To improve the visualization skills for better understanding of projection of solids
4	R201104	To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
5	R201104	To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.



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### BASIC ELECTRICAL & ELECTRONICS ENGINEERING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201214	Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
2	R201214	Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations
3	R201214	Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.
4	R201214	Analyze different electrical circuits, performance of machines and measuring instruments.
5	R201214	Evaluate different circuit configurations, Machine performance and Power systems operation

### CHEMISTRY LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201116	Determine the cell constant and conductance of solutions.
2	R201116	Prepare advanced polymer Bakelite materials.
3	R201116	Measure the strength of an acid present in secondary batteries.

### COMPUTER PROGRAMMING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201113	Read, understand, and trace the execution of programs written in C language



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2	R201113	Develop C programs which utilize memory efficiently using programming constructs like pointers, arrays and functions.
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### ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201238	Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.
2	R201238	Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.

### I Year II semester

### DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201201	Solve the differential equations related to various engineering fields.
2	R201201	Model engineering problems as higher order differential equations and solve analytically.
3	R201201	Identify solution methods for partial differential equations that model physical processes.
4	R201201	Interpret the physical meaning of different operators such as gradient, curl and divergence.
5	R201201	Estimate the work done against a field, circulation and flux using vector calculus.

### ENGINEERING PHYSICS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201207	Analyze the intensity variation of light due to polarization, interference and diffraction.
2	R201207	Familiarize with the basics of crystals and their structures.



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3	R201207	Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.
4	R201207	Summarize various types of polarization of dielectrics and classify the magnetic materials.
5	R201207	Explain the basic concepts of Quantum Mechanics and the band theory of solids. Identify the type of semiconductor using Hall effect.

### COMMUNICATIVE ENGLISH

At the end of the course student should be able

Sno	Course code	CO Statement
1	R201102	Remedially learn applying grammatical structures to formulate sentence sand use appropriate words and correct word forms.
2	R201102	Using discourse markers to speak clearly on a specific topic in formal as well as informal discussions.(not required)
3	R201102	Improved communicative competence in formal and informal contexts and for social and academic purposes.
4	R201102	Critically comprehending and appreciatingading /listening texts and to write summaries based on global comprehension of these texts.
5	R201102	Writing coherent paragraphs essays, letters/e-mails and resume.

### BASIC CIVIL & MECHANICAL ENGINEERING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201214	Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.
2	R201214	Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying
3	R201214	Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.
4	R201214	Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated
5	R201214	Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology

### NETWORK ANALYSIS

At the end of the course student should be able to



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Sno	Course code	CO Statement
1	R201213	Understand basic electrical circuits with nodal and mesh analysis.
2	R201213	Analyse the circuit using network simplification theorems.
3	R201213	Find Transient response and Steady state response of a network
4	R201213	Analyse electrical networks in the Laplace domain. Compute the parameters of a two-port network

### COMMUNICATIVE ENGLISH LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201106	Understand the different aspects of the English language proficiency with emphasis on LSRW skills.
2	R201106	Apply communication skills through various language learning activities

### ENGINEERING PHYSICS LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201233	Operate optical instruments like travelling microscope and spectrometer.
2	R201233	Estimate the wavelengths of different colours using diffraction grating
3	R201233	Plot the intensity of the magnetic field of circular coil carrying current with distance

### IT WORKSHOP

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R201237	Perform Hardware troubleshooting.
2	R201237	Understand Hardware components and inter dependencie



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3	R201237	Safeguard computer systems from viruses/worms.
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### ENGINEERING WORKSHOP

At the end of the course student should be able to

Sno	Course code	CO Statement
1		Identify workshop tools and their operational capabilities.
2		Apply fitting operations in various application
3		practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.

### NETWORK ANALYSIS AND SIMULATION LABORATORY

At the end of the course student should be able to

Sno	Course code	CO Statement
1		Verify Kirchoff's laws and network theorems.
2		Measure time constants of RL & RC circuits.
3		Analyze behavior of RLC and resonant circuit for different cases.

## DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

### COURSE OUTCOME (R-20)

#### II Year I semester

### ELECTRONIC DEVICES AND CIRCUITS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021041	Apply the basic concepts of semiconductor physics.
2	R2021041	Understand the formation of p-n junction and how it can be used as a p- n junction as diode in different modes of operation
3	R2021041	Know the construction; working principle of rectifiers with and with out filters with relevant expressions and necessary comparisons
4	R2021041	Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations



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5	R2021041	Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions
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### SWITCHING THEORY AND LOGIC DESIGN

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021042	Classify different number systems and apply to generate various codes.
2	R2021042	Use the concept of Boolean algebra in minimization of switching functions
3	R2021042	CO4 Design different types of combinational logic circuits. Apply knowledge of flip-flops in designing of Registers and counters
4	R2021042	The operation and design methodology for synchronous sequential circuits and algorithmic state machines

### SIGNALS AND SYSTEMS

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021043	Differentiate the various classifications of signals and systems
2	R2021043	Analyze the frequency domain representation of signals using Fourier concepts
3	R2021043	Classify the systems based on their properties and determine the response of FLTI
4	R2021043	Classify the systems based on their properties and determine the response of LTI
5	R2021043	Apply Laplace and (continuous & discrete). z-transforms to analyze

### RANDOM VARIABLES AND STOCHASTIC PROCESSES

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021044	Apply Mathematical model theorem and phenomena and solve simple probabilistic problems.



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2	R2021044	Analyze different types of random variables and compute statistical averages of the random variables
3	R2021044	Apply the random processes in the time and frequency domains.
4	R2021044	Analyze the LTI systems with random inputs.
5	R2021044	Understand the important concepts of random variables and stochastic processes

### MATHEMATICS-III

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021011	Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
2	R2021011	Estimate the work done against a field, circulation and flux using vector calculus (L5)
3	R2021011	Apply the Laplace transform for solving differential equations (L3)
4	R2021011	Find or compute the Fourier series of periodic signals (L3)
5	R2021011	Know and be able to apply integral expressions for the forward and inverse Fourier transform to arrange of non-periodic wave forms (L3)

### OOPS THROUGH JAVA LAB

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021045	Identify classes, objects, members of a class and the relationship among them
2	R2021045	Implement programs to distinguish different forms of inheritance
3	R2021045	Develop programs using Exception Handling mechanism
4	R2021045	Develop multithreaded application using synchronization concept
5	R2021045	Create packages and to reuse them

### ELECTRONIC DEVICES AND CIRCUITS LAB

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Sno	Course code	CO Statement
1	R2021046	Student Able to Know P-N Junction Diode Characteristics
2	R2021046	Student Able to Know Zener Diode Characteristics
3	R2021046	Student Able to Know Rectifiers (without and with c-filter)
4	R2021046	Student Able to Know BJT and FET Characteristics
5	R2021046	Student Able to Know SCR and UJT Characteristics

### SWITCHING THEORY AND LOGIC DESIGN LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021047	Know logic gates
2	R2021047	Know combinational circuits
3	R2021047	Know decoders and encoders
4	R2021047	Understand various multiplexers and de-multiplexers
5	R2021047	Know various flip lops and their operations

### PYTHON LAB (SKILL ORIENTED COURSE)

At the end of the course student should be able to

Sno	Course Code	Co statement
1	R2021047	Know comprehensions, generators in python
2	R2021047	Know file I/O
3	R2021047	Understand various data types like lists, tuples, strings etc
4	R2021047	Know exception handling in python
5	R2021047	Know the usage of various pre-defined functions on the above data types



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### ELECTRONIC CIRCUIT ANALYSIS

At the end of the course the student able to

S.No	Course code	CO Statement
1	R2022041	Design and analysis of small signal high frequency transistor amplifier using BJT and FET.
2	R2022041	Design and analysis of multistage amplifiers using BJT and FET and Differential amplifier using BJT
3	R2022041	Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept
4	R2022041	Know the classification of the power and tuned amplifiers and their analysis with performance comparison
5	R2022041	Design and analysis of small signal high frequency transistor amplifier using BJT and FET

### DIGITAL IC DESIGN

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2022042	Understand the structure of commercially available digital integrated circuit families.
2	R2022042	Learn the IEEE Standard 1076 Hardware Description Language (VHDL)
3	R2022042	Model complex digital systems at several levels of abstractions, behavioral, structural, and rapid system prototyping
4	R2022042	Analyze and design basic digital circuits with combinatorial and sequential

### ANALOG COMMUNICATIONS

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2022043	Differentiate various Analog modulation and demodulation schemes and their spectral characteristics
2	R2022043	Analyze noise characteristics of various analog modulation methods



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3	R2022043	Analyze various functional blocks of radiotransmitters and receivers
4	R2022043	Design simple analog systems for various modulation techniques
5	R2022043	Apply basic techniques for generating and demodulating various pulse modulated signals.

### LINEAR CONTROL SYSTEMS

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2022044	This course introduces the concepts of feedback and its advantages to various control systems
2	R2022044	The performance metrics to design the control system in time-domain and frequency domain are introduced.
3	R2022044	Control systems for various applications can be designed using time-domain and frequency domain analysis
4	R2022044	In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced
5	R2022044	Understand the concepts of state variable analysis, design and also the concepts of controllability and observability.

### MANAGEMENT AND ORGANIZATIONAL BEHAVIOR

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2022045	After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational structure.
2	R2022045	Will familiarize with the concepts of functional management that is HR Mand Marketing of new product developments.
3	R2022045	The learner is able to think in strategically through contemporary management practices
4	R2022045	The learner can develop positive attitude through personality development and can equip with motivational theories.
5	R2022045	The student can attain the group performance and grievance handling in managing the organizational culture

### ELECTRONIC CIRCUIT ANALYSIS LAB

At the end of the course student should be able



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S.No	Course code	CO Statement
1	R2022046	Design and analysis of small signal high frequency transistor amplifier using BJT and FET.
2	R2022046	Design and analysis of multistage amplifiers using BJT and FET and Differential amplifier using BJT.
3	R2022046	Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability
4	R2022046	Design and analysis of small signal high frequency transistor amplifier using BJT and FET
5	R2022046	Know the classification of the power and tuned amplifiers and their analysis with performance comparison

### ANALOG COMMUNICATIONS LAB

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2022047	Differentiate various Analog modulation and demodulation schemes and their spectral characteristics
2	R2022047	Analyze noise characteristics of various analog modulation methods
3	R2022047	Analyze various functional blocks of radio transmitters and receivers

### DIGITAL IC DESIGN LAB

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2022048	Understand the structure of commercially available digital integrated circuit families.
2	R2022048	Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
3	R2022048	Model complex digital systems at several levels of abstractions, behavioral, structural, simulation, synthesis and rapid system prototyping.

### SOFT SKILLS (SKILL ORIENTED COURSE)

At the end of the course student should be able

S.No	Course code	CO Statement
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1	R2022049	Use language fluently, accurately and appropriately in debates and group discussions.
2	R2022049	Use their skills of listening comprehension to communicate effectively in cross-cultural contexts
3	R2022049	Learn and use new vocabulary.
4	R2022049	Write resumes, project reports and reviews
5	R2022049	Exhibit interview skills and develop soft skills.

### DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING COURSE OUTCOMES

#### COURSE OUTCOME (R-20)

#### III Year I semester

#### ANALOG ICs AND APPLICATIONS

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2031041	Describe the Op-Amp and internal Circuitry: 555 Timer, PLL Discuss the
2	R2031041	Applications of Operational amplifier: 555 Timer, PLL CO3
3	R2031041	Design the Active filters using Operational Amplifier
4	R2031041	Understand timers and phase locked loops
5	R2031041	Use the Op-Amp in A to D & D to A Converters

#### WAVES AND TRANSMISSION LINES

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2031042	Determine E and H using various laws and applications of electric & magnetic fields
2	R2031042	Apply the Maxwell equations to analyze the time varying behavior of EM waves
3	R2031042	Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media



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4	R2031042	Calculate Brewster angle, critical angle and total internal reflection
5	R2031042	Derive and Calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith chart

### DIGITAL COMMUNICATIONS

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2031043	Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system.
2	R2031043	Analyze various source coding techniques.
3	R2031043	Compute and analyze Block codes, cyclic codes and convolution codes.
4	R2031043	Design a coded communication system.
5	R2031043	Create a digital communication system

### ANTENNA AND WAVE PROPAGATION (PE1)

At the end of the course student should be able

S.No	Course code	CO Statement
1	R203104F	Identify basic antenna parameters
2	R203104F	Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas.
3	R203104F	Quantify the fields radiated by various types of antennas
4	R203104F	Design and analyze antenna arrays
5	R203104F	Analyze antenna measurements to assess antenna's performance

### ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PE1)

At the end of the course student should be able

S.No	Course code	CO Statement
1	R203104B	Select the instrument to be used based on the requirements.
2	R203104B	Understand and analyze different signal generators and analyzers.
3	R203104B	Understand the design of oscilloscopes for different applications



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4	R203104B	Design different transducers for measurement of different parameters
5	R203104B	Understand the concept Transducers.

### COMPUTER ARCHITECTURE & ORGANIZATION (PE1)

At the end of the course student should be able

S.No	Course code	CO Statement
1		Students can understand the architecture of modern computer.
2		They can analyze the Performance of a computer using performance equation
3		Understanding of different instruction types
4		Students can calculate the effective address of an operand by addressing modes
5		They can understand how computer stores positive and negative numbers

### ANALOG ICs AND APPLICATIONS LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2031044	Student Able To Learn the characteristics of ideal and practical op-amp.
2	R2031044	Student Able To Learn different application of op-amp
3	R2031044	Student Able To Learn the characteristics of op-amp as active filter
4	R2031044	Student Able To Learn the characteristics op-amp as timer and phase locked loop
5	R2031044	Student Able To Learn the characteristics op-amp as analog to digital and digital to analog converter

### DIGITAL COMMUNICATIONS LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2031045	Able to understand basic theories of Digital communication system in practical.
2	R2031045	Able to design and implement different modulation and demodulation techniques



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3	R2031045	Able to analyze digital modulation techniques by using MATLAB tools
4	R2031045	Able to identify and describe different techniques in modern digital communications, in particular in source coding using MAT Lab tools.
5	R2031045	Able to perform channel coding

### DATA STRUCTURES USING JAVA LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2031046	Remember functions to implement linear data structure operations R
2	R2031046	Remember functions to implement non-linear data structure operations
3	R2031046	Evaluate the given problem

### III Year II semester

#### MICROPROCESSOR AND MICROCONTROLLERS

At the end of the course student should be able

S.No	Course code	CO Statement
1		Understand the architecture of microprocessor/ microcontroller and their operation. processors and Controllers.
2		Analyze various interfacing techniques
3		Demonstrate programming skills in assembly language for and apply them for the design of processor / Controller based systems.
4		Understand the knowledge on interfacing various peripherals, configure and develop programs to interface peripherals/sensors
5		Understand To develop programs efficiently on ARM Cortex processors and debug

#### VLSI DESIGN

At the end of the course student should be able

S.No	Course code	CO Statement
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1		Demonstrate a clear understanding of CMOS fabrication flow and technology scaling.
2		Apply the design Rules and draw layout of a given logic circuit.
3		Design basic building blocks in Analog IC design
4		Analyze the behavior of amplifier circuits with various loads.
5		Design various CMOS logic circuits for design of Combinational logic circuits.

### DIGITAL SIGNAL PROCESSING

At the end of the course student should be able

S.No	Course code	CO Statement
1		Apply the difference equations concept in the analysis of Discrete time systems
2		Use the FFT algorithm for solving the DFT of a given signal
3		Design a Digital filter (FIR&IIR) from the given specifications
4		Realize the FIR and IIR structures from the designed digital filter.
5		Use the Multirate Processing concepts in various applications (eg: Design of phase shifters, Interfacing of digital systems

### MICROWAVE ENGINEERING (PE2)

At the end of the course student should be able

S.No	Course code	CO Statement
1		Design different modes in waveguide structures
2		Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction
3		Distinguish between Microwave tubes and Solid State.
4		Devices, calculation of efficiency of devices



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5		Measure various microwave parameters using a Microwave test bench Study of different microwave devices and their parameters
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### MOBILE & CELLULAR COMMUNICATION (PE2)

At the end of the course student should be able

S.No	Course code	CO Statement
1		Analyze the limitations of conventional mobile telephone systems
2		Understand the frequency management, channel assignment strategies and antennas in cellular systems.
3		Understand the concept of architectures of various cellular systems
4		Understand the concepts of cellular systems.
5		Analyze handoff strategies

### EMBEDDED SYSTEMS (PE2)

At the end of the course student should be able

S.No	Course code	CO Statement
1		Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
2		The hardware components required for an embedded system and the design approach of an embedded hardware
3		The various embedded firmware design approaches on embedded environment.
4		Understand how to integrate hardware and firmware of an embedded system using real time operating system.
5		Create an embedded system design approach to perform a specific function

### CMOS ANALOG IC DESIGN (PE2)

At the end of the course student should be able

S.No	Course code	CO Statement
1		Design MOSFET based analog integrated circuits.
2		Analyze analog circuits at least to the first order.
3		Appreciate the trade-offs involved in analog integrated circuit design.



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4		Understand and appreciate the importance of noise and distortion in analog circuits
5		Analyze complex engineering problems critically in the domain of analog IC design for conducting research.

### MICROPROCESSOR AND MICROCONTROLLERS LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1		Demonstrate ability to handle arithmetic operations using assembly language programming in TASM and training boards
2		Demonstrate ability to handle logical operations using assembly language programming in TASM
3		Demonstrate ability to handle string instructions using assembly language programming in TASM

### VLSI DESIGN LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1		Create Verilog /VHDL Source code, perform simulation using relevant simulator
2		Create the latest FPGA/CPLD Hardware in the Laboratory
3		Analyze the obtained simulation results using necessary Synthesizer

### DIGITAL SIGNAL PROCESSING LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1		Create DT, DFT, ZERO PLOT, BODEPLOT, NYQUIST PLOT, FIR, IIR FILTERS USING MAT LAB AND CCS STUDIO.
2		Understand the use of TI DSP Starter Kit
3		Remember the use of Cypress FM4 Starter Kit



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## ARM BASED/ AURDINO BASED PROGRAMMING

At the end of the course student should be able

S.No	Course code	CO Statement
1		Apply simple applications on 88-bit microcontroller (ATmega328)
2		Analyze basics of SPI interface.
3		Analyze Accelerometer interface techniques

## DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING COURSE OUTCOMES

COURSE OUTCOME (R-20)

### IV Year I semester

#### OPTICAL COMMUNICATION

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2041011	Choose necessary components required in modern optical communications systems .
2	R2041011	Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers.
3	R2041011	Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems.
4	R2041011	Choose the optical cables for better communication with minimum losses
5	R2041011	Design, build, and demonstrate optical fiber experiments in the laboratory

#### DIGITAL IMAGE PROCESSING

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2041012	Perform image manipulations and different digital image processing techniques



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2	R2041012	Perform basic operations like - Enhancement, segmentation, compression, Image transforms and restoration techniques on image.
3	R2041012	Analyze pseudo and full color image processing techniques.
4	R2041012	Apply various morphological operators on images
5	R2041012	Create different digital image processing techniques

### LOW POWER VLSI DESIGN

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2041011	Capability to recognize advanced issues in VLSI systems, specific to the deep- submicron silicon Technologies.
2	R2041011	Students able to understand deep submicron CMOS technology and digital CMOS design styles
3	R2041011	To design chips used for battery-powered systems and high performance circuits.
4	R2041011	Learn the design of various CMOS dynamic logic circuits.
5	R2041011	Learn the design techniques low voltage and low power CMOS circuits for various applications

### SATELLITE COMMUNICATION

At the end of the course student should be able

S.No	Course code	CO Statement
1	R204104D	Understand the concepts, applications and subsystems of Satellite communications.
2	R204104D	Derive the expression for G/T ratio and to solve some analytical problems on satellite link design
3	R204104D	CO3 Understand the various types of multiple access techniques and architecture of earth station design.
4	R204104D	Understand the concepts, applications and subsystems of Satellite communications
5	R204104D	Understand the concepts of GPS and its architecture.

### DIGITAL IC DESIGN USING CMOS

At the end of the course student should be able



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S.No	Course code	CO Statement
1	R2041011	Understand the concepts of MOS Design. Design and analysis of Combinational and Sequential MOS Circuits.
2	R2041011	Extend the Digital IC Design to Different Applications
3	R2041011	Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization.
4	R2041011	Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization
5	R2041011	Remember the use of semiconductors

### RADAR ENGINEERING

At the end of the course student should be able

S.No	Course code	CO Statement
1	R204104G	Derive the radar range equation and to solve some analytical problems.
2	R204104G	Understand the different types of radars and its applications.
3	R204104G	Understand the concept of tracking and different tracking techniques
4	R204104G	Understand the various components of radar receiver and its performance
5	R204104G	Evaluate the noise in radar signals

### PATTERN RECOGNITION & MACHINE LEARNING

At the end of the course student should be able

S.No	Course code	CO Statement
1	R204104G	Study the parametric and linear models for classification
2	R204104G	Design neural network and SVM for classification
3	R204104G	Develop machine independent and unsupervised learning technique
4	R204104G	Analyze the linear discriminate functions



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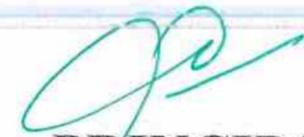
5	R204104G	Apply algorithms for independent machine learning
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### INTERNET OF THINGS

At the end of the course student should be able

S.No	Course code	CO Statement
1.	R204104T	Understand internet of Things and its hardware and software components.
2	R204104T	Interface I/O devices, sensors & communication modules.
3	R204104T	Remotely monitor data and control devices.
4	R204104T	Design real time IoT based applications
5	R204104T	Apply IOT case studies for various applications

  
HOD

  
PRINCIPAL

Principal  
Avanthi Institute of Engg. & Technol.  
Tamarant, Makavarapalem Md.,  
Anakapalli District., Pin: 531 113



**AVANTHI INSTITUTE OF ENGINEERING & TECHNOLOGY**  
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**VISAKHAPATNAM-531113**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**  
**COURSE OUTCOME (R-23)**

**I Year I semester**

**LINEAR ALGEBRA & CALCULUS**

At the end of the course student should be able to:

S.no	Course code	CO Statement
1	R23BS01	Develop matrix algebra techniques that is needed by engineers for practical applications.
2	R23BS01	To find the eigen values and eigen vectors and solve the problems by using linear transformation
3	R23BS01	Learn important tools of calculus in higher dimensions.
4	R23BS01	Familiarize with functions of several variables which is useful in optimization.
5	R23BS01	Familiarize with double and triple integrals of functions of several variables in two and three dimensions

**ENGINEERING PHYSICS**

At the end of the course student should be able to:

S.no	Course code	CO Statement
1	R23BS03	Analyze the intensity variation of light due to polarization, interference and diffraction
2	R23BS03	Familiarize with the basics of crystals and their structures.
3	R23BS03	Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.
4	R23BS03	Summarize various types of polarization of dielectrics and classify the magnetic materials.
5	R23BS03	Explain the basic concepts of Quantum Mechanics and the band theory of solids.
6	R23BS03	Identify the type of semiconductor using Hall effect.

**COMMUNICATIVE ENGLISH**

At the end of the course student should be able to:

S.no	Course code	CO Statement
1	R23HS01	By the end of the course the students will have Learned how to understand the context, topic, and specific information from social or transactional dialogues.
2	R23HS01	Remedially learn applying grammatical structures to formulate sentence sand use appropriate words and correct word forms.
3	R23HS01	Using discourse markers to speak clearly on a specific topic in formal as well as informal discussions.(not required)



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4	R23HS01	Improved communicative competence in formal and informal contexts and for social and academic purposes.
5	R23HS01	Critically comprehending and appreciating reading /listening texts and to write summaries based on global comprehension of these texts.
6	R23HS01	Writing coherent paragraphs essays, letters/e-mails, and resume.

### **BASIC CIVIL & MECHANICAL ENGINEERING**

At the end of the course student should be able to:

<b>S.no</b>	<b>Course code</b>	<b>CO Statement</b>
1	R23ES01	Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.
2	R23ES01	Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying
3	R23ES01	Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.
4	R23ES01	Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.
5	R23ES01	Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology

### **INTRODUCTION TO PROGRAMMING**

At the end of the course student should be able to:

<b>S.no</b>	<b>Course code</b>	<b>CO Statement</b>
1	R23ES07	Illustrate the Fundamental concepts of Computers and basics of computer programming and problem-solving approach.
2	R23ES07	Understand the Control Structures, branching and looping statements
3	R23ES07	Develop Modular program aspects and Strings fundamentals.
4	R23ES07	Develop Modular program aspects and Strings fundamentals.
5	R23ES07	Demonstrate the ideas of User Defined Data types, files. Solve real world problems using the concept of Structures, Unions and File
6	R23ES07	To impart the Knowledge Searching and Sorting Techniques



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### COMMUNICATIVE ENGLISH LAB

At the end of the course student should be able to:

S.no	Course code	CO Statement
1	R23HS01	Understand the different aspects of the English language oral communication with emphasis on Listening and Speaking S skills.
2	R23HS01	Apply communication skills through various language learning activities.
3	R23HS01	Analyse the English speech sounds, stress, rhythm and intonation for better listening and speaking comprehension.
4	R23HS01	Evaluate and exhibit professionalism in participating in debates and group discussions with polite turn taking strategies and sound more professional while communicating with others
5	R23HS01	Create effective resonate and prepare them to face interviews communicate appropriately in corporate settings.

### ENGINEERING PHYSICS LAB

At the end of the course student should be able to:

S.no	Course code	CO Statement
1	R23BS03	Operate optical instruments like travelling microscope and spectrometer.
2	R23BS03	Estimate the wavelengths of different colours using diffraction grating
3	R23BS03	Plot the intensity of the magnetic field of circular coil carrying current with distance.
4	R23BS03	Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
5	R23BS03	Calculate the band gap of a given semiconductor.
6	R23BS03	Identify the type of semiconductor using Hall effect.

### ENGINEERING WORKSHOP

At the end of the course student should be able to:

S.no	Course code	CO Statement
1	R23ES02	Identify workshop tools and their operational capabilities.
2	R23ES02	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
3	R23ES02	Apply fitting operations in various applications.
4	R23ES02	Apply basic electrical engineering knowledge for House Wiring Practice



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### **IT WORKSHOP**

At the end of the course student should be able to:

<b>S.no</b>	<b>Course code</b>	<b>CO Statement</b>
1	R23ES06	Perform Hardware troubleshooting.
2	R23ES06	Understand Hardware components and inter dependencies.
3	R23ES06	Safeguard computer systems from viruses/worms.
4	R23ES06	Document/ Presentation preparation.
5	R23ES06	Perform calculations using spreadsheets.

### **COMPUTER PROGRAMMING LAB**

At the end of the course student should be able to:

<b>S.no</b>	<b>Course code</b>	<b>CO Statement</b>
1	R23ES07	Read, understand, and trace the execution of programs written in C language.
2	R23ES07	Select the right control structure for solving the problem.
3	R23ES07	Develop C programs which utilize memory efficiently using programming constructs like pointers.
4	R23ES07	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

### **HEALTH AND WELLNESS, YOGA AND SPORTS**

At the end of the course student should be able to:

<b>S.no</b>	<b>Course code</b>	<b>CO Statement</b>
1	R23MC01	Understand the importance of yoga and sports for Physical fitness and sound health.
2	R23MC01	Demonstrate an understanding of health-related fitness components.
3	R23MC01	Compare and contrast various activities that help enhance their health.
4	R23MC01	Assess current personal fitness levels.
5	R23MC01	Develop Positive Personality



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**I Year II semester**

**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**

At the end of the course student should be able to:

S.no	Course code	CO Statement
1	R23BS02	Solve the differential equations related to various engineering fields.
2	R23BS02	Model engineering problems as higher order differential equations and solve analytically.
3	R23BS02	Identify solution methods for partial differential equations that model physical processes.
4	R23BS02	Interpret the physical meaning of different operators such as gradient, curl and divergence.
5	R23BS02	Estimate the work done against a field, circulation and flux using vector calculus.

**CHEMISTRY**

At the end of the course student should be able to:

S.no	Course code	CO Statement
1	R23BS05	Compare the materials of construction for battery and electrochemical sensors
2	R23BS05	Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers
3	R23BS05	Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.
4	R23BS05	Apply the principle of Band diagrams in the application of conductors and semiconductors.
5	R23BS05	Summarize the concepts of Instrumental methods.

**ENGINEERING GRAPHICS**

At the end of the course student should be able to:

S.no	Course code	CO Statement
1	R23ES03	Compare the materials of construction for battery and electrochemical sensors
2	R23ES03	Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers
3	R23ES03	Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.
4	R23ES03	Apply the principle of Band diagrams in the application of conductors and semiconductors.
5	R23ES03	Summarize the concepts of Instrumental methods.



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### **BASIC ELECTRICAL & ELECTRONICS ENGINEERING**

At the end of the course student should be able to:

<b>S. NO.</b>	<b>Course code</b>	<b>CO Statement</b>
1	R23ES04	Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
2	R23ES04	Understand the problem-solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.
3	R23ES04	Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.
4	R23ES04	Analyse different electrical circuits, performance of machines and measuring instruments.
5	R23ES04	Evaluate different circuit configurations, Machine performance and Power systems operation.

### **DATA STRUCTURES**

At the end of the course student should be able to:

<b>S. NO.</b>	<b>Course code</b>	<b>CO Statement</b>
1	R23PC04	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
2	R23PC04	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
3	R23PC04	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
4	R23PC04	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between dequeues and priority queues, and apply them appropriately to solve data management challenges.
5	R23PC04	Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees
6	R23PC04	Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.



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### **CHEMISTRY LAB**

At the end of the course student should be able to:

<b>S. NO.</b>	<b>Course code</b>	<b>CO Statement</b>
1	R23BS05	Determine the cell constant and conductance of solutions.
2	R23BS05	Prepare advanced polymer Bakelite materials.
3	R23BS05	Measure the strength of an acid present in secondary batteries.
4	R23BS05	Analyse the IR spectra of some organic compounds.
5	R23BS05	Calculate strength of acid in Pb-Acid battery.

### **BASIC ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP**

At the end of the course student should be able to:

<b>S. NO.</b>	<b>Course code</b>	<b>CO Statement</b>
1	R23ES05	Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.
2	R23ES05	Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.
3	R23ES05	Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.
4	R23ES05	Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.
5	R23ES05	Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

### **DATA STRUCTURES LAB**

At the end of the course student should be able to:

<b>S. NO.</b>	<b>Course code</b>	<b>CO Statement</b>
1	R23PC04	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
2	R23PC04	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
3	R23PC04	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.



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4	R23PC04	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.
5	R23PC04	Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees
6	R23PC04	Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

**NSS/NCC/SCOUTS & GUIDES/ COMMUNITY SERVICE**

At the end of the course student should be able to:

S. NO.	Course code	CO Statement
1	R23MC02	Understand the importance of discipline, character and service motto.
2	R23MC02	Solve some societal issues by applying acquired knowledge, facts, and techniques.
3	R23MC02	Explore human relationships by analyzing social problems.
4	R23MC02	Determine to extend their help for the fellow beings and downtrodden people.
5	R23MC02	Develop leadership skills and civic responsibilities.

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**  
**COURSE OUTCOME (R-20)**

**II Year I semester**

**MATHEMATICS III**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021011	Interpret the physical meaning of different operators such as gradient, curl and divergence
2	R2021011	Estimate the work done against a field, circulation and flux using vector calculus
3	R2021011	Apply the Laplace transform for solving differential equations
4	R2021011	Find or compute the Fourier series of periodic signals
5	R2021011	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms
6	R2021011	Identify solution methods for partial differential equations that model physical processes



## OBJECT ORIENTED PROGRAMMING THROUGH C++

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021051	Classify object oriented programming and procedural programming
2	R2021051	Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
3	R2021051	Build C++ classes using appropriate encapsulation and design principles
4	R2021051	Apply object oriented or non-object oriented techniques to solve bigger computing problems

## OPERATING SYSTEMS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021052	Describe various generations of Operating System and functions of Operating System
2	R2021052	Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
3	R2021052	Solve Inter Process Communication problems using Mathematical Equations by various methods
4	R2021052	Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
5	R2021052	Outline File Systems in Operating System like UNIX/Linux and Windows

## SOFTWARE ENGINEERING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021053	Ability to transform an Object-Oriented Design into high quality, executable code
2	R2021053	Skills to design, implement, and execute test cases at the Unit and Integration level
3	R2021053	Compare conventional and agile software methods



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**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021054	Demonstrate skills in solving mathematical problems
2	R2021054	Comprehend mathematical principles and logic
3	R2021054	Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
4	R2021054	Manipulate and analyze data numerically and/or graphically using appropriate Software
5	R2021054	Communicate effectively mathematical ideas/results verbally or in writing

**OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021055	Apply the various OOPs concepts with the help of programs.

**OPERATING SYSTEMS LAB**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021056	To use Unix utilities and perform basic shell control of the utilities
2	R2021056	To use the Unix file system and file access control
3	R2021056	To use of an operating system to develop software
4	R2021056	Students will be able to use Linux environment efficiently
5	R2021056	Solve problems using bash for shell scripting

**SOFTWARE ENGINEERING LAB**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021057	By the end of this lab the student is able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project
2	R2021057	prepare SRS document, design document, test cases and software configuration management and risk management related document.
3	R2021057	develop function oriented and object oriented software design using tools like rational rose
4	R2021057	use modern engineering tools necessary for software project management, estimations, time management and software reuse
5	R2021057	generate test cases for software testing



## SKILL ORIENTED COURSE I

### WEB APPLICATION DEVELOPMENT USING FULL STACK - MODULE 1

Sno	Course code	CO Statement
1	R2021059	Explain how data is collected, managed and stored for processing
2	R2021059	Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems
3	R2021059	Understand how to apply some linear algebra operations to n-dimensional arrays
4	R2021059	Use NumPy perform common data wrangling and computational tasks in Python.

## II Year II semester

### PROBABILITY AND STATISTICS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2022051	Classify the concepts of data science and its importance
2	R2022051	Interpret the association of characteristics and through correlation and regression tools
3	R2022051	Make use of the concepts of probability and their applications
4	R2022051	Apply discrete and continuous probability distributions
5	R2022051	Design the components of a classical hypothesis test
6	R2022051	Infer the statistical inferential methods based on small and large sampling tests

### DATABASE MANAGEMENT SYSTEMS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2022052	Describe a relational database and object-oriented database
2	R2022052	Create, maintain and manipulate a relational database using SQL
3	R2022052	Describe ER model and normalization for database design
4	R2022052	Examine issues in data storage and query processing and can formulate appropriate solutions
5	R2022052	Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage



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### **FORMAL LANGUAGES AND AUTOMATA THEORY**

At the end of the course student should be able

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R2022053	Classify machines by their power to recognize languages
2	R2022053	Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
3	R2022053	Employ finite state machines to solve problems in computing
4	R2022053	Illustrate deterministic and non-deterministic machines
5	R2022053	Quote the hierarchy of problems arising in the computer science

### **JAVA PROGRAMMING**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R2022054	To identify Java language components and how they work together in applications
2	R2022054	To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3	R2022054	To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4	R2022054	To understand how to design applications with threads in Java
5	R2022054	To understand how to use Java APIs for program development

### **MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R2022051	The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
2	R2022051	The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
3	R2022051	The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
4	R2022051	The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
5	R2022051	The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making



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### **DATABASE MANAGEMENT SYSTEMS LAB**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R2022056	Utilize SQL to execute queries for creating database and performing data manipulation operations
2	R2022056	Examine integrity constraints to build efficient databases
3	R2022056	Apply Queries using Advanced Concepts of SQL
4	R2022056	Build PL/SQL programs including stored procedures, functions, cursors and triggers

### **R PROGRAMMING LAB**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R2022057	Access online resources for R and import new function packages into the R workspace
2	R2022057	Import, review, manipulate and summarize data-sets in R
3	R2022057	Explore data-sets to create testable hypotheses and identify appropriate statistical tests
4	R2022057	Perform appropriate statistical tests using R
5	R2022057	Create and edit visualizations with R

### **JAVA PROGRAMMING LAB**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R2022058	Evaluate default value of all primitive data type, Operations, Expressions, Controlflow, Strings
2	R2022058	Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
3	R2022058	Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
4	R2022058	Construct Threads, Event Handling, implement packages, developing applets

### **SKILL ORIENTED COURSE II**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R202205A	Use language fluently, accurately and appropriately Inundates and group discussions
2	R202205A	Use their skills of listening comprehension to communicate effectively



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		incross-cultural contexts. CO5 Exhibit interview skills and develop soft skills
3	R202205A	Learn and use new vocabulary. CO 4 Write resumes, project reports and reviews.
4	R202205A	Write resumes, project reports and reviews.
5	R202205A	Exhibit interview skills and develop soft

### III Year I semester

#### DIGITAL LOGIC DESIGN

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031040	Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards
2	R2031040	Discuss different transmission media and different switching networks.
3	R2031040	Analyse data link layer services, functions and protocols like HDLC and PPP.
4	R2031040	Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocol
5	R2031040	Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc

#### COMPUTER NETWORKS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031051	Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
2	R2031051	Discuss different transmission media and different switching networks.
3	R2031051	Analyse data link layer services, functions and protocols like HDLC and PPP



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4	R2031051	Compare and classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
5	R2031051	Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

### DESIGN AND ANALYSIS OF ALGORITHMS

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2031052	Analyse the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
2	R2031052	List and describe various algorithmic approaches and Solve problems using divide and conquer & greedy Method
3	R2031052	Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
4	R2031052	Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
5	R2031052	Demonstrate NP- Completeness theory ,lower bound theory and String Matching

### DATA WAREHOUSE AND DATA MINING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031053	Illustrate the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications.
2	R2031053	Demonstrate on various Data Preprocessing Techniques viz. data cleaning, data integration, data transformation and data reduction and Process raw data to make it suitable for various data mining algorithms
3	R2031053	Choose appropriate classification technique to perform classification, model building and evaluation
4	R2031053	Make use of association rule mining techniques viz. Apriori and FP



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		Growth algorithms and analyze on frequent itemsets generation
5	R2031053	Identify and apply various clustering algorithm (with open source tools), interpret, evaluate and report the result

### **SOFTWARE PROJECT MANAGEMENT**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R2031058	Apply the process to be followed in the software development life-cycle models
2	R2031058	Apply the concepts of project management & planning
3	R2031058	Implement the project plans through managing people, communications and change
4	R2031058	Conduct activities necessary to successfully complete and close the Software projects
5	R2031058	Implement communication, modelling, and construction & deployment practices in software development

### **DATA WAREHOUSE AND DATA MINING LAB**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R2031054	Design a data mart or data warehouse for any organization
2	R2031054	Extract knowledge using data mining techniques and enlist various algorithms used in information analysis of Data Mining Techniques
3	R2031054	Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data
4	R2031054	Implement and Analyze on knowledge flow application on data sets and Apply the suitable visualization techniques to output analytical results

### **COMPUTER NETWORKS LAB**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R2031055	Know how reliable data communication is achieved through data link layer.
2	R2031055	Suggest appropriate routing algorithm for the network.
3	R2031055	Provide internet connection to the system and its installation.



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4	R2031055	Work on various network management tools
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**CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DEVOPS**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031057	Understand the why, what and how of DevOps adoption
2	R2031057	Attain literacy on Devops
3	R2031057	Align capabilities required in the team
4	R2031057	Create an automated CICD pipeline using a stack of tools

**EMPLOYABILITY SKILLS-I**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031058	Understand the corporate etiquette.
2	R2031058	Make presentations effectively with appropriate body language
3	R2031058	Be composed with positive attitude
4	R2031058	Understand the core competencies to succeed in professional and personal life

**SUMMER INTERNSHIP 2 MONTHS(MANDATORY) AFTER SECOND YEAR(TO BE EVOLUTED DURING V SEMISTER)**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031059	
2	R2031059	
3	R2031059	

**III Year II semester**

**MACHINE LEARNING**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2032051	Explain the fundamental usage of the concept Machine Learning system
2	R2032051	Demonstrate on various regression Technique



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3	R2032051	Analyze the Ensemble Learning Methods
4	R2032051	Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning
5	R2032051	Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

### COMPILER DESIGN

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2032052	Demonstrate phases in the design of compiler
2	R2032052	Organize Syntax Analysis, Top Down and LL(1) grammars
3	R2032052	Design Bottom Up Parsing and Construction of LR parser
4	R2032052	Analyse synthesized, inherited attributes and syntax directed translation schemes
5	R2032052	Determine algorithms to generate code for a target machine

### CROPTOGRAPHY AND NETWORK SECURITY

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2032053	Explain different security threats and countermeasures and foundation course of cryptography mathematics.
2	R2032053	Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
3	R2032053	Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
4	R2032053	Design applications of hash algorithms, digital signatures and key management techniques
5	R2032053	Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec

### MOBILE COMPUTING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R203205A	Develop a strong grounding in the fundamentals of mobile Networks



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2	R203205A	Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network
3	R203205A	Comprehend, design, and develop a lightweight network stack
4	R203205A	Analyse the Mobile Network Layer system working
5	R203205A	Explain about the WAP Model

### **BASIC ELECTRONICS**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R203204P	study the basics of semiconductor and their properties. By studying PN diodes, one gains insight into semiconductor physics, electronic device behaviour, and their vast applications in modern technology
2	R203204P	Acquire knowledge of BJT and working principle
3	R203204P	To explain construction and characteristics of JFET and MOSFET
4	R203204P	To study the application of Diac, Triac, SCR and IGBT in industrial and power electronics based on its operating.

### **MACHINE LEARNING USING PYTHON LAB**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R2032054	Implement procedures for the machine learning algorithms
2	R2032054	Design and Develop Python programs for various Learning algorithms
3	R2032054	Apply appropriate data sets to the Machine Learning algorithms
4	R2032054	Develop Machine Learning algorithms to solve real world problems

### **COMPILER DESIGN LAB**

At the end of the course student should be able to

<b>Sno</b>	<b>Course code</b>	<b>CO Statement</b>
1	R2032055	Design simple lexical analyzers
2	R2032055	Determine predictive parsing table for a CFG
3	R2032055	Apply Lex and Yacc tools
4	R2032055	Examine LR parser and generating SLR Parsing table
5	R2032055	Relate Intermediate code generation for subset C language



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**CROPTOGRAPHY AND NETWORK SECURITY LAB**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2032056	Apply the knowledge of symmetric cryptography to implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher
2	R2032056	Demonstrate the different algorithms like DES, BlowFish, and Rijndael, encrypt the text "Hello world" using Blowfish Algorithm
3	R2032056	Analyze and implement public key algorithms like RSA, Diffie-Hellman Key Exchange mechanism, the message digest of a text using the SHA-1 algorithm

**EMPLOYABILITY SKILLS-II**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2032059	Solve various Basic Mathematics problems by following different methods
2	R2032059	Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
3	R2032059	Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
4	R2032059	Analyze, summarize and present information in quantitative forms including table, graphs and formulas

**SKILL ORIENTED COURSE IV MEAN STACK TECHNOLOGIES-  
MODULE I HTML 5 JAVASCRIPT ,NODE JS ,EXPRESS JS**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2032058	Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles
2	R2032059	Utilize JavaScript for developing interactive HTML web pages and validate form data.
3	R2032059	Build a basic web server using Node.js and also working with Node Package Manager (NPM).
4	R2032059	Build a web server using Express.js



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5	R2032059	Make use of Typescript to optimize JavaScript code by using the concept of strict type checking
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#### IV Year I semester

#### UNIVERSAL HUMAN VALUES-2 UNDERSTANDING HARMONY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2041011	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2	R2041011	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3	R2041011	Strengthening of self-reflection
4	R2041011	Development of commitment and courage to act.

#### FUNDAMENTALS OF MICROPROCESSOR AND MICROCONTROLLERS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R204104Q	Understand the architecture of Microprocessor/Microcontroller and their operation
2	R204104Q	Demonstrate programming skills in assembly language for processors and controllers
3	R204104Q	Analyze various interfacing and apply them for the design of processor / controller based systems.
4	R204104Q	Describe architecture and PIN diagram of microcontroller 8051
5	R204104Q	Demonstrate the assembly language programming of microcontroller.

#### IOT AND APPLICATIONS

At the end of the course student should be able

Sno	Course code	CO Statement
1	R204104Q	Explain in a concise manner how the general Internet as well as Internet



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		of Things work
2	R204104Q	Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
3	R204104Q	Use basic sensing and measurement and tools to determine the real-time performance of network of devices.
4	R204104Q	Develop prototype models for various applications using IoT technology.

### **CLOUD COMPUTING**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R204105A	Illustrate the key dimensions of the challenge of Cloud Computing
2	R204105A	Classify the Levels of Virtualization and mechanism of tools
3	R204105A	Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
4	R204105A	Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
5	R204105A	Assess control storage systems and cloud security, the risks involved its impact and develop cloud application

### **INDUSTRIAL RESEARCH INTERNSHIP**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2041055	
2	R2041055	
3	R2041055	
4	R2041055	

### **DEEP LEARNING TECHNOLOGIES**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R204105E	Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.
2	R204105E	Discuss the Neural Network training, various random models.
3	R204105E	Explain the Techniques of Keras, TensorFlow, Theano and CNTK
4	R204105E	Classify the Concepts of CNN and RNN
5	R204105E	Implement Interactive Applications of Deep Learning



## WIRELESS NETWORK SECURITY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R204105J	Explain the Threats in networks and provide Authentication to real time problems
2	R204105J	Identify and investigate in-depth both early and contemporary threats to wireless networks security
3	R204105J	Ability to analyze and determine for any organization the database security requirements and appropriate solutions
4	R204105J	Determined IP Security Issues and solve real time problems.
5	R204105J	Build wireless Development Strategies in real time issues

## MEAN STACK TECHNOLOGIES MODULE-II ANGULAR JS AND MANGO DB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2041053	Build a component-based application using Angular components and enhance their functionality using directives.
2	R2041053	Utilize data binding for developing Angular forms and bind them with model data.
3	R2041053	Apply Angular built-in or custom pipes to format the rendered data.
4	R2041053	Develop a single page application by using synchronous or asynchronous Angular routing.
5	R2041053	Make use of MongoDB queries to perform CRUD operations on document database.

  
HOD

  
PRINCIPAL  
Principal  
Avanthi Institute of Engg. & Technology  
Tamaram, Makavarapalem Md.,  
District., Pin: 531 113



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Tamaram, Makavarapalem, Narsipatnam(R.D), Visakhapatnam Dist-531113

### DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING) COURSE OUTCOME (R-23)

**I Year I semester**

#### **LINEAR ALGEBRA & CALCULUS**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231101	Develop matrix algebra techniques that is needed by engineers for practical applications
2	R231101	To find the eigen values and eigen vectors and solve the problems by using linear transformation
3	R231101	Learn important tools of calculus in higher dimensions
4	R231101	Familiarize with functions of several variables which is useful in optimization.
5	R231101	Familiarize with double and triple integrals of functions of several variables in two and three dimensions

#### **ENGINEERING PHYSICS**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231102	Analyze the intensity variation of light due to polarization, interference and diffraction.
2	R231102	Familiarize with the basics of crystals and their structures.
3	R231102	Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.
4	R231102	Summarize various types of polarization of dielectrics and classify the magnetic materials.
5	R231102	Explain the basic concepts of Quantum Mechanics and the band theory of solids.
6	R231102	Identify the type of semiconductor using Hall effect.



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### COMMUNICATIVE ENGLISH

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231103	how to understand the context, topic, and specific information from social or transactional dialogues.
2	R231103	Remedially learn applying grammatical structures to formulate sentence sand use appropriate words and correct word forms.
3	R231103	Using discourse markers to speak clearly on a specific topic in formal as well as informal discussions.(not required)
4	R231103	Improved communicative competence in formal and informal contexts and for social and academic purposes
5	R231103	Critically comprehending and appreciating reading /listening texts and to write summaries based on global comprehension of these texts
6	R231103	Writing coherent paragraphs essays, letters/e-mails and resume.

### BASIC CIVIL & MECHANICAL ENGINEERING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231104	Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society
2	R231104	Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying
3	R231104	Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.
4	R231104	Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.
5	R231104	Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.



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### INTRODUCTION TO PROGRAMMING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231105	Illustrate the Fundamental concepts of Computers and basics of computer programming and problem-solving approach
2	R231105	Understand the Control Structures, branching and looping statements
3	R231105	Use of Arrays and Pointers in solving complex problems.
4	R231105	Develop Modular program aspects and Strings fundamentals.
5	R231105	Demonstrate the ideas of User Defined Data types, files. Solve real world problems using the concept of Structures, Unions and File operations.

### COMMUNICATIVE ENGLISH LAB:

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231109	Understand the different aspects of the English language oral communication with emphasis on Listening and Speaking S skills
2	R231109	Apply communication skills through various language learning activities.
3	R231109	Analyze the English speech sounds, stress, rhythm and intonation for better listening and speaking comprehension
4	R231109	Evaluate and exhibit professionalism in participating in debates and group discussions with polite turn taking strategies and sound more professional while communicating with others
5	R231109	Create effective resonance and prepare them to face interviews communicate appropriately in corporate settings.

### ENGINEERING PHYSICS LAB:

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231110	Operate optical instruments like travelling microscope and spectrometer.
2	R231110	Estimate the wavelengths of different colours using diffraction grating.
3	R231110	Plot the intensity of the magnetic field of circular coil carrying current with distance
4	R231110	Evaluate dielectric constant and magnetic susceptibility for



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		dielectric and magnetic materials respectively.
5	R231110	Calculate the band gap of a given semiconductor.
6	R231110	Identify the type of semiconductor using Hall effect.

### ENGINEERING WORKSHOP

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231111	Identify workshop tools and their operational capabilities.
2	R231111	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
3	R231111	Apply fitting operations in various applications.
4	R231111	Apply basic electrical engineering knowledge for House Wiring Practice

### COMPUTER PROGRAMMING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231105	Read, understand, and trace the execution of programs written in C language.
2	R231105	Select the right control structure for solving the problem.
3	R231105	Develop C programs which utilize memory efficiently using programming constructs like pointers.
4	R231105	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C

### HEALTH AND WELLNESS, YOGA AND SPORTS:

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23MC01	Read, understand, and trace the execution of programs written in C language.
2	R23MC01	Select the right control structure for solving the problem.
3	R23MC01	Develop C programs which utilize memory efficiently using programming constructs like pointers.
4	R23MC01	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C



### I Year II semester

### DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231201	solve the differential equations related to various engineering fields.
2	R231201	model engineering problems as higher order differential equations and solve analytically.
3	R231201	identify solution methods for partial differential equations that model physical processes.
4	R231201	interpret the physical meaning of different operators such as gradient, curl and divergence.
5	R231201	estimate the work done against a field, circulation and flux using vector calculus.

### CHEMISTRY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231204	Compare the materials of construction for battery and electrochemical sensors.
2	R231204	Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.
3	R231204	Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.
4	R231204	Apply the principle of Band diagrams in the application of conductors and semiconductors.
5	R231204	Summarize the concepts of Instrumental methods.

### ENGINEERING GRAPHICS :

At the end of the course student should be able

Sno	Course code	CO Statement
1	R23ES03	Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
2	R23ES03	Draw and interpret orthographic projections of points, lines, planes and



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		solids in front, top and side views.
3	R23ES03	Understand and draw projection of solids in various positions in first quadrant.
4	R23ES03	Explain principles behind development of surfaces.
5	R23ES03	Prepare isometric and perspective sections of simple solids.

### BASIC ELECTRICAL & ELECTRONICS ENGINEERING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23ES04	Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
2	R23ES04	Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.
3	R23ES04	Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.
4	R23ES04	Analyze different electrical circuits, performance of machines and measuring instruments. Evaluate different circuit configurations, Machine performance and Power systems operation.

### DATA STRUCTURES

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23PC04	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms. Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
2	R23PC04	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems. Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.



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3	R23PC04	Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.
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### APPLIED CHEMISTRY LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23BS05	Determine the cell constant and conductance of solutions. Prepare advanced polymer Bakelite materials. Measure the strength of an acid present in secondary batteries. Analyse the IR spectra of some organic compounds. Calculate strength of acid in Pb-Acid battery.

### ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23ES05	Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.
2	R23ES05	Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.
3	R23ES05	Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.
4	R23ES05	Analyse various characteristics of electrical circuits, electrical machines and measuring instruments. Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring

### DATA STRUCTURES LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23PC04	Understand the significance of linear data structures in problem-solving and basic time/space complexity analysis. 1.5 Create and manage linked lists to efficiently organize and manipulate data, emphasizing memory efficiency.



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2	R23PC04	Implement and apply stacks to manage program flow and solve problems involving expression evaluation and backtracking. Utilize queues to model real-world scenarios, such as process scheduling and breadth first search algorithms and understand the versatility of deques and prioritize data management using priority queues.
3	R23PC04	Impart basic understanding of non-linear data structures such as trees. Explore basic concepts of hashing and apply it to solve problems requiring fast data retrieval and management.

### NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23MC02	Understand the importance of discipline, character and service motto. Solve some societal issues by applying acquired knowledge, facts, and techniques. Explore human relationships by analyzing social problems. Determine to extend their help for the fellow beings and downtrodden people. Develop leadership skills and civic responsibilities.

### DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

#### COURSE OUTCOME (R-20)

#### II Year I semester MATHEMATICS -III

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021011	Interpret the physical meaning of different operators such as gradient, curl and divergence
2	R2021011	Estimate the work done against a field, circulation and flux using vector calculus (L5)
3	R2021011	Apply the Laplace transform for solving differential equations (L3)
4	R2021011	Find or compute the Fourier series of periodic signals (L3)
5	R2021011	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
6	R2021011	Identify solution methods for partial differential equations that



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		model physical processes (L3)
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### MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021054	Demonstrate skills in solving mathematical problems
2	R2021054	Comprehend mathematical principles and logic
3	R2021054	Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
4	R2021054	Manipulate and analyze data numerically and/or graphically using appropriate Software
5	R2021054	Communicate effectively mathematical ideas/results verbally or in writing

### INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021422	Enumerate the history and foundations of Artificial Intelligence.
2	R2021422	Apply the basic principles of AI in problem solving
3	R2021422	Choose the appropriate representation of Knowledge
4	R2021422	Enumerate the Perspectives and Issues in Machine Learning
5	R2021422	Identify issues in Decision Tree Learning

### DATABASE MANAGEMENT SYSTEMS

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021121	Describe a relational database and object-oriented database



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2	R2021121	Create, maintain and manipulate a relational database using SQL
3	R2021121	Describe ER model and normalization for database design
4	R2021121	Examine issues in data storage and query processing and can formulate appropriate solutions
5	R2021121	Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

## OBJECT ORIENTED PROGRAMMING WITH JAVA

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021422	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
2	R2021422	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
3	R2021422	Apply the concept of exception handling and Input/ Output operations
4	R2021422	Able to design the applications of Java & Java applet
5	R2021422	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

## OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021424	Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism Illustrating simple inheritance, multi-level inheritance, Handling, implement packages, developing applets

## INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB

At the end of the course student should be able to



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Sno	Course code	CO Statement
1	R2021423	Apply the basic principles of AI in problem solving using LISP/PROLOG
2	R2021423	Implement different algorithms using LISP/PROLOG
3	R2021423	Develop an Expert System using JESS/PROLOG

### DATABASE MANAGEMENT SYSTEMS LAB

At the end of the course student should be able to

Sno	R2021123	CO Statement
1	R2021123	Utilize SQL to execute queries for creating database and performing data manipulation operations
2	R2021123	Examine integrity constraints to build efficient databases
3	R2021123	Apply Queries using Advanced Concepts of SQL
4	R2021123	Build PL/SQL programs including stored procedures, functions, cursors and triggers

### MOBILE APP DEVELOPMENT:

At the end of the course student should be able to

Sno	Course Code	Co statement
1	R2021425	Identify various concepts of mobile programming that make it unique from programming for other platforms
2	R2021425	Critique mobile applications on their design pros and cons Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
3	R2021425	Program mobile applications for the Android operating system that use basic and advanced phone features and
4	R2021425	Deploy applications to the Android marketplace for distribution.

### II Year - II Semester

### PROBABILITY AND STATISTICS

At the end of the course the student able to



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S.No	Course code	CO Statement
1	R2022051	Classify the concepts of data science and its importance (L4) or (L2)
2	R2022051	Interpret the association of characteristics and through correlation and regression tools (L4)
3	R2022051	Make use of the concepts of probability and their applications (L3)
4	R2022051	Apply discrete and continuous probability distributions (L3)
5	R2022051	Design the components of a classical hypothesis test (L6)
6	R2022051	Infer the statistical inferential methods based on small and large sampling tests (L4)

### COMPUTER ORGANIZATION

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2022421	Develop a detailed understanding of computer systems
2	R2022421	Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
3	R2022421	Develop a detailed understanding of architecture and functionality of central processing unit
4	R2022421	Exemplify in a better way the I/O and memory organization
5	R2022421	Illustrate concepts of parallel processing, pipelining and inter processor communication

### FORMAL LANGUAGES AND AUTOMATA THEORY

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2022053	Classify machines by their power to recognize languages
2	R2022053	Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
3	R2022053	Employ finite state machines to solve problems in computing
4	R2022053	Illustrate deterministic and non-deterministic machines
5	R2022053	Quote the hierarchy of problems arising in the computer science

### DATA WAREHOUSING AND MINING

At the end of the course student should be able



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S.No	Course code	CO Statement
1	R2022421	Summarize the architecture of data warehouse
2	R2022421	Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data.
3	R2022421	Construct a decision tree and resolve the problem of model over fitting
4	R2022421	Compare Apriori and FP-growth association rule mining algorithms for frequent item set generation
5	R2022421	Apply suitable clustering algorithm for the given data set

### MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2022055	The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
2	R2022055	The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
3	R2022055	The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
4	R2022055	The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
5	R2022055	The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

### R PROGRAMMING LAB

At the end of the course student should be able



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S.No	Course code	CO Statement
1	R2022423	Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming.
2	R2022423	Implement the concepts of R Script to extract the data from data frames and file operations. Implement the various statistical techniques using R.
3	R2022423	Extend the functionality of R by using add-on packages
4	R2022423	Use R Graphics and Tables to visualize results of various statistical operations on data

### NATURAL LANGUAGE PROCESSING WITH PYTHIN LAB

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2022426	Installing and configuring mongo DB in windows
2	R2022426	Perform all database operations using mongo DB
3	R2022426	Develop applications by integrating mongoDB with java/PHP

### DATA MINING USING PYTHON LAB

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2022424	Apply preprocessing techniques on real world datasets
2	R2022424	Apply apriori algorithm to generate frequent itemsets.
3	R2022424	<b>Apply Classification and clustering algorithms on different datasets.</b>

### WEB APPLICATION DEVELOPMENT LAB

At the end of the course student should be able



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S.No	Course code	CO Statement
1	R2022425	Develop Single Page Applications
2	R2022425	Develop NodeJS & ReactJS Reusable Service
3	R2022425	Store the data in MySQL
4	R2022425	Get acquainted with the latest web application development trends in the IT industry

### III Year I semester

#### COMPILER AND DESIGN

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031421	Demonstrate phases in the design of compiler
2	R2031421	Organize Syntax Analysis, Top Down and LL(1) grammars
3	R2031421	Design Bottom Up Parsing and Construction of LR parsers
4	R2031421	Analyze synthesized, inherited attributes and syntax directed translation schemes
5	R2031421	Determine algorithms to generate code for a target machine

#### MACHINE LEARNING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031423	Explain the fundamental usage of the concept Machine Learning system
2	R2031423	Demonstrate on various regression Technique
3	R2031423	Analyze the Ensemble Learning Methods
4	R2031423	Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
5	R2031423	Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

#### OPERATING SYSTEMS

At the end of the course student should be able to



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Sno	Course code	CO Statement
1	R2031422	Describe various generations of Operating System and functions of Operating System
2	R2031422	Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
3	R2031422	Solve Inter Process Communication problems using Mathematical Equations by various methods
4	R2031422	Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
5	R2031422	Outline File Systems in Operating System like UNIX/Linux and Windows

### SOFTWARE ENGINEERING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R203142A	Ability to transform an Object-Oriented Design into high quality, executable code
2	R203142A	Skills to design, implement, and execute test cases at the Unit and Integration level
3	R203142A	Compare conventional and agile software methods

### FUNDAMENTALS OF MICROPROCESSOR AND MICROCONTROLLER

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031041	Understand the architecture of Microprocessor/Microcontroller and their operation
2	R2031041	Demonstrate programming skills in assembly language for processors and controllers
3	R2031041	Analyze various interfacing and apply them for the design of processor / controller based systems.
4	R2031041	Describe architecture and PIN diagram of microcontroller 8051
5	R2031041	Demonstrate the assembly language programming of microcontroller.

### MACHINE LEARNING LAB



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At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031425	Implement procedures for the machine learning algorithms
2	R2031425	Design and Develop Python programs for various Learning algorithms
3	R2031425	Apply appropriate data sets to the Machine Learning algorithms
4	R2031425	Develop Machine Learning algorithms to solve real world problems

### OPERATING SYSTEMS & COMPILER DESIGN LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031424	Implement various scheduling, page replacement algorithms and algorithms related to deadlocks
2	R2031424	Design programs for shared memory management and semaphores
3	R2031424	Determine predictive parsing table for a CFG
4	R2031424	Apply Lex and Yacc tools
5	R2031424	Examine LR parser and generating SLR Parsing table

### CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DEVOPS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031057	Understand the why, what and how of DevOps adoption
2	R2031057	Attain literacy on Devops
3	R2031057	Align capabilities required in the team .
4	R2031057	Create an automated CICD pipeline using a stack of tools

### EMPLOYABILITY SKILLS-I

Sno	Course code	CO Statement
1	R2031058	Understand the corporate etiquette.
2	R2031058	Make presentations effectively with appropriate body language
3	R2031058	Be composed with positive attitude
4	R2031058	Understand the core competencies to succeed in professional and personal life



### III Year II semester

#### COMPUTER NETWORKS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2032421	Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
2	R2032421	Discuss different transmission media and different switching networks.
3	R2032421	Analyze data link layer services, functions and protocols like HDLC and PPP
4	R2032421	Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
5	R2032421	Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

#### DEEP LEARNING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2032422	Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.
2	R2032422	Discuss the Neural Network training, various random models.
3	R2032422	Explain the Techniques of Keras, TensorFlow, Theano and CNTK
4	R2032422	Classify the Concepts of CNN and RNN
5	R2032422	Implement Interactive Applications of Deep Learning.

#### DESIGN AND ANALYSIS OF ALGORITHMS

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2032423	Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
2	R2032423	List and describe various algorithmic approaches and Solve problems using divide and conquer



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		&greedy Method
3	R2032423	Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
4	R2032423	Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
5	R2032423	Demonstrate NP- Completeness theory ,lower bound theory and String Matching

### SOFTWARE PROJECT MANAGEMENT

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R203242A	Apply the process to be followed in the software development life-cycle models
2	R203242A	Apply the concepts of project management & planning
3	R203242A	Implement the project plans through managing people, communications and change
4	R203242A	Conduct activities necessary to successfully complete and close the Software projects
5	R203242A	Implement communication, modeling, and construction & deployment practices in software development

### BASIC ELECTRONICS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R203204P	study the basics of semiconductor and their properties. By studying PN diodes, one gains insight into semiconductor physics, electronic device behaviour, and their vast applications in modern technology
2	R203204P	Acquire knowledge of BJT and working principle
3	R203204P	To explain construction and characteristics of JFET and MOSFET
4	R203204P	To study the application of Diac, Triac, SCR and IGBT in industrial and power electronics based on its operating.

### MEAN STACK DEVELOPMENT

At the end of the course student should be able to



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Sno	Course code	CO Statement
1	R2032058	Build static web pages using HTML 5 elements
2	R2032058	Apply JavaScript to embed programming interface for web pages and also to perform Client side validations.
3	R2032058	Build a basic web server using Node.js, work with Node Package Manager (NPM) and recognize the need for Express.js.
4	R2032058	Develop JavaScript applications using typescript and work with document database using MongoDB.
5	R2032058	Utilize Angular JS to design dynamic and responsive web pages.

### COMPUTER NETWORKS LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2032424	Know how reliable data communication is achieved through data link layer.
2	R2032424	Suggest appropriate routing algorithm for the network.
3	R2032424	Provide internet connection to the system and its installation.
4	R2032424	Work on various network management tools

### ALGORITHMS FOR EFFICIENT CODING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2032425	Analyze the program execution time

### DEEP LEARNING WITH TENSORFLOW

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2032426	Implement deep neural networks to solve real world problems
2	R2032426	Choose appropriate pre-trained model to solve real time problem
3	R2032426	Interpret the results of two different deep learning models

**IV Year I semester**



## CRYPTOGRAPHY AND NETWORK SECURITY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R204105Y	Explain different security threats and countermeasures and foundation course of cryptography mathematics.
2	R204105Y	Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
3	R204105Y	Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
4	R204105Y	Design applications of hash algorithms, digital signatures and key management techniques
5	R204105Y	Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL, TSL, and IPsec .

## CLOUD COMPUTING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R204142O	Illustrate the key dimensions of the challenge of Cloud Computing
2	R204142O	Classify the Levels of Virtualization and mechanism of tools.
3	R204142O	Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
4	R204142O	Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
5	R204142O	Assess control storage systems and cloud security, the risks involved its impact and develop cloud application

## FUNDAMENTALS OF MICROPROCESSOR AND MICROCONTROLLER

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R204104O	Understand the architecture of Microprocessor/Microcontroller and their operation
2	R204104O	Demonstrate programming skills in assembly language for processors and controllers
3	R204104O	Analyze various interfacing and apply them for the design of



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		processor / controller based systems.
4	R204104O	Describe architecture and PIN diagram of microcontroller 8051
5	R204104O	Demonstrate the assembly language programming of microcontroller.

### UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R20410411	This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as “H-102 Universal Human Values 2: Understanding Harmony” is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

### OBJECT ORIENTED ANALYSIS AND DESIGN

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R204142J	Become familiar with all phases of OOAD.
2	R204142J	Master the main features of the UML.
3	R204142J	Master the main concepts of Object Technologies and how to apply them at work and develop the ability to analyze and solve challenging problem in various domains.
4	R204142J	Learn the Object design Principles and understand how to apply them towards Implementation.



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### MEAN STACK TECHNOLOGIES-MODULE II- ANGULAR JS AND MONGODB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R204142M	Build a component-based application using Angular components and enhance their functionality using directives.
2	R204142M	Utilize data binding for developing Angular forms and bind them with model data.
3	R204142M	Apply Angular built-in or custom pipes to format the rendered data.
4	R204142M	Develop a single page application by using synchronous or asynchronous Angular routing.
5	R204142M	Make use of MongoDB queries to perform CRUD operations on document database.

  
HOD

  
PRINCIPAL

Principal  
Avanathi Institute of Engg. & Technology  
Tamaram, Makavarapalem Md.,  
Anakapalli District., Pin: 531 113



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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE) COURSE OUTCOME (R-23)

I Year I semester

### LINEAR ALGEBRA & CALCULUS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231101	Develop matrix algebra techniques that is needed by engineers for practical applications.
2	R231101	To find the eigen values and eigen vectors and solve the problems by using linear transformation
3	R231101	Learn important tools of calculus in higher dimensions
4	R231101	Familiarize with functions of several variables which is useful in optimization.
5	R231101	Familiarize with double and triple integrals of functions of several variables in two and three dimensions.

### ENGINEERING PHYSICS:

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231102	Analyze the intensity variation of light due to polarization, interference and diffraction.
2	R231102	Familiarize with the basics of crystals and their structures.
3	R231102	Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.
4	R231102	Summarize various types of polarization of dielectrics and classify the magnetic materials.
5	R231102	Explain the basic concepts of Quantum Mechanics and the band theory of solids.



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6	R231102	Identify the type of semiconductor using Hall effect
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### COMMUNICATIVE ENGLISH

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231103	how to understand the context, topic, and specific information from social or transactional dialogues.
2	R231103	Remedially learn applying grammatical structures to formulate sentence sand use appropriate words and correct word forms.
3	R231103	Using discourse markers to speak clearly on a specific topic in formal as well as informal discussions.(not required)
4	R231103	Improved communicative competence in formal and informal contexts and for social and academic purposes
5	R231103	Critically comprehending and appreciating reading /listening texts and to write summaries based on global comprehension of these texts
6	R231103	Writing coherent paragraphs essays, letters/e-mails and resume.

### BASIC CIVIL & MECHANICAL ENGINEERING:

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231104	EUnderstand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society
2	R231104	Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying
3	R231104	Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.
4	R231104	: Understand the importance of Water Storage and Conveyance Structuresso that the social responsibilities of water conservation will be appreciated.



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5	R231104	Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.

## INTRODUCTION TO PROGRAMMING:

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231105	Illustrate the Fundamental concepts of Computers and basics of computer programming and problem-solving approach
2	R231105	Understand the Control Structures, branching and looping statements
3	R231105	Use of Arrays and Pointers in solving complex problems.
4	R231105	Develop Modular program aspects and Strings fundamentals.
5	R231105	Demonstrate the ideas of User Defined Data types, files. Solve real world problems using the concept of Structures, Unions and File operations.

## COMMUNICATIVE ENGLISH LAB:

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231109	Understand the different aspects of the English language oral communication with emphasis on Listening and Speaking S skills
2	R231109	Apply communication skills through various language learning activities.
3	R231109	Analyze the English speech sounds, stress, rhythm and intonation for better listening and speaking comprehension
4	R231109	Evaluate and exhibit professionalism in participating in debates and group discussions with polite turn taking strategies and sound more professional while communicating with others
5	R231109	Create effective resonate and prepare them to face interviews communicate appropriately in corporate settings.



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### ENGINEERING PHYSICS LAB:

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231110	Operate optical instruments like travelling microscope and spectrometer.
2	R231110	Estimate the wavelengths of different colours using diffraction grating.
3	R231110	Plot the intensity of the magnetic field of circular coil carrying current with distance
4	R231110	Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
5	R231110	Calculate the band gap of a given semiconductor.
6	R231110	Identify the type of semiconductor using Hall effect.

### ENGINEERING WORKSHOP:

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231111	Identify workshop tools and their operational capabilities.
2	R231111	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
3	R231111	Apply fitting operations in various applications.
4	R231111	Apply basic electrical engineering knowledge for House Wiring Practice

### IT WORKSHOP:

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231112	Perform Hardware troubleshooting.
2	R231112	Understand Hardware components and inter dependencies.
3	R231112	Safeguard computer systems from viruses/worms.
4	R231112	Document/ Presentation preparation. CO5: Perform calculations using spreadsheets.



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### COMPUTER PROGRAMMING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231105	Read, understand, and trace the execution of programs written in C language.
2	R231105	Select the right control structure for solving the problem.
3	R231105	Develop C programs which utilize memory efficiently using programming constructs like pointers.
4	R231105	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C

### HEALTH AND WELLNESS, YOGA AND SPORTS:

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23MC01	Read, understand, and trace the execution of programs written in C language.
2	R23MC01	Select the right control structure for solving the problem.
3	R23MC01	Develop C programs which utilize memory efficiently using programming constructs like pointers.
4	R23MC01	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C

### I Year II semester

### DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231201	solve the differential equations related to various engineering fields.
2	R231201	model engineering problems as higher order differential equations and solve analytically.
3	R231201	identify solution methods for partial differential equations that model



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		physical processes.
4	R231201	interpret the physical meaning of different operators such as gradient, curl and divergence.
5	R231201	estimate the work done against a field, circulation and flux using vector calculus.

### CHEMISTRY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231204	Compare the materials of construction for battery and electrochemical sensors.
2	R231204	Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.
3	R231204	Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.
4	R231204	Apply the principle of Band diagrams in the application of conductors and semiconductors.
5	R231204	Summarize the concepts of Instrumental methods.

### ENGINEERING GRAPHICS :

At the end of the course student should be able

Sno	Course code	CO Statement
1	R23ES03	Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
2	R23ES03	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
3	R23ES03	Understand and draw projection of solids in various positions in first quadrant.
4	R23ES03	Explain principles behind development of surfaces.
5	R23ES03	Prepare isometric and perspective sections of simple solids.



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### BASIC ELECTRICAL & ELECTRONICS ENGINEERING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23ES04	Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
2	R23ES04	Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.
3	R23ES04	Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.
4	R23ES04	Analyze different electrical circuits, performance of machines and measuring instruments. Evaluate different circuit configurations, Machine performance and Power systems operation.

### DATA STRUCTURES

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23PC04	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms. Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
2	R23PC04	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems. Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.
3	R23PC04	Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.



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### APPLIED CHEMISTRY LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23BS05	Determine the cell constant and conductance of solutions. Prepare advanced polymer Bakelite materials. Measure the strength of an acid present in secondary batteries. Analyse the IR spectra of some organic compounds. Calculate strength of acid in Pb-Acid battery.

### ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23ES05	Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.
2	R23ES05	Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.
3	R23ES05	Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.
4	R23ES05	Analyse various characteristics of electrical circuits, electrical machines and measuring instruments. Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring

### DATA STRUCTURES LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23PC04	Understand the significance of linear data structures in problem-solving and basic time/space complexity analysis. 1.5 Create and manage linked lists to efficiently organize and manipulate data, emphasizing memory efficiency.
2	R23PC04	Implement and apply stacks to manage program flow and solve problems involving expression evaluation and backtracking.



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		Utilize queues to model real-world scenarios, such as process scheduling and breadth first search algorithms and understand the versatility of deques and prioritize data management using priority queues.
3	R23PC04	Impart basic understanding of non-linear data structures such as trees. Explore basic concepts of hashing and apply it to solve problems requiring fast data retrieval and management.

## NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23MC02	Understand the importance of discipline, character and service motto.
	R23MC02	Solve some societal issues by applying acquired knowledge, facts, and techniques.
	R23MC02	Explore human relationships by analyzing social problems.
	R23MC02	Determine to extend their help for the fellow beings and downtrodden people.
	R23MC02	Develop leadership skills and civic responsibilities

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE) COURSE OUTCOME (R-20)

II Year I semester

### MATHEMATICS -III

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021011	Interpret the physical meaning of different operators such as gradient, curl and divergence
2	R2021011	Estimate the work done against a field, circulation and flux using vector calculus (L5)
3	R2021011	Apply the Laplace transform for solving differential equations (L3)
4	R2021011	Find or compute the Fourier series of periodic signals (L3)
5	R2021011	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
6	R2021011	Identify solution methods for partial differential equations that model physical processes (L3)



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### OBJECT ORIENTED PROGRAMMING THROUGH JAVA

At the end of the course student should be able to

Sno	Course code	CO Statement
1	2021422	Able to realize the concept of Object Oriented Programming & Java Programming Constructs
2	2021422	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
3	2021422	Apply the concept of exception handling and Input/ Output operations Able to design the applications of Java & Java applet
4	2021422	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

### FUNDAMENTALS OF DATA SCIENCE

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021441	Apply principles of NumPy and Pandas to the analysis of data.
2	R2021441	Make use of various file formats in loading and storage of data.
3	R2021441	Identify and apply the need and importance of pre-processing techniques
4	R2021441	Show the results and present them in a pictorial format.

### DATABASE MANAGEMENT SYSTEMS

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021121	Describe a relational database and object-oriented database Create, maintain and manipulate a relational database using SQL Describe ER model and normalization for database design
2	R2021121	Examine issues in data storage and query processing and can formulate appropriate solutions
3	R2021121	Outline the role and issues in management of data such as efficiency,



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privacy, security, ethical responsibility, and strategic advantage

### MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021054	Demonstrate skills in solving mathematical problems
2	R2021054	Comprehend mathematical principles and logic
3	R2021054	Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
4	R2021054	Manipulate and analyze data numerically and/or graphically using appropriate Software
5	R2021054	Communicate effectively mathematical ideas/results verbally or in writing

### OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2021422	Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism Construct Threads, Event Handling, implement packages, developing applets

### FUNDAMENTALS OF DATA SCIENCE LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021444	Perform various operations on numpy arrays
2	R2021444	Importing data from different file formats using pandas
3	R2021444	Draw different types of charts using matplotlib



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### DATABASE MANAGEMENT SYSTEMS LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021123	Utilize SQL to execute queries for creating database and performing data manipulation operations
2	R2021123	Examine integrity constraints to build efficient databases
3	R2021123	Apply Queries using Advanced Concepts of SQL
4	R2021123	Build PL/SQL programs including stored procedures, functions, cursors and triggers

### MOBILE APP DEVELOPMENT:

At the end of the course student should be able to

Sno	Course Code	Co statement
1	R2021425	Identify various concepts of mobile programming that make it unique from programming for other platforms
2	R2021425	Critique mobile applications on their design pros and cons Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
3	R2021425	Program mobile applications for the Android operating system that use basic and advanced phone features and
4	R2021425	Deploy applications to the Android marketplace for distribution.

### II Year - II Semester

### PROBABILITY AND STATISTICS

At the end of the course the student able to

S.No	Course code	CO Statement
1	R2022051	Classify the concepts of data science and its importance (L4) or (L2)
2	R2022051	Interpret the association of characteristics and through correlation and regression tools (L4)



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3	R2022051	Make use of the concepts of probability and their applications (L3)
4	R2022051	Apply discrete and continuous probability distributions (L3)
5	R2022051	Design the components of a classical hypothesis test (L6)
6	R2022051	Infer the statistical inferential methods based on small and large sampling tests (L4)

### COMPUTER ORGANIZATION

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2022421	Develop a detailed understanding of computer systems
2	R2022421	Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
3	R2022421	Develop a detailed understanding of architecture and functionality of central processing unit
4	R2022421	Exemplify in a better way the I/O and memory organization
5	R2022421	Illustrate concepts of parallel processing, pipelining and inter processor communication

### FORMAL LANGUAGES AND AUTOMATA THEORY

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2022053	Classify machines by their power to recognize languages
2	R2022053	Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
3	R2022053	Employ finite state machines to solve problems in computing
4	R2022053	Illustrate deterministic and non-deterministic machines
5	R2022053	Quote the hierarchy of problems arising in the computer science

### DATA WAREHOUSING AND MINING

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2022423	Summarize the architecture of data warehouse



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2	R2022423	Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data.
3	R2022423	Construct a decision tree and resolve the problem of model over fitting
4	R2022423	Compare Apriori and FP-growth association rule mining algorithms for frequent item set generation
5	R2022423	Apply suitable clustering algorithm for the given data set

### MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2022055	The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
2	R202205	The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
3	R202205	The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
4	R202205	The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
5	R202205	The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

### R PROGRAMMING LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2022423	Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming.
2	R2022423	Implement the concepts of R Script to extract the data from data frames and file operations. Implement the various statistical techniques using R.
3	R2022423	Extend the functionality of R by using add-on packages
4	R2022423	Use R Graphics and Tables to visualize results of various statistical operations on data



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### MONGO DB

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2022444	Installing and configuring mongoDB in windows
2	R2022444	Perform all database operations using mongoDB
3	R2022444	Develop applications by integrating mongoDBwith java/PHP

### DATA MINING USING PYTHON LAB

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2022423	Apply preprocessing techniques on real world datasets
2	R2022423	Apply apriori algorithm to generate frequent itemsets.
3	R2022423	Apply Classification and clustering algorithms on different datasets.

### WEB APPLICATION DEVELOPMENT LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2022425	Develop Single Page Applications
2	R2022425	Develop NodeJS & ReactJS Reusable Service
3	R2022425	Store the data in MySQL
4	R2022425	Get acquainted with the latest web application development trends in the IT industry

  
HOD

  
PRINCIPAL  
Principal

Avanthi Institute of Engg. & Technology  
Tamaram, Makavarapalem Md.,  
Anakapalli District., Pin: 531 113



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### DEPARTMENT OF MECHANICAL ENGINEERING

#### COURSE OUTCOME (R-23)

1 Year I semester

#### LINEAR ALGEBRA & CALCULUS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231101	Develop matrix algebra techniques that is needed by engineers for practical applications.
2	R231101	To find the eigen values and eigen vectors and solve the problems by using linear transformation
3	R231101	Learn important tools of calculus in higher dimensions
4	R231101	Familiarize with functions of several variables which is useful in optimization.
5	R231101	Familiarize with double and triple integrals of functions of several variables in two and three dimensions.

#### ENGINEERING CHEMISTRY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231204	Demonstrate the corrosion prevention methods and factors affecting corrosion.
2	R231204	Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers.
3	R231204	Explain calorific values, octane number, refining of petroleum and cracking of oils.
4	R231204	Explain the setting and hardening of cement.
5	R231204	Summarize the concepts of colloids, micelle and nanomaterials, diffraction.



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### INTRODUCTION TO PROGRAMMING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231105	Illustrate the Fundamental concepts of Computers and basics of computer programming and problem-solving approach
2	R231105	Understand the Control Structures, branching and looping statements
3	R231105	Use of Arrays and Pointers in solving complex problems.
4	R231105	Develop Modular program aspects and Strings fundamentals.
5	R231105	Demonstrate the ideas of User Defined Data types, files. Solve real world problems using the concept of Structures, Unions and File operations.

### ENGINEERING GRAPHICS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23ES03	Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
2	R23ES03	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
3	R23ES03	Understand and draw projection of solids in various positions in first quadrant.
4	R23ES03	Explain principles behind development of surfaces.
5	R23ES03	Prepare isometric and perspective sections of simple solids.

### BASIC ELECTRICAL & ELECTRONICS ENGINEERING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23ES04	Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
2	R23ES04	Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation



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		mechanisms, Electricity billing concept and important safety measures related to electrical operations.
3	R23ES04	Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.
4	R23ES04	Analyze different electrical circuits, performance of machines and measuring instruments.
5	R23ES04	Evaluate different circuit configurations, Machine performance and Power systems operation.

### ENGINEERING CHEMISTRY LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23BS05	Determine the cell constant and conductance of solutions.
2	R23BS05	Prepare advanced polymer materials.
3	R23BS05	Determine the physical properties like surface tension, adsorption and viscosity.
4	R23BS05	Estimate the Iron and Calcium in cement.
5	R23BS05	Calculate the hardness of water.

### COMPUTER PROGRAMMING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231105	Read, understand, and trace the execution of programs written in C language.
2	R231105	Select the right control structure for solving the problem.
3	R231105	Develop C programs which utilize memory efficiently using programming constructs like pointers.
4	R231105	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.



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### ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23ES05	Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.
2	R23ES05	Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.
3	R23ES05	Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.
4	R23ES05	Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.
5	R23ES05	Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring

### NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23MC02	Understand the importance of discipline, character and service motto.
2	R23MC02	Solve some societal issues by applying acquired knowledge, facts, and techniques.
3	R23MC02	Explore human relationships by analyzing social problems
4	R23MC02	Determine to extend their help for the fellow beings and downtrodden people.
5	R23MC02	Develop leadership skills and civic responsibilities



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### 1 Year II semester

### DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

At the end of the course student should be able to

S no	Course code	CO Statement
1	R231201	solve the differential equations related to various engineering fields.
2	R231201	model engineering problems as higher order differential equations and solve analytically.
3	R231201	identify solution methods for partial differential equations that model physical processes.
4	R231201	interpret the physical meaning of different operators such as gradient, curl and divergence.
5	R231201	estimate the work done against a field, circulation and flux using vector calculus.

### ENGINEERING PHYSICS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231102	Analyze the intensity variation of light due to polarization, interference and diffraction.
2	R231102	Familiarize with the basics of crystals and their structures
3	R231102	Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.
4	R231102	Summarize various types of polarization of dielectrics and classify the magnetic materials.
5	R231102	Explain the basic concepts of Quantum Mechanics and the band theory of solids.
6	R231102	Identify the type of semiconductor using Hall effect

### COMMUNICATIVE ENGLISH

At the end of the course student should be able

Sno	Course code	CO Statement
1	R231103	<b>By the end of the course the students will have</b> Learned how to understand the context, topic, and specific information from social .





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5		Solve the problems involving the translational and rotational motion of rigid bodies.
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### COMMUNICATIVE ENGLISH LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231109	Understand the different aspects of the English language proficiency with emphasis on LSRW skills.
2	R231109	Apply communication skills through various language learning activities
3	R231109	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
4	R231109	Evaluate and exhibit professionalism in participating in debates and group discussions.
5	R231109	Create effective Course Objectives:

### ENGINEERING PHYSICS LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231110	Operate optical instruments like travelling microscope and spectrometer.
2	R231110	Estimate the wavelengths of different colours using diffraction grating.
3	R231110	Plot the intensity of the magnetic field of circular coil carrying current with distance.
4	R231110	Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively
5	R231110	Calculate the band gap of a given semiconductor.
6	R231110	Identify the type of semiconductor using Hall effect.



# GAVANTHI

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## IT WORKSHOP

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231112	Perform Hardware troubleshooting.
2	R231112	Understand Hardware components and inter dependencies.
3	R231112	Secure computer systems from viruses/worms.
4	R231112	Document/ Presentation preparation.
5	R231112	Perform calculations using spreadsheets.

## ENGINEERING WORKSHOP

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R231111	Identify workshop tools and their operational capabilities.
2	R231111	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
3	R231111	Apply fitting operations in various applications.
4	R231111	Apply basic electrical engineering knowledge for House Wiring Practice

## ENGINEERING MECHANICS LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1		Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.
2		Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever.



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3		Determine the Centre of gravity and Moment of Inertia of different configurations
4		Verify the equilibrium conditions of a rigid body under the action of different force systems.

### HEALTH AND WELLNESS, YOGA AND SPORTS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R23MC01	Understand the importance of yoga and sports for Physical fitness and sound health.
2	R23MC01	Demonstrate an understanding of health-related fitness components.
3	R23MC01	Compare and contrast various activities that help enhance their health
4	R23MC01	Assess current personal fitness levels.
5	R23MC01	Develop Positive Personality

### COURSE OUTCOME (R-20)

II Year I semester

### VECTOR CALCULUS FOURIER TRANSFORMS and PDE (M-III)

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021011	interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
2	R2021011	estimate the work done against a field, circulation and flux using vector calculus (L5)
3	R2021011	apply the Laplace transform for solving differential equations (L3)
4	R2021011	find or compute the Fourier series of periodic signals (L3)
5	R2021011	know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)



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6	R2021011	identify solution methods for partial differential equations that model physical processes (L3)
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## MECHANICS OF SOLIDS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021031	Model & Analyze the behavior of basic structural members subjected to various loading and support conditions based on principles of equilibrium.
2	R2021031	Understand the apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, moment and torsional moment.
3	R2021031	Students will learn all the methods to analyze beams, columns, trusses for normal, shear and torsion stresses and to solve deflection problems in preparation for the design of such structural components. Students are able to analyse beams and draw correct and complete shear and bending moment diagrams for beams.
4	R2021031	Students attain a deeper understanding of the loads, stresses, and strains acting on a structure and their relations in the elastic behavior.
5	R2021031	Design and analysis of Industrial components like pressure vessels.

## FLUID MECHANICS & HYDRAULIC MACHINES

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021032	The basic concepts of fluid properties.
2	R2021032	Fluid mechanics of fluids in static and dynamic conditions.
3	R2021032	Boundary layer theory, flow separation and dimensional analysis.
4	R2021032	Hydrodynamic forces of jet on vanes in different positions.
5	R2021032	Working Principles and performance evaluation of hydraulic pump and turbines



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### PRODUCTION TECHNOLOGY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021033	Able to design the patterns and core boxes for metal casting processes
2	R2021033	Able to design the gating system for different metallic components
3	R2021033	Know the different types of manufacturing processes
4	R2021033	Be able to use forging, extrusion processes
5	R2021033	Learn about the different types of welding processes used for special fabrication

### KINEMATICS OF MACHINERY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021034	Contrive a mechanism for a given plane motion with single degree of freedom.
2	R2021034	Suggest and analyze a mechanism for a given straight line motion and automobile steering motion.
3	R2021034	Analyze the motion (velocity and acceleration) of a plane mechanism.
4	R2021034	Suggest and analyze mechanisms for a prescribed intermittent motion like opening and closing of IC engine valves etc.
5	R2021034	Select a power transmission system for a given application and analyze motion of different transmission systems

### COMPUTER AIDED ENGINEERING DRAWING PRACTICE

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021035	Student get exposed on working of sheet metal with help of development of surfaces.
2	R2021035	Student understands how to know the hidden details of machine components with the help of sections and interpenetrations of solids.



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3	R2021035	Student shall exposed to modeling commands for generating 2D and 3D objects using computer aided drafting tools which are useful to create machine elements for computer aided analysis
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### FLUID MECHANICS & HYDRAULIC MACHINERY LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021036	To impart practical exposure on the performance evaluation methods of various flow measuring equipment and hydraulic turbines and pumps.

### PRODUCTION TECHNOLOGY LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021037	To impart hands-on practical exposure on manufacturing processes and equipment.

### DRAFTING AND MODELING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021038	Development of part drawings for various components in the form of orthographic and isometric. Representation of dimensioning and tolerances. Study of DXE, IGES files.
2	R2021038	Generation of various Surfaces using surface modeling

### ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2021039	Understand the concept of Traditional knowledge and its importance
2	R2021039	Know the need and importance of protecting traditional knowledge



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3	R2021039	Know the various enactments related to the protection of traditional knowledge
4	R2021039	Understand the concepts of Intellectual property to protect the traditional knowledge

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### II Year II semester

### MATERIALS SCIENCE & METALLURGY

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2022031	Understand the crystalline structure of different metals and study the stability of phases in different alloy systems.
2	R2022031	Study the behavior of ferrous and non ferrous metals and alloys and their application in different domains
3	R2022031	Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals.
4	R2022031	Grasp the methods of making of metal powders and applications of powder metallurgy
5	R2022031	Comprehend the properties and applications of ceramic, composites and other advanced methods.

### COMPLEX VARIABLES AND STATISTICAL METHODS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2022011	apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic (L3)
2	R2022011	find the differentiation and integration of complex functions used in engineering problems (L5)
3	R2022011	make use of the Cauchy residue theorem to evaluate certain integrals (L3)



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4	R2022011	apply discrete and continuous probability distributions (L3)
5	R2022011	infer the statistical inferential methods based on small and large sampling tests (L4)
6	R2022011	design the components of a classical hypothesis test (L6)

### DYNAMICS OF MACHINERY

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2022032	To compute the frictional losses and transmission in clutches, brakes and dynamometers
2	R2022032	To determine the effect of gyroscopic couple in motor vehicles, ships and aeroplanes
3	R2022032	To analyze the forces in four bar and slider crank mechanisms and design a flywheel
4	R2022032	To determine the natural frequencies of discrete systems undergoing longitudinal, torsional and transverse vibrations.
5	R2022032	To determine the unbalanced forces and couples in reciprocating and radial engines

### THERMAL ENGINEERING – I

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2022033	Derive the actual cycle from fuel-air cycle and air- standard cycle for all practical applications.
2	R2022033	Explain working principle and various components of IC engine
3	R2022033	Explain combustion phenomenon of CI and SI engines and their impact on engine variables.
4	R2022033	Analyze the performance of an IC engine based on the performance parameters
5	R2022033	Explain the cycles and systems of a gas turbine and determine the efficiency of gas turbine.



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6	R2022033	Explain the applications and working principle of rockets and jet propulsion.
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### INDUSTRIAL ENGINEERING AND MANAGEMENT

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2022034	Design and conduct experiments, analyse, interpret data and synthesize valid conclusions
2	R2022034	Design a system, component, or process, and synthesize solutions to achieve desired needs
3	R2022034	Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints
4	R2022034	Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management

### MECHANICS OF SOLIDS & METALLURGY LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2022035	To impart practical exposure on the microstructures of various materials and their hardness evaluation. Also to impart practical knowledge on the evaluation of material properties through various destructive testing procedures To impart practical exposure on the microstructures of various materials and their hardness evaluation. Also to impart practical knowledge on the evaluation of material properties through various destructive testing procedures

### MACHINE DRAWING PRACTICE

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2022036	Draw and represent standard dimensions of different mechanical fasteners and joints and Couplings.
2	R2022036	Draw different types of bearings showing different components



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3	R2022036	Assemble components of a machine part and draw the sectional assembly drawing showing the dimensions of all the components of the assembly as per bill of materials
4	R2022036	Select and represent fits and geometrical form of different mating parts in assembly drawings
5	R2022036	To prepare manufacturing drawings indicating fits, tolerances, surface finish and surface treatment requirements

## PYTHON PROGRAMMING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2022038	Solve the different methods for linear, non-linear and differential equations
2	R2022038	Learn the PYTHON Programming language
3	R2022038	Familiar with the string and matrices in PYTHON
4	R2022038	Write the Program scripts and functions in PYTHON to solve the methods

## DEPARTMENT OF MECHANICAL ENGINEERING

### COURSE OUTCOME (R-20)

#### III Year 3 semester

## THERMAL ENGINEERING – II

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031019	Explain the basic concepts of thermal engineering and boilers.
2	R2031019	Discuss the concepts of steam nozzles and steam turbines.
3	R2031019	Gain knowledge about the concepts of reaction turbine and steam condensers
4	R2031019	Discuss the concepts of reciprocating and rotary type of compressors.



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5	R2031019	Acquire knowledge about the centrifugal and axial flow compressors.
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### DESIGN OF MACHINE MEMBERS-I

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031032	Judge about materials and their properties along with manufacturing considerations.
2	R2031032	Gain knowledge about the strength of machine elements.
3	R2031032	Apply the knowledge in designing the riveted and welded joints, keys, cotters and knuckle joints
4	R2031032	Apply the knowledge in designing the shafts and shaft couplings.
5	R2031032	Apply the knowledge in designing the mechanical springs.

### MACHINING, MACHINE TOOLS & METROLOGY

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2031033	Discuss the concepts of machining processes.
2	R2031033	Apply the principles of lathe, shaping, slotting and planing machines
3	R2031033	Apply the principles of drilling, reaming and boring processes.
4	R2031033	Analyze the concepts of finishing processes and the system of limits and fits.
5	R2031033	Learn the concepts of surface roughness and optical measuring instruments

### NANO TECHNOLOGY (OE-1)

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2031031	Explain about nano-structured materials and their applications.
2	R2031031	Apply knowledge about the nano crystalline materials, their properties and defects.



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3	R2031031	Justify various techniques of nanofabrication.
4	R2031031	Apply the tools to characterize nano materials. CO5: Analyze the applications of nano materials.

### INDUSTRIAL ROBOTICS (PE-1)

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R203103B	Perceive the concepts of robotics and its systems.
2	R203103B	Apply knowledge about the motion analysis and manipulator kinematics
3	R203103B	Analyze the differential transformations.
4	R203103B	Apply the basics about path description and generation
5	R203103B	Judge about the actuators, feedback components and robotic applications.

### MACHINE TOOLS LABORATORY

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2031034	Demonstrate about general purpose machine tools in the machine shop.
2	R2031034	Perform various operations on lathe machine.
3	R2031034	Perceive different operations on drilling machine.
4	R2031034	Experiment with basic operations on shaping machines.
5	R2031034	Utilize slotting machine to make keyways

### THERMAL ENGINEERING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031035	Experiment with two stroke and four stroke compression and spark ignition engines for various characteristics.
2	R2031035	Perceive flash point, fire point, calorific value of different fuels using various apparatus
3	R2031035	Perform engine friction, heat balance test, volumetric efficiency, load test of petrol and diesel engines.
4	R2031035	Perform speed test, performance test and cooling temperature on petrol and diesel engines. CO5: Utilize air compressor for its



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		performance test and to determine efficiency.
5	R2031035	Discuss the principles through assembly and disassembly of 2/3 wheelers, 2/4 stroke engines, tractor, heavy duty engines, boilers and their mountings and accessories

### ADVANCED COMMUNICATION SKILLS LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	R2031036	Acquire vocabulary and use it contextually
2	R2031036	Listen and speak effectively
3	R2031036	Develop proficiency in academic reading and writing

### PROFESSIONAL ETHICS AND HUMAN VALUES

At the end of the course student should be able to

Sno	Course Code	Co statement
1	R2031037	Judge the concepts of human values.
2	R2031037	Justify knowledge about the principles of engineering ethics.
3	R2031037	Interpret engineering as social experimentation.
4	R2031037	Realize engineers' responsibility for safety and risk
5	R2031037	Learn about the engineers' rights and responsibilities

### III YEAR - II SEMESTER

#### HEAT TRANSFER

(HEAT TRANSFER DATA BOOK IS ALLOWED)

At the end of the course the student able to

S.No	Course code	CO Statement
1	R2032031	Apply knowledge about mechanism and modes of heat transfer.
2	R2032031	Understand the concepts of conduction and convective heat transfer
3	R2032031	Learn about forced and free convection



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4	R2032031	Analyze the concepts of heat transfer with phase change and condensation along with heat exchangers
5	R2032031	Interpret the knowledge about radiation mode of heat transfer

### DESIGN OF MACHINE MEMBERS-II

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2032032	Apply knowledge about the design of bearings.
2	R2032032	Explain the concepts in designing various engine parts.
3	R2032032	Utilize the knowledge to design curved beams and power screws
4	R2032032	Justify power transmission systems and to design pulleys and gear drives
5	R2032032	Apply the concepts in designing various machine tool elements

### INTRODUCTION TO ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

At the end of the course student should be able to

S.No	Course code	CO Statement
1	R2032033	Discuss basic concepts of artificial intelligence, neural networks and genetic algorithms.
2	R2032033	Apply the principles of knowledge representation and reasoning.
3	R2032033	Learn about bayesian and computational learning and machine learning
4	R2032033	Utilize various machine learning techniques
5	R2032033	Apply the machine learning analytics and deep learning techniques

### AUTOMOBILE ENGINEERING (PE-2)

At the end of the course student should be able

S.No	Course code	CO Statement
1	R203203A	Discuss various components of four wheeler automobile.
2	R203203A	Apply the knowledge of different parts of transmission system



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3	R203203A	Judge about steering and suspension systems
4	R203203A	Justify the braking system and electrical system used in automobiles
5	R203203A	Analyze the concepts about engine specifications and service, safety and electronic system used in automobiles

### ADVANCED MATERIALS (OE-2)

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2032031	Explain the metals and alloys and their utility in different environments.
2	R2032031	Learn about polymers and ceramics and their applications.
3	R2032031	Analyze composite materials along with reinforcements and their applications
4	R2032031	Apply the basics of shape memory alloys and functionally graded materials.
5	R2032031	Analyze the knowledge about the nanomaterials and their applications

### HEAT TRANSFER LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2032034	Determine the heat transfer rate and coefficient.
2	R2032034	Determine the thermal conductivity, efficiency and effectiveness.
3	R2032034	Determine the emissivity and Stefan-Boltzman constant.
4	R2032034	Determine critical heat flux and investigate Lambert's cosine law
5	R2032034	Experiment with Virtual labs and analyse conduction, HT coefficient
6	R2032034	Experiment with Virtual labs and investigate Lambert's laws.



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## CAE & CAM LAB

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2032035	Experiment with trusses and beams to determine stress, deflection, natural frequencies, harmonic analysis, HT analysis and buckling analysis.
2	R2032035	Create part programmes using FANUC controller
3	R2032035	Apply G-codes for automated tool path using CAM software
4	R2032035	Analyze about rapid prototyping machine and to print simple parts
5	R2032035	Experiment with virtual 3D printing simulation using Vlabs.

## MEASUREMENTS & METROLOGY LAB

At the end of the course student should be able

Sno	Course code	CO Statement
1	R2032035	Demonstrate the calibration experiments with different gauges, transducers, thermocouple and temperature detector.
2	R2032035	Demonstrate the calibration experiments with rotameter, seismic apparatus
3	R2032035	Demonstrate the calibration experiments with vernier calipers, micrometer, height and dial gauges

## ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1	R2032037	Understand objectives and characteristics of a research problem.
2	R2032037	Analyze research related information and to follow research ethics
3	R2032037	Understand the types of intellectual property rights.
4	R2032037	Learn about the scope of IPR
5	R2032037	Understand the new developments in IPR.



### DEPARTMENT OF MECHANICAL ENGINEERING

#### COURSE OUTCOME (R-20)

#### IV Year I semester

#### UNCONVENTIONAL MACHINING PROCESSES (PE-3)

At the end of the course student should be able

S.No	Course code	CO Statement
1	R204103C	Understand the concepts of modern machining processes.
2	R204103C	Learn the principles of ultrasonic machining.
3	R204103C	Apply the principles and procedure of electro-chemical and chemical machining processes
4	R204103C	Apply the principles and procedure of thermal metal removal processes
5	R204103C	Illustrate the principles and procedure of electron beam machining, laser beam machining and plasma machining.

#### POWER PLANT ENGINEERING (PE-4)

At the end of the course student should be able

S.No	Course code	CO Statement
1	R204103H	Identify the different components of the steam power plant for power production.
2	R204103H	Illustrate the component used in the diesel and gas power plant for power production
3	R204103H	Understand how the power is produced by hydro-electric and
4	R204103H	Interpret the power production by combined power plants and operating principles of different instruments used in power plants
5	R204103H	Analyze power plant economics and implementation of pollution standards and control of pollution caused by the power plants

#### ADDITIVE MANUFACTURING (PE-5)

At the end of the course student should be able

S.No	Course code	CO Statement
1	R204103P	Understand the principles of prototyping, classification of RP processes



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		and liquid-based RP systems.
2	R204103P	Understand and apply different types of solid-based RP systems
3	R204103P	Apply powder-based RP systems
4	R204103P	Analyze and apply various rapid tooling techniques.
5	R204103P	Understand different types of data formats and explore the applications of AM processes in various fields

## NON DESTRUCTIVE EVALUATION (PE-5)

At the end of the course student should be able

S.No	Course code	CO Statement
1	R204103Q	Understand the concepts of various NDE techniques and the requirements of radiography techniques and safety aspects.
2	R204103Q	Interpret the principles and procedure of ultrasonic testing (BL-2)
3	R204103Q	Understand the principles and procedure of Liquid penetration and eddy current testing
4	R204103Q	Illustrate the principles and procedure of Magnetic particle testing.
5	R204103Q	Interpret the principles and procedure of infrared testing and thermal testing

## OPERATIONS MANAGEMENT (OE-4)

At the end of the course student should be able

S.No	Course code	CO Statement
1	R204103X	Apply appropriate forecasting techniques & Aggregate planning methods
2	R204103X	Learn Materials management analysis and scheduling policies
3	R204103X	Learn about the inventory control techniques, MRP and contemporary management techniques.
4	R204103X	Apply quality management principles proposed by Taguchi, Juran & Demings
5	R204103X	Apply optimization to LP model & transportation and assignment problems.



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### OPERATIONS MANAGEMENT (OE-4)

At the end of the course student should be able

S.No	Course code	CO Statement
1	R204103X	Apply appropriate forecasting techniques & Aggregate planning methods
2	R204103X	Learn Materials management analysis and scheduling policies
3	R204103X	Learn about the inventory control techniques, MRP and contemporary management techniques.
4	R204103X	Apply quality management principles proposed by Taguchi, Juran & Demings
5	R204103X	Apply optimization to LP model & transportation and assignment problems.

### MECHATRONICS LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1	R204103Y	Understand the Characteristics of LVDT
2	R204103Y	Measure load, displacement and temperature using analogue and digital sensors.
3	R204103Y	Develop PLC programs for control of traffic lights, water level, lifts and conveyor belts.
4	R204103Y	Simulate and analyze PID controllers for a physical system using MATLAB.
5	R204103Y	Develop pneumatic and hydraulic circuits using Automaton studio

  
HOD

  
PRINCIPAL

Head of the Department  
Department of Mechanical Engg.  
Avanthi Institute of Engg. & Tech.,  
Makavarapalem, Anakapalli Dt. -531113



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## DEPARTMENT OF MASTER OF BUSINESS ADMINISTRATION

### I YEAR ISEMSTER

### MANAGEMENT ORGANISATIONAL BEHAVIOUR

At the end of the course student should be able to

Sno	Course code	CO Statement
1		Identify various basic perspectives of management.
2		Make effective planning and decision-making
3		Understanding the flow of author in an or organization
4		Understand the theories underlying in or organizational behavior.
5		Ability to Knowing how to manage team in an or organization.

### MANAGERIAL ECONOMICS

At the end of the course student should be able to

Sno	Course code	CO Statement
1		Develop an understanding of the applications of managerial economics.
2		understanding Demand Analysis and Forecasting methods.
3		Knowledge about Cost and Production Analysis.
4		Knowled e to determine rice under different market structures'
5		Identify basic knowledge about Macro Economic factors of the Nation

### QUALITATIVE ANALYSIS FOR BUSINESS DECISIONS

At the end of the course student should be able to

Sno	Course code	CO Statement
1		Understanding of mathematical and statistical tools.
2		Ability to understand statistical tools.
3		Understanding theories to make decisions.
4		Understanding concept of sam lin and sam lin distribution
5		Investigate the concept of tests and analysis of variance.

### BUSINESS COMMUNICATION AND SOFTSKILLS

At the end of the course student should be able to

Sno	Course code	CO Statement
1		Understanding fundamentals of Communication.
2		Compare the oral, written and non-verbal communication skills.
3		Understanding body language aspects
4		Enhencing the written communication skills
5		Improved Presentation skills.



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## RURAL INNOVATION PROJECTS

At the end of the course student should be able to

Sno	Course code	CO Statement
1		Understand types of resources and importance of resources in rural development
2		Experience in Land Resources Development
3		Understand Human Resources Dimensions of Rural Development
4		Understand the Approaches of Rural Development in India
5		Ability to review of Rural Development Programme

## I YEAR II SEM

### HUMAN RESOURCE MANAGEMENT

At the end of the course student should be able to

Sno	Course code	CO Statement
1		Integrated perspective on functions ,role of HRM. Policies and Ability to plan human resources
2		Competency to recruit, train, and job analysis and know management development.
3		Understand performance appraisal .career development and counseling.
4		Rational design to compensation an sa ary' a illustration , wage management and differential
5		Ability to handle employee grievances and to know managing work place stress.

## II YEAR I SEMESTER

### STRATEMC MANAGEMENT

At the end of the course student should be able to

Sno	Course code	CO Statement
1		Understand and measures shareholder value and managerial implication shareholder value creation.
2		Understand Capital structure planning and policy and how leverage effects share holders' risk.
3		Understand Dividend Policy and how it effects value of the firm-
4		Evaluate investment opportunities to allocation of resources and Financial Evaluation of Lease.
5		Describe Financial impact of merger and Merger and Dilution Effect on Earnin s Per Share



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### INDUSTRIAL ELECTRONICS (OPEN ELECTIVE-III)

At the end of the course student should be able

S.No	Course code	CO Statement
1	R204104	Understand the concept of DC amplifiers
2	R204104	Analyze and design different voltage regulators for real time applications
3	R204104	Describe the basis of SCR and Thyristor
4	R204104	Determine the performance of DIAC and TRIAC
5	R204104	Develop real time application using electronics

### UNIVERSAL HUMAN VALUES-2: UNDERSTANDING HARMONY

At the end of the course student should be able

S.No	Course code	CO Statement
1		Students will be able to discuss a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence, to explain (or developing clarity) of the humanity in the human being, family, society and nature/existence, to strengthen self-reflection and to judge the commitment and courage to act.

### SKILL ADVANCED COURSE MACHINE LEARNING WITH PYTHON LAB

At the end of the course student should be able

S.No	Course code	CO Statement
1		Implement procedures for the machine learning algorithms
2		Design and Develop Python programs for various learning algorithms
3		Apply appropriate data sets to the Machine Learning algorithms
4		Develop Machine Learning algorithms to solve real world problem

  
HOD

  
PRINCIPAL

Principal  
Avanathi Institute of Engg. & Technology,  
Tamaram, Makavarapalem Md.,  
Anakapalli District., Pin: 531 113



**MASTER OF COMPUTER APPLICATIONS**

**COURSE OUTCOME (R-23)**

**I Year I semester**

**BUSINESS COMMUNICATION**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA1101	Adapt Proficiency in handling Professional Communication
2	MCA1101	Adapt Proficiency in handling Professional Communication

**MATHEMATICAL AND STATISTICAL FOUNDATIONS**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA1102	Apply the basic rules and theorems of probability theory such as Baye's Theorem, determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
2	MCA1102	Able to perform and analyze of sampling, means, proportions, variances and estimates the maximum likelihood based on population parameters
3	MCA1102	Learn how to formulate and test hypotheses about sample means, variances and proportions and to draw conclusions based on the results of statistical tests.
4	MCA1102	Design various ciphers using number theory.
5	MCA1102	Apply graph theory for real time problems like network routing problem.



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### COMPUTER ORGANIZATION & OPERATING SYSTEMS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA1103	Understand the basic organization of computer and different instruction formats and addressing modes
2	MCA1103	Analyze the concept of pipelining, segment registers and pin diagram of CPU.
3	MCA1103	Understand and analyze various issues related to memory hierarchy
4	MCA1103	Evaluate various modes of data transfer between CPU and I/O devices
5	MCA1103	Examine various inter connection structures of multi processors

### DATA STRUCTURES

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA1104	Implement basic programs by using C concepts.
2	MCA1104	Select the data structures that efficiently model the information in a problem
3	MCA1104	Assess efficiency trade-offs among different data structure implementations or combinations.
4	MCA1104	Implement and know the application of algorithms for sorting and pattern matching.



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### OBJECT ORIENTED PROGRAMMING WITH JAVA

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA1105	Describe the uses OOP concepts
2	MCA1105	Distinguish the concept of packages and interfaces
3	MCA1105	Apply OOP concepts to solve real world problems
4	MCA1105	Demonstrate the exception handling, multithread applications with synchronization
5	MCA1105	Design the GUI based applications using AWT and Swings

### OPERATING SYSTEMS AND LINUX LAB

At the end of the course student should be able to

S no	Course code	CO Statement
1	MCA1106	Implement various CPU scheduling algorithms and compare results
2	MCA1106	Implement various disk scheduling algorithms and compare results
3	MCA1106	Implement page replace algorithms
4	MCA1106	Implement various memory management techniques.
5	MCA1106	Execute basic Linux commands.

### DATA STRUCTURES LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA1107	Implement various basic data structures and its operations.



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2	MCA1107	Apply sorting and searching algorithms to given numbers
3	MCA1107	Implement various tree operations.
4	MCA1107	Implement various graphs algorithms.
5	MCA1107	Develop applications using various data structures

### JAVA PROGRAMMING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA1108	Apply OOP concepts to solve real world problems
2	MCA1108	Implement different forms of inheritance
3	MCA1108	Create packages and to reuse them.
4	MCA1108	Implement multi threaded programs using synchronization concepts
5	MCA1108	Create user defined exceptions

### I Year II semester

### DATABASE MANAGEMENT SYSTEMS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA2101	Illustrate the concept of databases, database management systems, database languages, database structures and their work
2	MCA2101	Apply ER modeling and Relational modeling for designing simple databases.
3	MCA2101	Summarize the concepts related to relational model and SQL and Write database queries using relational algebra and structured query language



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4	MCA2101	Design and develop databases from the real world by applying the concepts of Normalization.
5	MCA2101	Outline the issues associated with Transaction Management and Recovery, Tree Structured and Hash-Based Indexing

### COMPUTER NETWORKS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA2102	Explain the network architecture, TCP/IP and OSI reference models
2	MCA2102	Identify and understand various techniques and modes of transmission
3	MCA2102	Demonstrate the data link protocols, multi-channel access protocols and IEEE 802 standards for LAN
4	MCA2102	Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme
5	MCA2102	Discuss the elements and protocols of transport layer
6	MCA2102	Develop network security and define various protocols such as FTP, HTTP, Telnet, DNS

### SOFTWARE ENGINEERING AND DESIGN PATTERNS

At the end of the course student should be able

Sno	Course code	CO Statement
1	MCA2103	Define various software application domains and remember different process model used in software development.
2	MCA2103	Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques
3	MCA2103	Convert the requirements model into the design model and demonstrate use of software and user interface design principles.
4	MCA2103	Illustrate the appropriate design patterns to solve object-oriented design problems.



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5	MCA2103	Apply structural patterns to solve design problems
6	MCA2103	Evaluate the design solutions by using behavioral patterns.

### NOSQL DATABASES

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA2105	Identify what type of NoSQL database to implement based on business requirements (key-value, document, full text, graph, etc.)
2	MCA2105	Apply NoSQL data modeling from application specific queries
3	MCA2105	Use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing
4	MCA2105	Solve coding tasks related to the fundamental notions and techniques used in objectoriented programming

### DESIGN AND ANALYSIS OF ALGORITHMS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA2105	Describe asymptotic notation used for denoting performance of algorithms
2	MCA2105	Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
3	MCA2105	List and describe various algorithmic approaches
4	MCA2105	Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches
5	MCA2105	Apply graph search algorithms to real world problems



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### MOBILE APPLICATION DEVELOPMENT

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA2105	Install and configure Android application development tools
2	MCA2105	Design and develop user Interfaces for the Android platform
3	MCA2105	Save state information across important operating system events
4	MCA2105	Apply Java programming concepts to Android application development

### ARTIFICIAL INTELLIGENCE

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA2105	Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
2	MCA2105	Apply the language/framework of different AI methods for a given problem
3	MCA2105	Implement basic AI algorithms
4	MCA2105	Design and carry out an empirical evaluation of different algorithms on problem formalization and state the conclusions that the evaluation supports

### ACCOUNTING FOR MANAGERS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA2105	The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various techniques for decision making.



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### DBMS LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA2106	At the end of the course the student will be able to:
2	MCA2106	Utilize SQL to execute queries for creating database and performing data manipulation operations
3	MCA2106	Examine integrity constraints to build efficient databases
4	MCA2106	Apply Queries using Advanced Concepts of SQL
5	MCA2106	Build PL/SQL programs including stored procedures, functions, cursors and triggers

### COMPUTER COMMUNICATION AND NETWORKS LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA2107	Understand fundamental underlying principles of computer networking
2	MCA2107	Understand details and functionality of layered network architecture.
3	MCA2107	Apply mathematical foundations to solve computational problems in computer networking
4	MCA2107	: Analyze performance of various communication protocols
5	MCA2107	Compare routing algorithms
6	MCA2107	Practice packet /file transmission between nodes.



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### EMPLOYABILITY SKILLS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MCA2109	Recite the soft skills
2	MCA2109	Make presentations effectively with appropriate body language
3	MCA2109	Be composed with positive attitude
4	MCA2109	Apply their core competencies to succeed in professional and personal life

  
HOD

  
PRINCIPAL

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**  
**M.Tech CSE for COMPUTER SCIENCE & ENGINEERING PROGRAMME**  
**COURSE OUTCOMES****Year I semester****MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MTCSE1101	To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
2	MTCSE1101	Able to perform and analyze of sampling, means, proportions, variances and estimates the maximum likelihood based on population parameters.
3	MTCSE1101	To learn how to formulate and test hypotheses about sample means, variances and proportions and to draw conclusions based on the results of statistical tests.
4	MTCSE1101	Design various ciphers using number theory.
5	MTCSE1101	Apply graph theory for real time problems like network routing problem.

**ADVANCED DATA STRUCTURES & ALGORITHMS**

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MTCSE1102	Ability to write and analyze algorithms for algorithm correctness and efficiency
2	MTCSE1102	Master a variety of advanced abstract data type (ADT) and data structures and their Implementation
3	MTCSE1102	Demonstrate various searching, sorting and hash techniques and be able to apply and solve problems of real life
4	MTCSE1102	Design and implement variety of data structures including linked lists, binary trees, heaps, graphs and search trees
5	MTCSE1102	Ability to compare various search trees and find solutions for IT related problems



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### BIG DATA ANALYTICS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MTCSE1103	Illustrate on big data and its use cases from selected business domains.
2	MTCSE1103	Interpret and summarize on No SQL, Cassandra
3	MTCSE1103	Analyze the HADOOP and Map Reduce technologies associated with big data analytics and explore on Big Data applications Using Hive
4	MTCSE1103	Make use of Apache Spark, RDDs etc. to work with datasets.
5	MTCSE1103	Assess real time processing with Spark Streaming.

### COMPUTER NETWORKS

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MTCSE1104	Illustrate reference models with layers, protocols and interfaces.
2	MTCSE1104	Describe the routing algorithms, Sub netting and Addressing of IP V4and IPV6.
3	MTCSE1104	Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation
4	MTCSE1104	Describe the concepts Wireless LANS, WIMAX, IEEE 802.11, Cellular telephony and Satellite networks
5	MTCSE1104	Describe the emerging trends in networks-MANETS and WSN

### ADVANCED DATA STRUCTURES & ALGORITHMS LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MTCSE1106	Identify classes, objects, members of a class and relationships among them needed for a specific problem.
2	MTCSE1106	Examine algorithms performance using Prior analysis and asymptotic notations



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3	MTCSE1106	Organize and apply to solve the complex problems using advanced data structures (like arrays, stacks, queues, linked lists, graphs and trees.)
4	MTCSE1106	Apply and analyze functions of Dictionary

### ADVANCED COMPUTING LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MTCSE1107	The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.
2	MTCSE1107	• Development and use of s IoT technology in Societal and Industrial Applications.
3	MTCSE1107	• Skills to undertake high quality academic and industrial research in Sensors and IoT.
4	MTCSE1107	• To classify Real World IoT Design Constraints, Industrial Automation in IoT.

### I Year II semester

### MACHINE LEARNING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MTCSE1201	Domain Knowledge for Productive use of Machine Learning and Diversity of Data.
2	MTCSE1201	Demonstrate on Supervised and Computational Learning
3	MTCSE1201	Analyze on Statistics in learning techniques and Logistic Regression
4	MTCSE1201	Illustrate on Support Vector Machines and Perceptron Algorithm
5	MTCSE1201	Design a Multilayer Perceptron Networks and classification of decision tree



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### MEAN STACK TECHNOLOGIES

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MTCSE1202	After the completion of the course, student will be able to
2	MTCSE1202	Identify the Basic Concepts of Web & Markup Languages
3	MTCSE1202	Develop web Applications using Scripting Languages & Frameworks.
4	MTCSE1202	Make use of Express JS and Node JS frameworks
5	MTCSE1202	Illustrate the uses of web services concepts like restful, react js.
6	MTCSE1202	Adapt to Deployment Techniques & Working with cloud platform.

### SOFT COMPUTING

At the end of the course student should be able

Sno	Course code	CO Statement
1	MTCSE1203	Elaborate fuzzy logic and reasoning to handle uncertainty in engineering problems..
2	MTCSE1203	Make use of genetic algorithms to combinatorial optimization problems
3	MTCSE1203	Distinguish artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning.
4	MTCSE1203	Formulate and apply the principles of self-adopting and self organizing neuro fuzzy inference systems.
5	MTCSE1203	Evaluate and compare solutions by various soft computing approaches for a given problem

### CLOUD COMPUTING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MTCSE1204	Interpret the key dimensions of the challenge of Cloud Computing..
2	MTCSE1204	Examine the economics, financial, and technological implications for



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		selecting cloud computing for own organization.
3	MTCSE1204	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
4	MTCSE1204	Evaluate own organizations' needs for capacity building and training in cloud computing-related IT areas. To Illustrate Virtualization for Data-Center Automation

### MACHINE LEARNING WITH PYTHON LAB

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MTCSE1205	Implement procedures for the machine learning algorithms
2	MTCSE1205	Design Python programs for various Learning algorithms
3	MTCSE1205	Apply appropriate data sets to the Machine Learning algorithms
4	MTCSE1205	Identify and apply Machine Learning algorithms to solve real world problems

### MEAN STACK TECHNOLOGIES LAB

Sno	Course code	CO Statement
1	MTCSE1206	Identify the Basic Concepts of Web & Markup Languages
2	MTCSE1206	Develop web Applications using Scripting Languages & Frameworks.
3	MTCSE1206	Creating & Running Applications using JSP libraries.
4	MTCSE1206	Creating Our First Controller Working with and Displaying in Angular Js and Nested Forms with ng form. Working with the Files in React JS and Constructing Elements with Data.



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### YEAR I SEMESTER

### DEEP LEARNING

At the end of the course student should be able to

Sno	Course code	CO Statement
1	MTCSE2101	Demonstrate the basic concepts fundamental learning techniques and layers.
2	MTCSE2101	Discuss the Neural Network training, various random models.
3	MTCSE2101	Explain different types of deep learning network models.
4	MTCSE2101	Classify the Probabilistic Neural Networks.
5	MTCSE2101	Implement tools on Deep Learning techniques.

**HOD**

**PRINCIPAL**

Principal  
Avanathi Institute of Engg. & Technology  
Tamaram, Makavarapalem Md.,  
Anakapalli District., Pin: 531 113