MEA ENGINEERING COLLEGE, PERINTHALMANNA

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY 2019 SCHEME

Course Outcomes – Semester 1 and semester 2

MAT 101 vector calculus and differential equations

- CO 1 solve the consistent system of linear equations and apply orthogonal to a quadratic form
- CO 2 find the maxima and minima of multivariable functions
- CO 3 find areas and volumes of geometrical shapes, mass and centre of gravity of plane
- laminas using double and triple integrals
- CO 4 perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
- CO 5 determine the power series expansion of a given function

MAT102 Vector calculus, Differential Equations and Transforms

- CO 1 Apply the concept of vector functions and learn to work with conservative vector field
- CO 2 Apply computing integrals of scalar and vector field over surfaces in three-dimensional space.
- CO 3 Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
- CO 4 Apply Laplace transforms to solve physical problems arising in engineering
- CO 5 Apply Fourier transforms to solve physical problems arising in engineering

EST 130 Basics of Electrical and Electronics Engineering

- CO 1 Apply fundamental concepts and circuit laws to solve simple DC electric and magnetic circuits
- CO 2 Develop and solve models of magnetic circuits

- CO 3 Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state
- CO 4 Describe working of a voltage amplifier
- CO 5 Outline the principle of an electronic instrumentation system
- CO 6 Explain the principle of radio and cellular communication

PHT 100 Engineering Physics A

- CO 1 Compute the quantitative aspects of waves and oscillations in engineering systems.
- CO 2 Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.
- CO 3 Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.
- CO 4 Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems
- CO 5 Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system

PHT110 Engineering Physics B

- CO 1 Compute the quantitative aspects of waves and oscillations in engineering systems.
- CO 2 Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.
- CO 3 Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.
- CO 4 Apply the knowledge of ultrasonics in non-destructive testing and use the principles of acoustics to explain the nature and characterization of acoustic design and to provide a safe and healthy environment

- CO 5 Apply the comprehended knowledge about laser and fibre optic communication systems In various engineering applications

CYT 100 Engineering Chemistry

- CO 1 Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
- CO 2 Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
- CO 3 Apply the knowledge of analytical method for characterizing a chemical mixture or a compound. Understand the basic concept of SEM for surface characterisation of nanomaterials.
- CO 4 Learn about the basics of stereochemistry and its application. Apply the knowledge of conducting polymers and advanced polymers in engineering.
- CO 5 Study various types of water treatment methods to develop skills for treating wastewater.

EST 100 Engineering Mechanics

- CO1 Apply the knowledge of engineering drawings and standards to prepare standard dimensioned drawings of machine parts and other engineering components
- CO 1 Recall principles and theorems related to rigid body mechanics
- CO 2 Identify and describe the components of system of forces acting on the rigid body
- CO 3Apply the conditions of equilibrium to various practical problems involving different force system.
- CO 4 Choose appropriate theorems, principles or formulae to solve problems of mechanics.
- CO 5 Solve problems involving rigid bodies, applying the properties of distributed areas and masses

EST 110 Engineering Graphics

- CO 1 Draw the projection of points and lines located in different quadrants
- CO 2 Prepare multi view orthographic projections of objects by visualizing them in different positions
- CO 3 Draw sectional views and develop surfaces of a given object
- CO 4 Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.
- CO 5 Convert 3D views to orthographic views and vice versa
- CO 6 Obtain multi view projections and solid models of objects using CAD tools

EST 120 Basics of Civil and Mechanical Engineering

- CO 1Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.
- CO 2Explain different types of buildings, building components, building materials and building construction
- CO 3 Describe the importance, objectives and principles of surveying.
- CO 4 Summarize the basic infrastructure services MEP, HVAC, elevators, escalators and ramps
- CO 5 Discuss the Materials, energy systems, water management and environment for green buildings.
- CO 6 Analyze thermodynamic cycles and calculate its efficiency
- CO 7 Illustrate the working and features of IC Engines
- CO 8 Explain the basic principles of Refrigeration and Air Conditioning
- CO 9 Describe the working of hydraulic machines
- CO 10 Explain the working of power transmission elements
- CO 11 Describe the basic manufacturing, metal joining and machining processes

HUN 101 Life skills

- CO 1 Define and Identify different life skills required in personal and professional life
- CO 2 Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
- CO 3 Explain the basic mechanics of effective communication and demonstrate these through presentations.
- CO 4 Take part in group discussions
- CO 5 Use appropriate thinking and problem solving techniques to solve new problems
- CO 6 Understand the basics of teamwork and leadership

HUN 102 Professional Communication

- CO 1 Develop vocabulary and language skills relevant to engineering as a profession
- CO 2 Analyze, interpret and effectively summarize a variety of textual content
- CO 3 Create effective technical presentations
- CO 4 Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus
- CO 5 Identify drawbacks in listening patterns and apply listening techniques for specific needs
- CO 6 Create professional and technical documents that are clear and adhering to all the necessary conventions

EST 102 Programming in C

- CO 1 Analyze a computational problem and develop an algorithm/flowchart to find its solution
- CO 2 Develop readable* C programs with branching and looping statements, which use Arithmetic, Logical, Relational or Bitwise operators.
- CO 3 Write readable C programs with arrays, structure or union for storing the the data to be processed

- CO 4 Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem
- CO 5 Write readable C programs which use pointers for array processing and parameter passing
- CO 6 Develop readable C programs with files for reading input and storing output

PHL 120 Engineering Physics Lab

- CO 1 Apply modern instruments like CRO, strain gauge to measure the basic physical quantities viz. frequency and amplitude of a wave pattern, strain etc. Carryout measurement of wave pattern in a stretched string and the corresponding frequency values using a Melde's string apparatus.
- CO 2 Determine the wavelength of monochromatic beam of light and thickness of micro-thin object etc. by forming Newton's rings pattern and an air wedge fringe pattern.
- CO 3 Carryout the measurement of wavelength by diffraction of plane transmission grating and the spectra formed by a monochromatic beam of light and a laser.
- CO 4 Determine the wavelength of a laser beam using the plane transmission rating. Measurement of numerical aperture of an optic fibre and evaluate the properties ofa solar cell and LED through its I-V characteristics.
- CO 5 Determine the velocity of ultrasonic waves in liquid using ultrasonic diffractometer. Compare the magnetic moment of various magnets and determine the magnetic flux density using deflection/vibration Magnetometer.

CYL 120 Engineering Chemistry Lab

- CO 1 Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses
- CO 2 Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs

- CO 3 Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds
- CO 4 Acquire the ability to understand, explain and use instrumental techniques for chemical analysis
- CO 5 Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments
- CO 6 Function as a member of a team, communicate effectively and engage in further learning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum

ESL 120 Civil and Mechanical Workshop

- CO 1 Name different devices and tools used for civil engineering measurements
- CO 2 Explain the use of various tools and devices for various field measurements
- CO 3 Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work.
- CO 4 Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.
- CO 5 Compare different techniques and devices used in civil engineering measurements
- CO 6 Identify Basic Mechanical workshop operations in accordance with the material and objects
- CO 7 Apply appropriate Tools and Instruments with respect to the mechanical workshop trades
- CO 8 Apply appropriate safety measures with respect to the mechanical workshop trades

ESL 130 Electrical and Electronics Workshop

- CO 1 Demonstrate safety measures against electric shocks.
- CO 2 Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols.
- CO 3 Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings.
- CO 4 Identify and test various electronic components
- CO 5 Draw circuit schematics with EDA tools
- CO 6 Assemble and test electronic circuits on board
- CO 7 Work in a team with good interpersonal skills

MEA ENGINEERING COLLEGE, PERINTHALMANNA

DEPARTMENT OF CIVIL ENGINEERING

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY 2019 SCHEME

PROGRAM: B TECH IN CIVIL ENGINEERING

Course Outcomes – Semester 3

MAT201 PARTIAL DIFFERENTIAL EQUATIONS & COMPLEX ANALYSIS

Course Outcomes	
MAT201.1	Understand the concept and the solution of partial differential equations.
MAT201.2	Analyse and solve one dimensional wave equation and heat equation.
MAT201.3	Understand complex functions, its continuity differentiability with the use of Cauchy-Riemann equations.
MAT201.4	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula,understand the series expansion of analytic function.
MAT201.5	Understand the series expansion of complex function about a singularity and apply residue theorem to compute several kinds of real integrals.

CET 201MECHANICS OF SOLIDS

Course Outcomes	
CET201.1	Recall the fundamental terms and theorems associated with mechanics of linear elastic deformable bodies.
CET201.2	Explain the behavior and response of various structural elements under various loading conditions.
CET201.3	Apply the principles of solid mechanics to calculate internal stresses/strains, stress resultants and strain energies in structural elements subjected to axial/transverse loadsand bending/twisting moments.
CET201.4	Choose appropriate principles or formula to find the elastic constants of materials making use of the information available.
CET201.5	Perform stress transformations, identify principal planes/ stresses and maximum shear stress at a point in a structural member.
CET201.6	Analyse the given structural member to calculate the safe load or proportion the cross section to carry the load safely.

CET 203FLUID MECHANICS AND HYDRAULICS

Course Outcomes

CO1	Recall the relevant principles of hydrostatics and hydraulics of pipes and open channels
CO2	Identify or describe the type, characteristics or properties of fluid flow
CO3	Estimate the fluid pressure, perform the stability check of bodies under hydrostatic condition
CO4	Compute discharge through pipes or estimate the forces on pipe bends by applying hydraulic principles of continuity, energy and/or momentum
CO5	Analyze or compute the flow through open channels, perform the design of prismatic channels

CET205 SURVEYING & GEOMATICS

Course Outcomes	
CET205.1	Apply surveying techniques and principles of leveling for the preparation of contour maps, computation of area-volume and sketching mass diagram
CET205.2	Apply the principles of surveying for triangulation
CET205.3	Apply different methods of traverse surveying and traverse balancing
CET205.4	Identify the possible errors in surveying and apply the corrections in field measurements
CET205.5	Apply the basic knowledge of setting out of different types of curves
CET205.6	Employ surveying techniques using advanced surveying equipments

MCN201 SUSTAINABLE ENGINEERING

Course Outcomes	
MCN201 1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
MCN201 2	Explain the different types of environmental pollution problems and their sustainable solutions
MCN201 3	Discuss the environmental regulations and standards
MCN201 4	Outline the concepts related to conventional and non-conventional energy
MCN201 5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

EST 200 DESIGN AND ENGINEERING

Course Outcomes	
EST 200.1	Explain the different concepts and principles involved in design engineering.
EST 200.2	Apply design thinking while learning and practicing engineering.

EST 200.3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.

CEL201CIVIL ENGINEERING PLANNNG AND DRAFTING LAB

Course Outcomes	
CEL201.1	Illustrate ability to organise civil engineering drawings systematically and professionally
CEL201.2	Prepare building drawings as per the specified guidelines.
CEL201.3	Assess a complete building drawing to include all necessary information
CEL201.4	Create a digital formof the building plan using any drafting software

CEL 203SURVEYING LAB

Course Outcomes	
CEL203.1	Use conventional surveying tools such as chain/tape and compass for plotting and area determination
CEL203.2	Apply levelling principles in field
CEL203.3	Solve triangulation problems using theodolite
CEL203.4	Employ total station for field surveying
CEL203.5	Demonstrate the use of distomat and handheld GPS

Course Outcomes – Semester 4

MAT 202PROBABILITY DISTRIBUTIONS,TRANSFORMS AND NUMERICAL METHODS

Course Outcomes	
	Understand the concept and important methods of discrete random variables and using them , analyse suitable random phenomena.
	Understand the concept and important models of continues random variables and using them , analyse suitable random phenomena.
	Preform statistical inference concerning characteristics of a population based on attributes of sample drawn from the population
	compute roots of equation,evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques.
	Apply standard numerical techniques for solving system of equations fitting curves on given numerical data and solving ordinary differential equations.

CET202ENGINEERING GEOLOGY

Course Outcomes	
CET202.1	Recall the fundamental concepts of surface processes, subsurface process, minerals, rocks, groundwater and geological factors in civil engineering constructions.

CET202.2	Identify and describe the surface processes, subsurface process, earth materials,groundwater and geological factors in civil engineering constructions.
CET202.3	Apply the basic concepts of surface and subsurface processes, minerals, rocks,groundwater and geological characteristics in civil engineering constructions
CET202.4	Analyze and classify geological processes, earth materials and groundwater.
CET202.5	Evaluation of geological factors in civil engineering constructions.

CET204GEOTECHNICAL ENGINEERING-I

Course Outcomes	
CET204.1	Explain the fundamental concepts of basic and engineering properties of soil
CET204.2	Describe the laboratory testing methods for determining soil parameters
CET204.3	Solve the basic properties of soil by applying functional relationships
CET204.4	Calculate the engineering properties of soil by applying the laboratory test results and the fundamental concepts of soil mechanics
CET204.5	Analyze the soil properties to identify and classify the soil

CET206TRANSORTATION ENGINEERING

Course Outcomes	
CET206.1	Apply the basic principles of Highway planning and design highway geometric elements
CET206.2	Apply standard code specifications in judging the quality of highway materials; designing of flexible pavements
CET206.3	Explain phenomena in road traffic by collection, analysis and interpretation of traffic data through surveys; creative design of traffic control facilities
CET206.4	Understand about railway systems, tunnel, harbour and docks
CET206.5	Express basics of airport engineering and design airport elements

MCN202CONSTITUTION OF INDIA

Course Outcomes	
MCN202.1	Explain the background of the present constitution of India and features.
MCN202.2	Utilize the fundamental rights and duties
MCN202.3	Understand the working of the union executive, parliament and judiciary
MCN202.4	Understand the working of the state executive, legislature and judiciary.
MCN202.5	Utilize the special provisions and statutory institutions.
MCN202.6	Show national and patriotic spirit as responsible citizens of the country

HUT 200PROFESSIONAL ETHICS

Course Outcomes

HUT 200 .1	Understand the core values that shape the ethical behaviour of a professional.
HUT 200 .2	Adopt a good character and follow an ethical life.
HUT 200 .3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
HUT 200 .4	Solve moral and ethical problems through exploration and assessment by established experiments.
HUT 200 .5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.

CEL202MATERIAL TESTING LAB – 1

Course Outcomes	
CEL202.1	understand the behaviour of engineering materials under various forms and stages of loading.
CEL202.2	Characterize the elastic properties of various materials.
CEL202.3	Evaluate the strength and stiffness properties of engineering materials under various loading conditions.

CEL 204FLUID MECHANICS LAB

Course Outcomes	
CEL202.1	Apply fundamental knowledge of Fluid Mechanics to corresponding experiments
CEL202.2	Apply theoretical concepts in Fluid Mechanics to respective experiments
CEL202.3	Analyse experimental data and interpret the results
CEL202.4	Document the experimentation in prescribed manner

Course Outcomes – Semester 5

CET301STRUCTURAL ANALYSIS I

Course Outcomes	
CET301.1	Apply the principles of solid mechanics to analyse the trusses.
CET301.2	Apply the energy principles to analyse the statically determinate structures.
CET301.3	Identify the problems with statically indeterminacy and understand the basic concepts of tackling such problems by means of consistant deformation.
CET301.4	Apply suitable methods of analysis for various types of structures including cables, suspension bridges and arches.
CET301.5	Analyze the effect of moving loads on structures using influence lines.
CET301.6	Apply specific methods such as slope deflection and moment distribution

	methods of structural analysis for typical structures with different characteristics.

CET303 DESIGN OF CONCRETE STRUCTURES

Course Outcomes	
CET303.1	Recall the fundamental concepts of limit state design and code provisions for design of concrete members under bending, shear, compression and torsion.
CET303.2	Analyse reinforced concrete sections to determine the ultimate capacity in bending, shear and compression.
CET303.3	Design and detailbeams, slab, stairs and footings using IS code provisions.
CET303.4	Design and detail columns using IS code and SP 16 design charts.
CET303.5	Explain the criteria for earthquake resistant design of structures and ductile detailing of concrete structures subjected to seismic forces.

CET305GEOTECHNICAL ENGINEERING-II

Course Outcomes	
CET305.1	Understand soil exploration methods
CET305.2	Explain the basic concepts, theories and methods of analysis in foundation engineering
CET305.3	Calculate bearing capacity, pile capacity, foundation settlement and earth pressure
CET305.4	Analyze shallow and deep foundations
CET305.5	Solve the field problems related to geotechnical engineering

CET307HYDROLOGY & WATER RESOURCES ENGINEERING

Course Outcomes	
CET307.1	Describe and estimate the different components of hydrologic cycle by processing hydro-meteorological data
CET307.2	Determine the crop water requirements for the design of irrigation canals by recollectingthe principles of irrigation engineering
CET307.3	Perform the estimation of streamflow and/or describe the river behaviour and control structures
CET307.4	Describe and apply the principles of reservoir engineering to estimate the capacity of reservoirs and their useful life
CET307.5	Demonstrate the principles of groundwater engineering and apply them for computing the yield of aquifers and wells

CET309 CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Course Outcomes	
CET309.1	Describe the properties of materials used in construction
CET309.2	Explain the properties of concrete and its determination
CET309.3	Describe the various elements of building construction
CET309.4	Explain the technologies for construction
CET309.5	Describe the procedure for planning and executing public works
CET309.6	Apply scheduling techniques in project planning and control

CEL331 MATERIAL TESTING LAB II

Course Outcomes	
CEL331.1	describe the basic properties of various construction materials.
CEL331.2	Characterize the physical and mechanical properties of various construction materials.
CEL331.3	Interpret the quantity of various construction materials as per IS Codal provisions.

CEL 333 GEOTECHNICAL ENGINEERING LAB

Course Outcomes	
CET301.1	Identify and classify soil based on standard geotechnical experimental methods.
CET301.2	Perform and analyse permeability tests.
CET301.3	Interpret engineering behaviour of soils based on test results.
CET301.4	Perform laboratory compaction, CBR and in-place density test for fill quality control in the field.
CET301.5	Evaluate the strength of soil by performing various tests viz. direct shear test, unconfined compressive strength test and triaxial shear test.
CET301.6	Evaluate settlement characteristics of soils.

Course Outcomes – Semester 6

CET302STRUCTURAL ANALYSIS II

Course Outcomes	
CET302.1	Understand the principles of plastic theory and its applications in structural analysis

CET302.2	Examine the type of structure and decide on the method of analysis.
CET302.3	Apply approximate methods of analysis for framed structures to ascertain stress resultants approximately but quickly.
CET302.4	Apply the force method to analyse framed structures.
CET302.5	Apply the displacement methods to analyse framed structures.
CET302.6	Remember basic dynamics, understand the basic principles of structural dynamics and apply the same to simple structures.

CET304ENVIRONMENTAL ENGINEERING

Course Outcomes	
CET304.1	Appreciate the role of environmental engineering in improving the quality of environment
CET304.2	Plan for collection and conveyance of water and waste water
CET304.3	Enhance natural water purification processes in an engineered environment
CET304.4	Decide on appropriate technology for water and waste water treatment

CET306DESIGN OF HYDRAULIC STRUCTURES

Course Outcomes	
CET306.1	Elucidate the causes of failure, principles of design of different components of hydraulic structures
CET306.2	Describe the features of canal structures and perform the design of alluvial canals
CET306.3	Perform the hydraulic design of minor irrigation structures such as cross drainage works, canal falls, cross regulator.
CET306.4	Prepare the scaled drawings of different minor irrigation structures
CET306.5	Describe the design principles and features of dams and perform the stability analysis of gravity dams

CET308COMPREHENSIVE COURSE WORK

Course Outcomes	
CET308.1	Learn to prepare for a competitive examination
CET308.2	Comprehend the questions in Civil Engineering field and answer them with confidence
CET308.3	Communicate effectively with faculty in scholarly environments
CET308.4	Analyze the comprehensive knowledge gained in basic courses in the field of Civil Engineering

CET332TRAFFIC ENGINEERING AND MANAGEMENT

Course Outcomes

CET332.1	Identify the relationship among various traffic stream variables. (K2, K3)
CET332.2	Apply traffic management measures and regulations so as to solve issues related to traffic low in road network. (K2, K3)
CET332.3	Explain the concept of capacity and LOS and its estimation for various traffic facilities (K2,K3)
CET332.4	Identify the need for intersection control and design of various types.(K2,K3)
CET332.5	Analyse causes of road accidents and suggest preventive measures (K2, K3

CEL332TRANSPORTATION ENGINEERING LAB

Course Outcomes	
CEL 332.1	Analyse the suitability of soil as a pavement subgrade material
CEL 332.2	Assess the suitability of aggregates as a pavement construction material
CEL 332.3	Characterize bitumen based on its properties so as to recommend it as a pavement construction material
CEL 332.4	Design bituminous mixes for pavement layers
CEL 332.5	Assess functional adequacy of pavements based on roughness of pavement surface.

CEL 334CIVIL ENGINEERING SOFTWARE LAB

Course Outcomes	
CEL334.1	undertake analysis and design of multi-storeyed framed structure, schedule a given set of project activities using a software.
CEL334.2	prepare design details of different structural components, implementation plan for a project.
CEL334.3	prepare a technical document on engineering activities like surveying ,structural design and project planning.

Course Outcomes – Semester 7

MCN 401INDUSTRIAL SAFETY ENGINEERING

Course Outcomes	
MCN401.1	Describe the theories of accident causation and preventive measures of industrial accidents
MCN401.2	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping.
MCN401.3	Explain different issues in construction industries.
MCN401.4	Describe various hazards associated with different machines and mechanical material handling
MCN401.5	Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards.

CET 401DESIGN OF STEEL STRUCTURES

Course Outcomes	
CO1	Explain the behavior and properties of structural steel members to resist various structural forces and actions and apply the relevant codes of practice
CO2	Analyses the behavior of structural steel members and undertake design at both serviceability and ultimate limit states.
CO3	Explain the theoretical and practical aspects of Design of composite Steel Structure along with the planning and design aspects
CO4	Apply a diverse knowledge of Design of Steel engineering practices applied to real life problems
CO5	Demonstrate experience in the implementation of design of structures on engineering concepts which are applied in field Structural Engineering

CET423GROUND IMPROVEMENT TECHNIQUES

Course Outcomes	
CET423.1	Classify different ground improvement methods based on the soil suitability
CET423.2	Outline the basic concept/ design aspects of various ground improvement methods
CET423.3	Identify the construction procedure of different ground improvement methods
CET423.4	Choose different application of geosynthetics and soil stabilisation in Ground improvement

MET445RENEWABLE ENERGY ENGINEERING

Course Outcomes	
MET455.1	Explain renewable energy sources and evaluate the implication of renewable energy. To predict solar radiation at a location
MET455.2	Explain solar energy collectors, storages, solar cell characteristics and applications
MET455.3	Explain the different types of wind power machines and control strategies of wind turbines
MET455.4	Explain the ocean energy and conversion devices and different Geothermal sources
MET455.5	Explain biomass energy conversion devices. Calculate the Net Present value and payback period

CEQ413SEMINAR

Course Outcomes	
CEQ413.1	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply).

CEQ413.2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze).
CEQ413.3	Prepare a presentation about an academic document (Cognitive knowledge level: Create).
CEQ413.4	Give a presentation about an academic document (Cognitive knowledge level: Apply).Give a presentation about an academic document (Cognitive knowledge level: Apply).
CEQ413.5	Prepare a technical report (Cognitive knowledge level:Create).

CEL411ENVIRONMENTAL ENGINEERING LAB

Course Outcomes	
CEL 411.1	Analyse various physico-chemical and biological parameters of water
CEL 411.2	Compare the quality of water with drinking water standards and recommend its suitability for drinking purposes

CED415PROJECT PHASE I

Course Outcomes	
CED415.1	Model and solve real world problems by applying knowledge across domains. (Cognitive knowledge level: Apply).
CED415.2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
CED415.3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
CED415.4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
CED415.5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
CED415.6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

Course Outcomes – Semester 8

CET402QUANTITY SURVEYING AND VALUATION

Course Outcomes	
CET402.1	Define basic terms related to estimation, quantity surveying and contract document

CET402.2	Interpret the item of work from drawings and explain its general specification and unit of measurement
CET402.3	Make use of given data from CPWD DAR/DSR for calculating the unit rate of different items of work associated with building construction
CET402.4	Develop detailed measurement (including BBS) and BoQ of a various work like buildings, earthwork for road, sanitary andwater supply work
CET402.5	Explain various basic terms related to valuation of land and building
CET402.6	Develop valuation of buildings using different methods of valuation.

CET456REPAIR AND REHABILITATION OF BUILDINGS

Course Outcomes	
CET456.1	Recall the basics ideas and theories associated with Concrete technology and Masonry structures
CET456.2	Understand the need and methodology of repair and rehabilitation of structures, the various mechanisms used, and tools for diagnosis of structures
CET456.3	Identifying the criterions for repairing / maintenance and the types and properties of repair materials used in site. Learn various techniques for repairing dam- aged and corroded structures
CET456.4	Proposing wholesome solutions for maintenance/rehabilitation and applying methodologies for repairing structures or demolishing structures.
CET456.5	Analyse and asses the damage to structures using various tests

CET438AIRPORT,SEAPORT AND HARBOUR ENGINEERING

Course Outcomes	
CET438.1	Explain the basic principles of planning and design for site selection, Airport components based on air traffic characteristics
CET438.2	Explain the basic design principles of Runway orientation, basic runway length and corrections required, Geometric design of runways, Design of taxiways and aprons, Terminal area planning,
CET438.3	Explain various aspects such as Airport markings, Lighting of runway approaches, taxiways and aprons, Air traffic control methods.
CET438.4	Explain the basic principles ,site selection characteristics ,lay out ,break waters, quays, piers, wharves, jetties, transit sheds and warehouses - navigational aids - light houses, signals - types - Moorings
CET438.5	Explain the basics of Docks – Functions and types - dry docks, wet docks arrangement of basins and docks

CET434RAILWAY AND TUNNEL ENGINEERING

Course Outcomes	
CET434.1	Explain the role of railways in national development and carry out geometric design of railway track by identifying component parts of railway track
CET434.2	Design railway operation and control systems
CET434.3	Analyze factors affecting railway accidents and understand the modern developments in railways and develop an awareness about the maintenance of railway system
CET434.4	Explain about the importance, types and methods of construction of tunnel
CET434.5	Develop and analyze design aspects of ventilation, lining and lighting in tunnels

CED416PROJECT PHASE II

Course Outcomes	
CED415.1	Model and solve real world problems by applying knowledge across domains. (Cognitive knowledge level: Apply).
CED415.2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
CED415.3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
CED415.4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
CED415.5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
CED415.6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

MEA ENGINEERING COLLEGE, PERINTHALMANNA
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY 2019 SCHEME

PROGRAM: B TECH IN ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Course Outcomes – Semester 3

MAT 203DISCRETE MATHEMATICAL STRUCTURES

- CO1-Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic.
- CO2-Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion.
- CO3-Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science.
- CO4-Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science.
- CO5-Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients.
- CO6-Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups.

CST201 DATA STRUCTURES

- CO1 Design an algorithm for a computational task and calculate the time/space complexities of that algorithm.
- CO2 Identify the suitable data structure (array or linked list) to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem.

- CO3 Write an algorithm to find the solution of a computational problem by selecting an appropriate data structure.
- CO4 Store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set.
- CO5 Select appropriate sorting algorithms to be used in specific circumstances.
- CO6Design and implement Data Structures for solving real world problems efficiently.

CST203 LOGIC DESIGN SYSTEM

- CO1 Illustrate decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers.
- CO2 Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates.
- CO3 Design combinational circuits - Adders, Code Convertors, Decoders, Magnitude Comparators, Parity Generator/Checker and design the Programmable Logic Devices - ROM and PLA.
- CO4 Design sequential circuits - Registers, Counters and Shift Registers.
- CO5 Use algorithms to perform addition and subtraction on binary, BCD and floating point numbers.

CST205 OBJECT ORIENTED PROGRAMMING IN JAVA

- CO 1 Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism.
- CO 2 Utilise datatypes, operators, control statements, built in packages & interfaces, Input/ Output Streams and Files in Java to develop programs.
- CO 3 Illustrate how robust programs can be written in Java using exception handling mechanism.
- CO 4 Write application programs in Java using multithreading and database connectivity.
- CO 5 Write Graphical User Interface based application programs by utilising event handling features and Swing in Java.

CSL201 DATA STRUCTURE LAB

- CO 1 Write a time/space efficient program using arrays/linked lists/trees/graphs to provide Necessary functionalities meeting a given set of user requirements.
- CO 2 Write a time/space efficient program to sort a list of records based on a given key in the record.
- CO 3 Examine a given Data Structure to determine its space complexity and time complexities of operations on it
- CO 4 Design and implement an efficient data structure to represent given data.
- CO5 Write a time/space efficient program to convert an arithmetic expression from one notation to another.
- CO6 Write a program using linked lists to simulate Memory Allocation and Garbage Collection.

CSL203 OBJECT ORIENTED PROGRAMMING IN LAB

- CO 1 Implement the Object Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java.
- CO 2 Implement programs in Java which use datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and File.
- CO 3 Implement robust application programs in Java using exception handling.
- CO 4 Implement application programs in Java using multithreading and database connectivity.
- CO 5 Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java.

Course Outcomes – Semester 4

MAT256 PROBABILITY AND STATISTICAL MODELLING

- CO 1 Explain the concept, properties and important models of discrete random variables and usethem to analyze suitable random phenomena.

- CO 2 Summarize the properties and relevant models of continuous random variables and use them to analyze suitable random phenomena.
- CO 3Make use of concepts of sampling and theory of estimation to solve application level problems.
- CO 4Organize the basic concepts in hypothesis testing and develop decision procedures for the most frequently encountered testing problems.
- CO 5Build statistical methods like correlation and regression analysis to interpret experimental data.

CST202 COMPUTER ORGANIZATION AND ARCHITECTURE

- CO1 Recognize and express the relevance of basic components, I/O organization and pipelining schemes in a digital computer.
- CO2 Explain the types of memory systems and mapping functions used in memory systems.
- CO3 Demonstrate the control signals required for the execution of a given instruction.
- CO4 Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it.
- CO5 Explain the implementation aspects of arithmetic algorithms in a digital computer.
- CO6 Develop the control logic for a given arithmetic problem.

CST204DATABASE MANAGEMENT SYSTEMS

- CO 1 Summarize and exemplify fundamental nature and characteristics of database systems
- CO 2 Model real word scenarios given as informal descriptions, using Entity Relationship diagrams.
- CO 3 Model and design solutions for efficiently representing and querying data using relational model
- CO 4 Demonstrate the features of indexing and hashing in database applications
- CO 5 Discuss and compare the aspects of Concurrency Control and Recovery in Database systems.
- CO 6 Explain various types of NoSQL databases.

CST206 OPERATING SYSTEMS

- CO1 Explain the relevance, structure and functions of Operating Systems in computing devices.
- CO2 Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems.
- CO3Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors.
- CO4Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems.
- CO5Explain the memory management algorithms in Operating Systems.
- CO6 Explain the security aspects and algorithms for file and storage management in Operating Systems.

ADL202 PYTHON AND STATISTICAL MODELLING LAB

- CO 1 Experiment with concepts of iteration, function, string and list
- CO 2Identify the importance of tuples, dictionary traversal, dictionary methods**,** files and operations
- CO 3 Model graphical representation of data, measures of central tendency and measures of dispersion
- CO 4 Solve problems based on Binomial distribution, Poisson distribution, sampling and regression analysis.
- CO 5 Make use of various correlation tests and utilize statistical analysis software.

CSL204 OPERATINGS SYSTEMS LAB

- CO 1 Illustrate the use of systems calls in Operating Systems.
- CO 2 Implement Process Creation and Inter Process Communication in Operating Systems.
- CO 3Implement Fist Come First Served, Shortest Job First, Round Robin and Priority based CPU Scheduling Algorithms.

- CO 4Illustrate the performance of First In First Out, Least Recently Used and Least Frequently Used Page Replacement Algorithms.
- CO 5Implement modules for Deadlock Detection and Deadlock Avoidance in Operating Systems.
- CO 6 Implement modules for Storage Management and Disk Scheduling in Operating Systems.

Course Outcomes – Semester 5

ADT301 FOUNDATIONS OF DATA SCIENCE

- CO 1 Recall the fundamental concepts and applications of data science, and make interference on key important points.
- CO 2 Identify the concepts in data mining and analyze the different steps in data pre-processing.
- CO 3 Illustrate the concepts of classification methods.
- CO 4 Perform association mining and analyze cluster using different methods.
- CO 5 Evaluate & improve the performance of machine learning classification models.

CST303 COMPUTER NETWORKS

- CO 1 Explain the features of computer networks, protocols, and network design models
- CO 2 Describe the fundamental characteristics of the physical layer and identify the usage in network communication
- CO 3Explain the design issues of data link layer, link layer protocols, bridges and switches
- CO 4Illustrate wired LAN protocols (IEEE 802.3) and wireless LAN protocols (IEEE 802.11)
- CO 5Select appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for a network
- CO 6Illustrate the functions and protocols of the network layer, transport layer, and application layer in inter-networking .

ADT305 INTRODUCTION TO MACHINE LEARNING

- CO 1 Illustrate Machine Learning concepts and basics of supervised learning concepts.
- CO 2 Describe dimensionality reduction techniques and supervised learning concepts (regression, linear classification).
- CO 3Solve real life problems using appropriate machine learning models and evaluate the performance measures and Illustrate the concepts of Multilayer neural network
- CO 4Illustrate basics of parameter estimation models and the working of classifier SVM classifier model
- CO 5Describe unsupervised learning concepts

AIT307 INTRODUCTION TO ARTIFICIAL INTELLIGENCE

- CO 1 Explain the fundamental concepts of intelligent systems and their architecture.
- CO 2 Illustrate uninformed and informed search techniques for problem solving in intelligent systems.
- CO 3 Solve Constraint Satisfaction Problems using search techniques.
- CO 4 Illustrate different types of learning techniques used in intelligent systems.
- CO 5 Represent AI domain knowledge using logic systems and use inference techniques for reasoning in intelligent systems.

AIT307 MANAGEMENT OF SOFTWARE SYSTEMS

- CO 1 Demonstrate Traditional and Agile Software Development approaches.
- CO 2 Prepare Software Requirement Specification and Software Design for a given problem.
- CO 3 Justify the significance of design patterns and licensing terms in software development, prepare testing, maintenance and DevOps strategies for a project.
- CO 4 Make use of software project management concepts while planning, estimation, scheduling, tracking and change management of a project, with a traditional/agile framework**.**
- CO 5 Utilize SQA practices, Process Improvement techniques and Technology advancements in cloud based software models and containers & micro services.

ADL331 AI & DATA SCIENCE LAB

- CO 1 Implement various predictive and descriptive analysis measures using Python. Use various packages and libraries in Python for data handling.
- CO 2 Implement different Regression methods such as Linear and Logistic regression to interpret the given dataset.
- CO 3 Implement various supervised learning models like k-Nearest Neighbour, Support Vector Machine, Naïve Bayesian Classifier and Decision Tree algorithms
- CO 4 Implement mathematical optimization method like the Hill Climbing algorithm and Deep Learning method like Convolutional Neural Network algorithm.
- CO 5 Implement different methods (like Correlation and Covariance) to determine the dependence between features in the dataset and apply dimensionality reduction techniques

CSL333 DATABASE MANAGEMENT SYSTEMS LAB

- CO 1 Design database schema for a given real world problem-domain using standard design and modelling approaches.
- CO 2 Construct queries using SQL for database creation, interaction, modification, and updating.
- CO 3 Design and implement triggers and cursors.
- CO 4 Implement procedures, functions, and control structures using PL/SQL**.**
- CO 5Perform CRUD operations in NoSQL Databases.
- CO 6 Develop database applications using front-end tools and back-end DBMS.

Course Outcomes – Semester 6

ADT302 CONCEPTS IN BIG DATA ANALYTICS

- CO 1 Outline the basic big data concept.
- CO 2 Categorize and summarize the processing in Big Data and its importance
- CO 3 Simulate various Big data technologies like Hadoop MapReduce, Pig, Hive, Hbase.

- CO 4 Determine tools and techniques to analyze Big Data .
- CO 5 Resolve problems associated with big data with the features of R programming.

AIT304 ROBOTICS AND INTELLIGENT SYSTEM

- CO 1 Understand the concepts of manipulator and mobile robotics.
- CO 2 Choose the suitable sensors, actuators and control for robot design
- CO 3 Developing kinematic model of mobile robot and understand robotic vision intelligence.
- CO 4 Discover the localization and mapping methods in robotics.
- CO 5 Plan the path and navigation of robot by applying artificial intelligence algorithm.

ADT305 INTRODUCTION TO MACHINE LEARNING

- CO 1 Illustrate Machine Learning concepts and basics of supervised learning concepts.
- CO 2 Describe dimensionality reduction techniques and supervised learning concepts (regression, linear classification).
- CO 3Solve real life problems using appropriate machine learning models and evaluate the performance measures and Illustrate the concepts of Multilayer neural network
- CO 4 Illustrate basics of parameter estimation models and the working of classifier SVM classifier model
- CO 5 Describe unsupervised learning concepts

CST306ALGORITHM ANALYSIS AND SYSTEM

- CO 1 Analyze any given algorithm and express its time and space complexities in asymptotic notations.
- CO 2 Derive recurrence equations and solve it using Iteration, Recurrence Tree, Substitution And Master's Method to compute time complexity of algorithms
- CO 3 Illustrate Graph traversal algorithms & applications and Advanced Data structures like AVL trees and Disjoint set operations.
- CO 4 Demonstrate Divide-and-conquer, Greedy Strategy, Dynamic programming, Branch-and Bound and Backtracking algorithm design techniques

- CO 5Classify a problem as computationally tractable or intractable, and discuss strategies to address intractability.
- CO 6Identify the suitable design strategy to solve a given problem.

ADT308 COMPREHENSIVE COURSE WORK

- CO 1 Comprehend the concepts in machine learning
- CO 2 Comprehend the concepts and applications of data structures
- CO 3 Comprehend the concepts, functions and algorithms in Operating System
- CO 4 Comprehend the fundamental principles of database design and manipulation
- CO 5 Comprehend the basic concepts of data science

ADL332 BIGDATA ANALYTICS LAB

- CO 1 Illustrate the setting up of and Installing Hadoop in one of the three operating modes.
- CO 2 Implement the file management tasks in Hadoop and explore the shell commands
- CO 3 Implement different tasks using Hadoop Map Reduce programming model.
- CO 4 Iimplement Pig Scripting operations and Spark Application functionalities
- CO 5 Implement data extraction from files and other sources and perform various data manipulation tasks on them using R Program.
- CO 6 Illustrate the knowledge of R gained to data analytics for real life applications

ADD333 MINI PROJECT

- CO 1 Identify technically and economically feasible problems of social relevance
- CO 2 Identify and survey the relevant literature for getting exposed to related solutions
- CO 3Perform requirement analysis and identify design methodologies and develop adaptable and reusable solutions of minimal complexity by using modern tools and advanced programming techniques
- CO 4 Prepare technical report and deliver presentation.
- CO 5Apply engineering and management principles to achieve the goal of the project

Course Outcomes – Semester 7

AIT401FOUNDATION OF DEEP LEARNING

- CO 1Illustrate the basic concepts of neural networks, deep learning and its practical issues
- CO 2Outline the standard regularization and optimization techniques for the effective training of deep neural networks.
- CO 3Build convolutional Neural Network (CNN) models for different use cases.
- CO 4Apply the concepts of Recurrent Neural Network (RNN), Long Short Term Memory(LSTM), Gated Recurrent Unit (GRU**).**
- CO 5 Explain the concepts of auto encoder, generative models.

AIT413ADVANCE CONCEPTS OF MICRO PROCESSOR AND MICRO CONTROLLER

- CO1 Illustrate the **architecture**, modes of operation and addressing modes of microprocessors
- CO2 Develop 8086 **assembly** language programs. Demonstrate interrupts, its **handling** in 8086
- CO3 Illustrate how different peripherals are interfaced with 8086 microprocessors (8259,8255,8254,8257)
- CO4 Illustrate the architecture and features of advanced microprocessors
- CO5 Outline features of **microcontrollers** and develop low level programs.

CST423 CLOUD COMPUTING

- CO1 Explain the various cloud computing models and services.
- CO2 Demonstrate the significance of implementing virtualization techniques.
- CO3 Explain different cloud enabling technologies and compare private cloud platforms
- CO4 Apply appropriate cloud programming methods to solve big data problems.
- CO5 Describe the need for security mechanisms in cloud
- CO6 Compare the different popular cloud computing platforms

CST433 SECURITY IN COMPUTING

- CO1 Identify the security services provided against different types of security attacks.
- CO2 Illustrate symmetric/asymmetric key cryptosystems for secure communication.
- CO3 Illustrate symmetric/asymmetric key cryptosystems for secure communication.
- CO4 Explain message integrity and authentication methods in a secure communication scenario.
- CO5 Interpret public/secret key distribution techniques for secure communication
- CO6 Identify the effects of intruders, malicious software and distributed denial of service attacks on system security.

CST455 OBJECT ORIENTED CONCEPTS

- CO1 Develop Java programs using the object-oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism.
- CO2 Utilise data types, operators, control statements, built in packages & interfaces, Input/output Streams and Files in Java to develop programs.
- CO3 Illustrate how robust programs can be written in Java using exception handling mechanism.
- CO4 Develop application programs in Java using multithreading.
- CO5 Develop Graphical User Interface based application programs by utilising event handling features and Swing in Java.

AIL411 DEEP LEARNING LAB

- C01 Implement advanced machine learning concepts using python.
- CO2Apply basic data pre-processing and tuning techniques.
- CO3 Implement basic neural network and CNN on standard datasets.
- CO4 Design and Implement sequence modelling schemes.
- CO5 Implement auto encoders on standard datasets and analyse the performance.

ADQ413 SEMINAR

- CO1 Identify academic documents from the literature which are related to her/his areas of interest.
- CO2 Read and apprehend an academic document from the literature which is related to her/ his areas of interest.
- CO3 Prepare a presentation about an academic document.
- CO4 Give a presentation about an academic document.
- CO5 Prepare a technical report.

ADD415 PROJECT PHASE 1

- CO1 Model and solve real world problems by applying knowledge across domains.
- CO2 Develop products, processes or technologies for sustainable and socially relevant applications.
- CO3 Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks.
- CO4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms.
- CO5 Identify technology/research gaps and propose innovative/creative solutions.
- CO6 Organize and communicate technical and scientific findings effectively in written and oral forms.

Course Outcomes – Semester 8

ADT402 BUISNESS ANALYTICS

- CO1 Explain the various business analytical concepts, applications and models.
- CO2 Make use of statistical models for business analytics in data management.
- CO3 Apply tableau tool for business analytics applications.
- CO4 Make use of business analytical tools and techniques in Web Analytics.
- CO5 Demonstrate business analysis with data science toolkits.

AMT414 GPU COMPUTING

- CO1 Explain the massive parallelization of programs and GPU-based computing.
- CO2 Explain CUDA architecture and programming model for parallel computing.
- CO3 Describe memory and performance considerations for CUDA-based parallel computing.
- CO4 Illustrate the parallel floating point arithmetic using CUDA
- CO5 Appreciate the application of GPU-based parallel computation in multiple domains.

CST414 PROGRAMMING PARADIGMS

- CO1 Explain the criteria for evaluating programming languages and compare Imperative, Functional and Logic programming languages
- CO2 Illustrate the characteristics of data types and variables
- CO3 Comprehend how control flow structures and subprograms help in developing the structure of a program to solve a computational problem
- CO4 Explain the characteristics of Object-Oriented Programming Languages
- CO5 Compare concurrency constructs in different programming languages

CST434 NETWORK SECURITY PROTOCOLS

- CO1 Explain authentication protocols, X.509 authentication service and Public Key Infrastructure (PKI).
- CO2 Identify the security mechanisms in E mail security services.
- CO3 Summarize the network and transport layer security services provided in a secure communication scenario.
- CO4Describe real time communication security and application layer security protocols.
- CO5Explain the concepts of firewalls and wireless network security.

ADD416 PROJECT PHASE II

- CO1 Model and solve real world problems by applying knowledge across domains.
- CO2 Develop products, processes or technologies for sustainable and socially relevant applications.
- CO3 Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks.
- CO4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms.
- CO5 Identify technology/research gaps and propose innovative/creative solutions.
- CO6 Organize and communicate technical and scientific findings effectively in written and oral forms.

MEA ENGINEERING COLLEGE, PERINTHALMANNA

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY 2019 SCHEME

PROGRAM: B TECH ELECTRONICS AND COMMUNICATION ENGINEERING

S3

MAT201 PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS

CO 1 Understand the concept and the solution of partial differential equation.

CO 2 Analyse and solve one dimensional wave equation and heat equation.

CO 3 Understand complex functions, its continuity differentiability with the use of CauchyRiemann equations.

CO 4 Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function

CO 5 Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.

MCN201 SUSTAINABLE ENGINEERING

CO 1 Understand the relevance and the concept of sustainability and the global initiatives in this direction

CO 2 Explain the different types of environmental pollution problems and their sustainable solutions

CO 3 Discuss the environmental regulations and standards

CO 4 Outline the concepts related to conventional and non-conventional energy

CO 5 Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

EST 200 DESIGN AND ENGINEERING

CO 1 Explain the different concepts and principles involved in design engineering.

CO 2 Apply design thinking while learning and practicing engineering.

CO 3 Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering**.**

ECT201 SOLID STATE DEVICES

CO 1 Apply Fermi-Dirac Distribution function and Compute carrier concentration at equilibrium and the parameters associated with generation, recombination and transport mechanism

CO 2 Explain drift and diffusion currents in extrinsic semiconductors and Compute current density due to these effects.

CO 3 Define the current components and derive the current equation in a pn junction diode and bipolar junction transistor.

CO 4 Explain the basic MOS physics and derive the expressions for drain current in linear and saturation regions.

CO 5 Discuss scaling of MOSFETs and short channel effects.

ECT 203 LOGIC CIRCUIT DESIGN

CO 1 Explain the elements of digital system abstractions such as digital representations of information, digital logic and Boolean algebra

CO 2 Create an implementation of a combinational logic function described by a truth table using and/or/inv gates/ muxes

CO 3 Compare different types of logic families with respect to performance and efficiency

CO 4 Design a sequential logic circuit using the basic building blocks like flip-flops

CO 5 Design and analyze combinational and sequential logic circuits through gate level Verilog models.

ECT205 NETWORK THEORY

CO 1 Apply Mesh / Node analysis or Network Theorems to obtain steady state response of the linear time invariant networks.

CO 2 Apply Laplace Transforms to determine the transient behavior of RLC networks.

CO 3 Apply Network functions and Network Parameters to analyses the single port and two port networks.

ECL201 SCIENTIFICCOMPUTINGLABORATORY

CO1 Describe the needs and requirements of scientific computing and to familiarize one programming language for scientific computing and data visualization.

CO2 Approximate an array/matrix with matrix decomposition.

CO3 Implement numerical integration and differentiation.

CO4 Solve ordinary differential equations for engineering applications

CO5 Compute with exported data from instruments CO6 Realize how periodic functions are constituted by sinusoids

CO7 Simulator and om processes and understand their statistics**.**

ECL 203 LOGIC DESIGN LAB

CO 1 Design and demonstrate the functioning of various combinational and sequential circuits using ICs

CO 2 Apply an industry compatible hardware description language to implement digital circuits

CO 3 Implement digital circuis on FPGA boards and connect external hardware to the boards

CO 4 Function effectively as an individual and in a team to accomplish the given task

ECT 283 ANALOG COMMUNICATION (MINOR)

CO 1 Explain various components of a communication system

CO 2 Discuss various sources of noise, and its the effect in a communication system

CO 3 Explain amplitude modulation and its variants for a sinusoidal message

CO 4 Explain frequency modulation and its variants for a sinusoidal message

CO 5 List and compare various transmitter and receiver systems of AM and FM

S4

MAT 202PROBABILITY,STATISTICS AND NUMERICAL METHODS

CO 1 Understand the concept, properties and important models of discrete random variables and,using them, analyse suitable random phenomena.

CO 2 Understand the concept, properties and important models of continuous random variables and,using them, analyse suitable random phenomena.

CO 3 Perform statistical inferences concerning characteristics of a population based on attributes of samples drawn from the population

CO 4 Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques

CO 5 Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations

ECT202 ANALOG CIRCUITS

CO 1 Design analog signal processing circuits using diodes and first order RC circuit

CO 2 Analyse basic amplifiers using BJT and MOSFET

CO 3 Apply the principle of oscillator and regulated power supply circuits.

ECT 204 SIGNALS AND SYSTEMS

CO 1 Apply properties of signals and systems to classify them

CO 2 Represent signals with the help of series and transforms

CO 3 Describe orthogonality of signals and convolution integral.

CO 4 Apply transfer function to compute the LTI response to input signals.

CO 5 Apply sampling theorem to discretize continuous time signals

ECT 206 COMPUTER ARCHITECTURE AND MICROCONTROLLERS*

CO 1 Explain the functional units, I/O and memory management w.r.t a typical computer architecture.

CO 2 Distinguish between microprocessor and microcontroller.

CO 3 Develop simple programs using assembly language programming.

CO 4 Interface 8051 microcontroller with peripheral devices using ALP/Embedded C

CO 5 Familiarize system software and Advanced RISC Machine Architecture.

ECL 202 ANALOG CIRCUITS AND SIMULATION LAB

CO 1 Design and demonstrate the functioning of basic analog circuits using discrete components.

CO 2 Design and simulate the functioning of basic analog circuits using simulation tools.

CO 3 Function effectively as an individual and in a team to accomplish the given task.

ECL 204 MICROCONTROLLER LAB

CO 1 Write an Assembly language program/Embedded C program for performing data manipulation.

CO 2 Develop ALP/Embedded C Programs to interface microcontroller with peripherals

CO 3 Perform programming/interfacing experiments with IDE for modern microcontrollers**.**

ECT 284 DIGITAL COMMUNICATION(MINOR)

CO 1 Explain the main components in a digital communication system

CO 2 Explain the source coding schemes

CO 3 Explain codes for signaling

CO 4 Apply the knowledge of digital modulation schemes in digital transmission.

CO 5 Apply channel coding in digital transmission CO 6 Explain digital receivers

ECT292 NANOELECTRONICS(HONOUR)

CO 1 Explain quantum mechanical effects associated with low dimensional semiconductors.

CO 2 Explain the different processes involved in the fabrication of nanoparticles and nanolayers.

CO 3 Explain the different techniques for characterizing nano layers and particles

CO 4 Explain the different transport mechanisms in nano structures

CO 5 Illustrate the operating principle of Nano scale electronic devices like SET, Resonant tunnelling devices, Quantum lasers etc.

HUT 200 Professional Ethics

CO 1 Understand the core values that shape the ethical behaviour of a professional.

CO 2 Adopt a good character and follow an ethical life.

CO 3 Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.

CO 4 Solve moral and ethical problems through exploration and assessment by established experiments.

CO 5 Apply the knowledge of human values and social values to contemporary ethical values and global issues.

MCN202 COURSE NAME CONSTITUTION OF INDIA

CO 1 Explain the background of the present constitution of India and features.

CO 2 Utilize the fundamental rights and duties.

CO 3 Understand the working of the union executive, parliament and judiciary.

CO 4 Understand the working of the state executive, legislature and judiciary.

CO 5 Utilize the special provisions and statutory institutions.

CO 6 Show national and patriotic spirit as responsible citizens of the country

MAT201PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS

CO 1 Understand the concept and the solution of partial differential equation.

CO 2 Analyse and solve one dimensional wave equation and heat equation.

CO 3 Understand complex functions, its continuity differentiability with the use of CauchyRiemann equations.

CO 4 Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function

CO 5 Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.

S5

ECT301 LINEAR INTEGRATED CIRCUITS

CO 1 Understand Op Amp fundamentals and differential amplifier configurations

CO 2 Design operational amplifier circuits for various applications

CO 3 Design Oscillators and active filters using opamps

CO4 Explain the working and applications of timer, VCO and PLL ICs

CO5 Outline the working of Voltage regulator IC's and Data converters

ECT303 DIGITAL SIGNAL PROCESSING

CO 1 State and prove the fundamental properties and relations relevant to DFT and solve basic problems involving DFT based filtering methods

CO 2 Compute DFT and IDFT using DIT and DIF radix-2 FFT algorithms

CO 3 Design linear phase FIR filters and IIR filters for a given specification

CO 4 Illustrate the various FIR and IIR filter structures for the realization of the given system function

CO5 Explain the basic multi-rate DSP operations decimation and interpolation in both time and frequency domains using supported mathematical equations

CO6 Explain the architecture of DSP processor (TMS320C67xx) and the finite word length effects

ECT305 ANALOG AND DIGITAL COMMUNICATION

CO 1 Explain the existent analog communication systems.

CO 2 Apply the concepts of random processes to LTI systems.

CO 3 Apply waveform coding techniques in digital transmission.

CO 4 Apply GS procedure to develop digital receivers.

CO 5 Apply equalizer design to counteract ISI.

CO 6 Apply digital modulation techniques in signal transmission.

ECT307 CONTROL SYSTEMS

CO 1 Analyse electromechanical systems by mathematical modelling and derive their transfer functions

CO 2 Determine Transient and Steady State behaviour of systems using standard test signals

CO 3 Determine absolute stability and relative stability of a system

CO 4 Apply frequency domain techniques to assess the system performance and to design a control system with suitable compensation techniques

CO 5 Analyse system Controllability and Observability using state space representation

MCN 301 DISASTER MANAGEMENT

CO1 Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: Understand).

CO2 Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level: Understand).

CO3 Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level: Understand).

CO4 Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive knowledge level: Apply)

CO5 Identify factors that determine the nature of disaster response and discuss the various disaster response actions (Cognitive knowledge level: Understand).

CO6 Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level: Understand).

HUT 300 Industrial Economics & Foreign Trade

CO1 Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare. (Cognitive knowledge level: Understand)

CO2 Take appropriate decisions regarding volume of output and to evaluate the social cost of production. (Cognitive knowledge level: Apply)

CO3 Determine the functional requirement of a firm under various competitive conditions. (Cognitive knowledge level: Analyse)

CO4 Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society. (Cognitive knowledge level: Analyse)

CO5 Determine the impact of changes in global economic policies on the business opportunities of a firm. (Cognitive knowledge level: Analyse**)**

ECL331 ANALOG INTEGRATED CIRCUITS AND SIMULATION LAB

CO 1 Use data sheets of basic Analog Integrated Circuits and design and implement application circuits using Analog ICs.

CO 2 Design and simulate the application circuits with Analog Integrated Circuits using simulation tools.

CO 3 Function effectively as an individual and in a team to accomplish the given task.

ECL333 DIGITAL SIGNAL PROCESSING LABORATORY

CO 1 Simulate digital signals.

CO 2 verify the properties of DFT computationally

CO 3 Familiarize the DSP hardware and interface with computer.

CO 4 Implement LTI systems with linear convolution.

CO 5 Implement FFT and IFFT and use it on real time signals.

CO 6 Implement FIR low pass filter.

CO 7 Implement real time LTI systems with block convolution and FFT.

ECT383 COMMUNICATION SYSTEMS(MINOR)

CO1 Explain the components required for an Optical Communication Systems

CO2 Discuss the principle involved in RADAR and Navigation

CO3 Explain the concept and subsystems for Cellular Communication networks

CO4 Outline the requirement for Satellite communication systems

CO5 Discuss the role of different layers in TCP/IP protocol stack in communication networks

ECT393 FPGA BASED SYSTEM DESIGN(HONOUR)

CO 1 Design simple digital systems with programmable logic devices

CO 2 Analyze the architecture of FPGA

CO 3 Analyze the design considerations of FPGA

CO4 Design simple combinational and sequential circuits using FPGA

ECD481 MINIPROJECT

CO1 Be able to practice acquired knowledge within the selected area of technology for project development.

CO2 Identify, discuss and justify the technical aspects and design aspects of the project with a systematic approach.

CO3 Reproduce, improve and refine technical aspects for engineering projects.

CO4 Work as a team in development of technical projects.

CO5 Communicate and report effectively project related activities and findings.

S6

ECT302 ELECTROMAGNETICS

CO 1 K2 To summarize the basic mathematical concepts related to electromagnetic vector fields.

CO 2 K3 Analyse Maxwell's equation in different forms and apply them to diverse engineering problems.

CO3 K3 Toanalyse electromagnetic wave propagation and wave polarization

CO4 K3 To analyse the characteristics of transmission lines and solve the transmission line problems using Smith chart.

CO5 K3 To analyse and evaluate the propagation of EM waves in Wave guides.

ECT304 VLSI CIRCUIT DESIGN

CO1 Explain the various methodologies in ASIC and FPGA design.

CO2 Design VLSI Logic circuits with various MOSFET logic families.

CO3 Compare different types of memory elements.

CO4 Design and analyse data path elements such as Adders and multipliers.

CO5 Explain MOSFET fabrication techniques and layout design rules.

ECT306 INFORMATION THEORY AND CODING

CO 1 Explain measures of information – entropy, conditional entropy, mutual information

CO 2 Apply Shannon's source coding theorem for data compression.

CO 3 Apply the concept of channel capacity for characterize limits of error-free transmission.

CO 4 Apply linear block codes for error detection and correction

CO 5 Apply algebraic codes with reduced structural complexity for error correction

CO 6 Understand encoding and decoding of covolutional and LDPC codes

ECT308 COMPREHENSIVE COURSE WORK

CO 1 Apply the knowledge of circuit theorems and solid state physics to solve the problems in electronic Circuits

CO 2 Design a logic circuit for a specific application

CO 3 Design linear IC circuits for linear and non-linear circuit applications.

CO 4 Explain basic signal processing operations and Filter designs

CO 5 Explain existent analog and digital communication systems

HUT 310 Management for Engineers

CO1 Explain the characteristics of management in the contemporary context (Cognitive Knowledge level: Understand).

CO2 Describe the functions of management (Cognitive Knowledge level: Understand).

CO3 Demonstrate ability in decision making process and productivity analysis (Cognitive Knowledge level: Understand).

CO4 Illustrate project management technique and develop a project schedule (Cognitive Knowledge level: Apply).

CO5 Summarize the functional areas of management (Cognitive Knowledge level: Understand).

CO6 Comprehend the concept of entrepreneurship and create business plans (Cognitive Knowledge level: Understand**).**

ECL332 COMMUNICATION LAB

CO 1 Setup simple prototype circuits for waveform coding and digial modulation techniques working in a team.

CO 2 Simulate the error performance of a digital communication system using standard binary and M -ary modulation schemes.

CO 3 Develop hands-on skills to emulate a communication system with software-designed-radio working in a team**.**

ECD334 MINIPROJECT

CO1 Be able to practice acquired knowledge within the selected area of technology for project development.

CO2 Identify, discuss and justify the technical aspects and design aspects of the project with a systematic approach.

CO3 Reproduce, improve and refine technical aspects for engineering projects.

CO4 Work as a team in development of technical projects.

CO5 Communicate and report effectively project related activities and findings.

ECT342 EMBEDDED SYSTEMS

CO 1 K2 Understand and gain the basic idea about the embedded system.

CO 2 K3 Able to gain architectural level knowledge about the system and hence to program an embedded system.

CO 3 K3 Apply the knowledge for solving the real life problems with the help of an embedded system.

ECT394 ELECTRONIC DESIGN AUTOMATION(HONOUR)

CO 1 Apply Search Algorithms and Shortest Path Algorithms to find various graph solutions.

CO 2 Outline VLSI Design Flow and Design Styles and apply partitioning algorithms on graphs representing netlist.

CO 3 Illustrate Design Layout Rules and apply different algorithms for layout compaction.

CO 4 Make use of various algorithms to solve placement and floorplan problems.

CO 5 Utilise different algorithms to solve routing problems.

S7

ECT401 MICROWAVES AND ANTENNAS

CO1-K2 Understand the basic concept of antennas and its parameters.

CO2-K3 Analyze the far filed pattern of Short dipole and Half wave dipole antenna.

CO3-K3 Design of various broad band antennas, arrays and its radiation patterns.

CO4-K2 Illustrate the principle of operation of cavity resonators and various microwave sources.

CO5-K2 Explain various microwave hybrid circuits and microwave semiconductor devices.

MCN401 INDUSTRIAL SAFETY ENGINEERING

CO1 Describe the theories of accident causation and preventive measures of industrial accidents. (Cognitive Knowledge level: Understand)

CO2 Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping. (Cognitive Knowledge level: Understand)

CO3 Explain different issues in construction industries. (Cognitive Knowledge level: Understand)

CO4 Describe various hazards associated with different machines and mechanical material handling. (Cognitive Knowledge level: Understand)

CO5 Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards. (Cognitive Knowledge level: Apply)

ECL411 ELECTROMAGNETICS LAB

CO1 Familiarize the basic Microwave components and to analyse few microwave measurements and its parameters.

CO2 Understand the principles of fiber-optic communications and the different kind of losses, signal distortion and other signal degradation factors.

CO3 Design and simulate basic antenna experiments with simulation tools.

ECQ413 SEMINAR

CO1 Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply).

CO2 Read and apprehend an academic document from the literature which is related to

her/ his areas of interest (Cognitive knowledge level: Analyze).

CO3 Prepare a presentation about an academic document (Cognitive knowledge

level: Create).

CO4 Give a presentation about an academic document (Cognitive knowledge level:

Apply).

CO5 Prepare a technical report (Cognitive knowledge level: Create).

ECD415 PROJECT PHASE I

CO1 Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).

CO2 Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).

CO3 Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).

CO4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).

CO5 Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).

CO6 Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

ECT423 COMPUTER NETWORKS

CO1 K2 Describe the protocols used in web and email applications.

CO2 K4 Analyse problems pertaining to reliable data transfer, flow control and congestion over a TCP network.

CO3 K3 Apply Dijkstra's algorithm and distance-vector algorithm in the context of routing over computer networks.

CO4 K4 Analyze the performance of collision avoidance algorithms in random access protocols such as ALOHA.

CO5 K4 Analyze the delay performance of an ARQ system using standard queueing models.

ECT413 OPTICAL FIBER COMMUNICATION

CO 1 Understand the working and classification of optical fibers in terms of propagation modes

CO 2 Solve problems of transmission characteristics and losses in optical fiber

CO 3 Explain the constructional features and the characteristics of optical sources and detectors

CO4 Describe the operations of optical amplifiers

CO5 Understand the concept of WDM, FSO and LiFi

ECT495 RF MEMS

CO1 Understand the various fabrication techniques and actuation mechanisms used in RF -MEMS design and apply them in practical situations

CO2 Explain the principle of operation of MEMS switches

CO3 Understand the construction and principle of operation of micromachined inductors and capacitors

CO4 Understand the construction and principle of operation of micromachined RF filters and phase shifters

CO5 Analyse the performance improvement of antenna due to micromachining techniques.

CO6 Identify the constraints in integration and packaging of RF MEMS devices

S8

ECT402 WIRELESS COMMUNICATION

CO1 K2 Summarize the basics of cellular system and cellular design fundamentals.

CO2 K2 Describe the wireless channel models and discuss capacity of wireless channels.

CO3 K4 Analyse the performance of the modulation techniques for flat-fading channels and multicarrier modulation.

CO4 K3 Illustrate how receiver performance can be enhanced by various diversity techniques.

CO5 K3 Identify advantages of various equalization techniques and multiple-access techniques in wireless communication.

CO6 K3 Calculate system parameters such antenna height, range, maximum usable frequency in different modes of radio wave propagation.

ECD416 PROJECT PHASE II

CO1 Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).

CO2 Develop products, processes or technologies for sustainable and socially relevant Applications (Cognitive knowledge level: Apply).

CO3 Function effectively as an individual and as a leader in diverse teams and to Comprehend and execute designated tasks (Cognitive knowledge level: Apply).

CO4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).

CO5 Identify technology/research gaps and proposes innovative/creative solutions (Cognitive knowledge level: Analyse).

CO6 Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

ECT474 ENTREPRENEURSHIP

CO 1 Discuss the fundamental concepts of entrepreneurship

CO 2 Understand entrepreneurial motivation and motivation theories

CO 3 Analyse types of enterprises and ownership structure

CO 4 Apply project evaluation methods

CO5 Evaluate enterprise financial strength

ECT426 REAL TIME OPERATING SYSTEMS

CO1	K2	Summarize the functions and structure of general-purpose operating Systems.
CO2	K3	Use different scheduling algorithms on processes and threads.
CO3	K2	Interpret a real time operating system along with its synchronization, Communication and interrupt handling tools.
CO4	K4	Illustrate task constraints and analyse the different scheduling algorithms on Tasks.
CO5	K3	Illustrate the applications of real time operating systems.

ECT458 INTERNET OF THINGS

CO 1	K1	Understand the IoT fundamentals and architecture modelling (K1)
CO 2	K2	Understand the smart things in IoT and functional blocks (K2)
CO3	K2	To understand the communication networks and protocols used in IoT. (K2)
CO 4	K3	To understand the cloud resources, data analysis and applications. (K3)
CO5	K3	To apply the IoT processes in embedded applications. (K3)

MEA ENGINEERING COLLEGE, PERINTHALMANNA
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY 2019 SCHEME
PROGRAM: B TECH ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes- Sem 3

MAT201 Partial Differential Equation and Complex Analysis

- CO 1 Understand the concept and the solution of partial differential equation.
- CO 2 Analyse and solve one dimensional wave equation and heat equation.
- CO 3 Understand complex functions, its continuity differentiability with the use of Cauchy Riemann equations.
- CO 4 Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function
- CO 5 Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.

EET201 Circuits and Networks

- CO 1 Apply circuit theorems to simplify and solve complex DC and AC electric networks.
- CO 2 Analyse dynamic DC and AC circuits and develop the complete response to excitations.
- CO 3 Solve dynamic circuits by applying transformation to s-domain.
- CO 4 Analyse three-phase networks in Y and Δ configurations.
- CO 5 Solve series /parallel resonant circuits.
- CO 6 Develop the representation of two-port networks using network parameters and analyse.

EET203 Measurements and Instrumentation

- CO 1 Identify and analyse the factors affecting performance of measuring system
- CO 2 Choose appropriate instruments for the measurement of voltage, current in ac and dc measurements
- CO 3 Explain the operating principle of power and energy measurement
- CO 4 Outline the principles of operation of Magnetic measurement systems

- CO 5 Describe the operating principle of DC and AC bridges, transducersbased systems.
- CO 6 Understand the operating principles of basic building blocks of digital systems, recording and display units

EET205 Analog Electronics

- CO 1 Design biasing scheme for transistor circuits.
- CO 2 Model BJT and FET amplifier circuits.
- CO 3 Identify a power amplifier with appropriate specifications for electronic circuit applications.
- CO 4 Describe the operation of oscillator circuits using BJT.
- CO 5 Explain the basic concepts of Operational amplifier(OPAMP)
- CO 6 Design and develop various OPAMP application circuits.

HUT200 Professional Ethics

- CO 1 Understand the core values that shape the ethical behaviour of a professional.
- CO 2 Adopt a good character and follow an ethical life.
- CO 3 Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
- CO 4 Solve moral and ethical problems through exploration and assessment by established experiments.
- CO 5 Apply the knowledge of human values and social values to contemporary ethical values and global issues.

MCN201 Sustainable Engineering

- CO 1 Understand the relevance and the concept of sustainability and the global initiatives in this direction
- CO 2 Explain the different types of environmental pollution problems and their sustainable solutions
- CO 3 Discuss the environmental regulations and standards
- CO 4 Outline the concepts related to conventional and non-conventional energy
- CO 5 Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

EEL203 Analog Electronics Lab

- CO 1 Use the various electronic instruments and for conducting experiments.
- CO 2 Design and develop various electronic circuits using diodes and Zener diodes.
- CO 3 Design and implement amplifier and oscillator circuits using BJT and JFET.
- CO 4 Design and implement basic circuits using IC (OPAMP and 555 timers).
- CO 5 Simulate electronic circuits using any circuit simulation software.
- CO 6 Use PCB layout software for circuit design

Course Outcomes-Sem 4

MAT 204 COURSE NAME PROBABILITY, RANDOM PROCESSES AND NUMERICAL METHODS

- CO 1 Understand the concept, properties and important models of discrete random variables and, using them, analyse suitable random phenomena.
- CO 2 Understand the concept, properties and important models of continuous random variables and, using them, analyse suitable random phenomena.
- CO 3 Analyse random processes using autocorrelation, power spectrum and Poisson process model as appropriate.
- CO 4 Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques
- CO 5 Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations.

EET202 DC MACHINES AND TRANSFORMERS

- CO 1 Acquire knowledge about constructional details of DC machines
- CO 2 Describe the performance characteristics of DC generators
- CO3 Describe the principle of operation of DC motors and select appropriate motor types for different applications
- CO 4 Acquire knowledge in testing of DC machines to assess its performance
- CO 5 Describe the constructional details and modes of operation of single phase and three phase transformers
- CO6 Analyse the performance of transformers under various conditions

EET204 ELECTROMAGNETIC THEORY

- CO 1 Apply vector analysis and coordinate systems to solve static electric and magnetic field problems.
- CO 2 Apply Gauss Law, Coulomb's law and Poisson's equation to determine electrostatic field parameters CO 3 Determine magnetic fields from current distributions by applying Biot-Savart's law and Amperes Circuital law.
- CO 4 Apply Maxwell Equations for the solution of time varying fields
- CO 5 Analyse electromagnetic wave propagation in different media.

EET206 DIGITAL ELECTRONICS

- CO 1 Identify various number systems, binary codes and formulate digital functions using Boolean algebra.
- CO 2 Design and implement combinational logic circuits.
- CO 3 Design and implement sequential logic circuits.
- CO 4 Compare the operation of various analog to digital and digital to analog conversion circuits.
- CO 5 Explain the basic concepts of programmable logic devices and VHDL

MCN202 COURSE NAME CONSTITUTION OF INDIA

- CO 1 Explain the background of the present constitution of India and features.
- CO 2 Utilize the fundamental rights and duties.
- CO 3 Understand the working of the union executive, parliament and judiciary.
- CO 4 Understand the working of the state executive, legislature and judiciary.
- CO 5 Utilize the special provisions and statutory institutions.
- CO 6 Show national and patriotic spirit as responsible citizens of the country

EEL202 ELECTRICAL MACHINES

- CO 1 Analyse the performance of DC motors and DC generators by performing load test.
- CO 2 Sketch the Open Circuit Characteristics of a self excited DC shunt generator and check conditions of voltage build up by performing suitable experiment.
- CO 3 Develop equivalent circuit and predetermine their regulation and efficiency by performing OC & SC tests on transformer.

- CO 4 Analyse the efficiency and regulation of the transformer by performing load test.
- CO 5 Analyse the efficiency of a DC machine when working as motor and generator by conducting suitable test.
- CO 6 Examine the efficiency by performing Sumpner's test on two similar transformers.

EEL204 DIGITAL ELECTRONICS LAB

- CO 1 Formulate digital functions using Boolean Algebra and verify experimentally.
- CO 2 Design and implement combinational logic circuits.
- CO 3 Design and implement sequential logic circuits. CO 4 Design and fabricate a digital circuit using the knowledge acquired from the laboratory

Course Outcomes-Sem 5

EET301 POWER SYSTEMS I

- CO 1 Identify the power generating system appropriate for a given area.
- CO 2 Evaluate the electrical performance of any transmission line.
- CO 3 Compute various physical characteristics of underground and overhead transmission systems.
- CO 4 Select appropriate switchgear for protection schemes.
- CO 5 Design a simple electrical distribution system as per the standards.

EET303 MICROPROCESSORS AND MICROCONTROLLERS

- CO 1 Describe the architecture and timing diagram of 8085 microprocessor.
- CO 2 Develop assembly language programs in 8085 microprocessor.
- CO 3 Identify the different ways of interfacing memory and I/O with 8085 microprocessor.
- CO 4 Understand the architecture of 8051 microcontroller and embedded systems.
- CO 5 Develop assembly level and embedded C programs in 8051 microcontroller.

EET305 SIGNALS AND SYSTEMS

- CO 1 Explain the basic operations on signals and systems.
- CO 2 Apply Fourier Series and Fourier Transform concepts for continuous time signals.
- CO 3 Analyse the continuous time systems with Laplace Transform.
- CO 4 Analyse the discrete time system using Z Transform.

- CO 5 Apply Fourier Series and Fourier Transform concepts for Discrete time domain.
- CO 6 Describe the concept of stability of continuous time systems and sampled data systems.

EET307 SYNCHRONOUS AND INDUCTION MACHINES

- CO 1 Analyse the performance of different types of alternators.
- CO 2 Analyse the performance of a synchronous motor.
- CO 3 Analyse the performance of different types of induction motors.
- CO 4 Describe operating principle of induction machine as generator.
- CO 5 Explain the types of single phase induction motors and their working principle.

EEL331 MICROPROCESSORS AND MICROCONTROLLERS LAB

- CO 1 Develop and execute assembly language programs for solving arithmetic and logical problems using microprocessor/microcontroller.
- CO 2 Design and Implement systems with interfacing circuits for various applications.
- CO 3 Execute projects as a team using microprocessor/microcontroller for real life applications.

EEL333 ELECTRICAL MACHINES LAB II

- CO 1 Analyse the performance of single phase and three phase induction motors by conducting suitable tests.
- CO 2 Analyse the performance of three phase synchronous machine from V and inverted V curves.
- CO 3 Analyse the performance of a three phase alternator by conducting suitable tests.

Course Outcomes - Sem 6

EET302 LINEAR CONTROL SYSTEMS

- CO 1 Describe the role of various control blocks and components in feedback systems.
- CO 2 Analyse the time domain responses of the linear systems.
- CO 3 Apply Root locus technique to assess the performance of linear systems.
- CO 4 Analyse the stability of the given LTI systems.
- CO 5 Analyse the frequency domain response of the given LTI systems.
- CO 6 Design compensators using time domain and frequency domain techniques.

EET304 POWER SYSTEMS II

- CO 1 Apply the per unit scheme for any power system network and compute the fault levels.
- CO 2 Analyse the voltage profile of any given power system network using iterative methods.
- CO 3 Analyse the steady state and transient stability of power system networks.
- CO 4 Model the control scheme of power systems.
- CO 5 Schedule optimal generation scheme.

EET306 POWER ELECTRONICS

- CO 1 Explain the operation of modern power semiconductor devices and its characteristics.
- CO 2 Analyse the working of controlled rectifiers.
- CO 3 Explain the working of AC voltage controllers, inverters and PWM techniques.
- CO 4 Compare the performance of different dc-dc converters.
- CO 5 Describe basic drive schemes for ac and dc motors.

EET312 BIOMEDICAL INSTRUMENTATION

- CO 1 Explain the basics of anatomy and physiology of human body.
- CO 2 Explain different techniques for the measurement of various physiological parameters.
- CO 3 Describe modern imaging techniques for medical diagnosis
- CO 4 Identify the various therapeutic equipments used in biomedical field
- CO 5 Discuss the patient safety measures and recent advancements in medical field.

EET308 COMPREHENSIVE COURSE WORK

CO 1 Apply the knowledge of circuit theorems to solve the problems in electrical networks

CO 2 Evaluate the performance of DC machines and Transformers under different loading conditions

CO 3 Identify appropriate digital components to realise any combinational or sequential logic.

CO 4 Apply the knowledge of Power generation, transmission and distribution to select appropriate components for power system operation.

CO 5 Apply appropriate mathematical concepts to analyse continuous time and discrete time signals and systems

EEL332 POWER SYSTEMS LAB

- CO 1 Develop mathematical models and conduct steady state and transient analysis of power system networks using standard software.
- CO 2 Develop a frequency domain model of power system networks and conduct the stability analysis.
- CO 3 Conduct appropriate tests for any power system component as per standards.
- CO 4 Conduct site inspection and evaluate performance ratio of solar power plant.

EEL334 POWER ELECTRONICS LAB

- CO 1 Determine the characteristics of SCR and design triggering circuits for SCR based circuits.
- CO 2 Design, set up and analyse single phase AC voltage controllers.
- CO 3 Design, set up and test suitable gate drives for MOSFET/IGBT.
- CO 4 Design, set up and test basic inverter topologies.
- CO 5 Design and set up dc-dc converters.
- CO 6 Develop simulation models of dc-dc converters, rectifiers and inverters using modern simulation tools.

Course Outcomes-Sem 7

MCN401 INDUSTRIAL SAFETY ENGINERING

- CO1 Describe the theories of accident causation and preventive measures of industrial accidents. (Cognitive Knowledge level: Understand)
- CO2 Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping. (Cognitive Knowledge level: Understand)
- CO3 Explain different issues in construction industries. (Cognitive Knowledge level: Understand)
- CO4 Describe various hazards associated with different machines and mechanical material handling. (Cognitive Knowledge level: Understand)
- CO5 Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards.

EET455 ENERGY MANAGEMENT

- CO 1 Explain the significance and procedure for energy management and audit.
- CO 2 Discuss the energy efficiency and management of electrical loads.
- CO 3 Discuss the energy efficiency in boilers and furnaces.
- CO 4 Explain the energy management opportunities in HVAC systems
- CO 5 Compute the economic feasibility of the energy conservation measures.

EET413 ELECTRIC DRIVES

- CO 1 Describe the transient and steady state aspects electric drives
- CO 2 Apply the appropriate configuration of controlled rectifiers for the speed control of DC motors
- CO 3 Analyse the operation of chopper-fed DC motor drive in various quadrants
- CO 4 Illustrate the various speed control techniques of induction motors
- CO 5 Examine the vector control of induction motor drives
- CO 6 Distinguish different speed control methods of synchronous motor drives

EET401 ADVANCED CONTROL SYSTEMS

- CO 1 Develop the state variable representation of physical systems
- CO 2 Analyse the performance of linear and nonlinear systems using state variable approach
- CO 3 Design state feedback controller for a given system
- CO 4 Explain the characteristics of nonlinear systems
- CO 5 Apply the tools like describing function approach or phase plane approach for assessing the performance of nonlinear systems
- CO 6 Apply Lyapunov method for the stability analysis of physical systems.

EEL411 CONTROL SYSTEMS LAB

- CO 1 Demonstrate the knowledge of simulation tools for control system design.
- CO 2 Develop the mathematical model of a given physical system by conducting appropriate experiments.
- CO 3 Analyse the performance and stability of physical systems using classical and advanced control approaches.
- CO 4 Design controllers for physical systems to meet the desired specifications.

EEQ413 SEMINAR

- CO1 Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply).
- CO2 Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze).
- CO3 Prepare a presentation about an academic document (Cognitive knowledge level: Create).
- CO4 Give a presentation about an academic document (Cognitive knowledge level: Apply).
- CO5 Prepare a technical report (Cognitive knowledge level:Create).

EED415 PROJECT PHASE I

- CO1 Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
- CO2 Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
- CO3 Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
- CO4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
- CO5 Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze). CO6 Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply)

Course Outcomes-Sem 8

EET402 ELECTRICAL SYSTEM DESIGN AND ESTIMATION

- CO 1 Explain the rules and regulations in the design of components for medium and high voltage installations.
- CO 2 Design lighting schemes for indoor and outdoor applications.
- CO 3 Design low/medium voltage domestic and industrial electrical installations.
- CO 4 Design, testing and commissioning of 11 kV transformer substation.
- CO 5 Design electrical installations in high rise buildings.

EET424 ENERGY MANAGEMENT

- CO 1 Analyse the significance of energy management and auditing.
- CO 2 Discuss the energy efficiency and management of electrical loads.
- CO 3 Apply demand side management techniques.
- CO 4 Explain the energy management opportunities in industries.
- CO 5 Compute the economic feasibility of the energy conservation measures.

EET456 DESIGN OF POWER ELECTRONIC SYSTEMS

- CO 1 Design gate drive circuits for various power semiconductor switches.
- CO 2 Design protection circuits for various semiconductor devices.
- CO 3 Select appropriate passive components for power electronic circuits.
- CO 4 Design the magnetic components for power electronic circuits.
- CO 5 Design signal conditioning circuits and passive filters for converters.

EET438 ENERGY STORAGE SYSTEMS

- CO 1 Identify the role of energy storage in power systems
- CO 2 Classify thermal, kinetic and potential storage technologies and their applications
- CO 3 Compare Electrochemical, Electrostatic and Electromagnetic storage technologies
- CO 4 Illustrate energy storage technology in renewable energy integration
- CO 5 Summarise energy storage technology applications for smart grids)

EED416 PROJECT PHASE II

- CO1 Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
- CO2 Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
- CO3 Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
- CO4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
- CO5 Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).

- CO6 Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

MEA ENGINEERING COLLEGE, PERINTHALMANNA
DEPARTMENT OF MECHANICAL ENGINEERING

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY 2019 SCHEME

PROGRAM: B TECH IN COMPUTER SCIENCE AND ENGINEERING

Course Outcomes – Semester 3

MAT 203Discrete Mathematical Structures

- CO 1 Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic (Cognitive Knowledge Level: Apply)
- CO 2 Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion (Cognitive Knowledge Level: Apply)
- CO 3 Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science (Cognitive Knowledge Level: Understand)
- CO 4 Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science (Cognitive Knowledge Level: Apply)
- CO 5 Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients (Cognitive Knowledge Level: Apply).
- CO 6 Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups (Cognitive Knowledge Level: Understand)

CST 201Data structures

- CO 1 Design an algorithm for a computational task and calculate the time/space complexities of that algorithm (Cognitive Knowledge Level: Apply)
- CO 2 Identify the suitable data structure (array or linked list) to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem (Cognitive Knowledge Level: Apply)
- CO 3 Write an algorithm to find the solution of a computational problem by selecting an appropriate data structure (binary tree/graph) to represent a data item to be processed (Cognitive Knowledge Level: Apply)
- CO 4 Store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set (Cognitive Knowledge Level: Apply)
- CO 5 Select appropriate sorting algorithms to be used in specific circumstances (Cognitive Knowledge Level: Analyze)
- CO 6 Design and implement Data Structures for solving real world problems efficiently (Cognitive Knowledge Level: Apply)

CST 203Logic System Design

- CO1 Illustrate decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers (Cognitive Knowledge level: Understand)
- CO2 Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates (Cognitive Knowledge level: Apply)

- CO3 Design combinational circuits - Adders, Code Convertors, Decoders, Magnitude Comparators, Parity Generator/Checker and design the Programmable Logic Devices - ROM and PLA. (Cognitive Knowledge level: Apply)
- CO4 Design sequential circuits - Registers, Counters and Shift Registers. (Cognitive Knowledge level: Apply)
- CO5 Use algorithms to perform addition and subtraction on binary, BCD and floating point numbers (Cognitive Knowledge level: Understand)

CST205 Object Oriented Design using JAVA

- CO1 Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism (Cognitive Knowledge Level: Apply)
- CO2 Utilise data types, operators, control statements, built in packages & interfaces, Input/Output Streams and Files in Java to develop programs (Cognitive Knowledge Level:
  Apply)
- CO3 Illustrate how robust programs can be written in Java using exception handling mechanism (Cognitive Knowledge Level: Understand)
- CO4 Write application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
- CO5 Write Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: Apply)

CSL 201 DATA STRUCTURESLAB

- CO1 Write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements (Cognitive) Knowledge Level: Analyse)
- CO2 Write a time/space efficient program to sort a list of records based on a given key in the record (Cognitive Knowledge Level: Apply)

- CO3 Examine a given Data Structure to determine its space complexity and time complexities of operations on it (Cognitive Knowledge Level: Apply)
- CO4 Design and implement an efficient data structure to represent given data (Cognitive Knowledge Level: Apply)
- CO5 Write a time/space efficient program to convert an arithmetic expression from one notation to another (Cognitive Knowledge Level: Apply)
- CO6 Write a program using linked lists to simulate Memory Allocation and Garbage Collection (Cognitive Knowledge Level: Apply)

CSL 203OBJECT ORIENTEDPROGRAMMINGLAB (IN JAVA)

- CO1Implement the Object Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java (Cognitive Knowledge Level: Apply)
- CO2Implement programs in Java which use data types, operators, control statements, built in packages & interfaces, Input/Output streams and Files (Cognitive Knowledge Level: Apply)
- CO3Implement robust application programs in Java using exception handling(Cognitive Knowledge Level: Apply)
- CO4Implement application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
- CO5 Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: Apply)

Course Outcomes – Semester 4

MAT 206 GRAPH THEORY

- CO1 Explain vertices and their properties, types of paths, classification of graphs and trees & their properties. (Cognitive Knowledge Level: Understand)
- CO2 Demonstrate the fundamental theorems on Eulerian and Hamiltonian graphs.(Cognitive Knowledge Level: Understand)
- CO3 Illustrate the working of Prim's and Kruskal's algorithms for finding minimum cost

spanning tree and Dijkstra's and Floyd-Warshall algorithms for finding shortest paths. (Cognitive Knowledge Level: Apply)

- CO4 Explain planar graphs, their properties and an application for planar graphs. (Cognitive Knowledge Level: Apply)
- CO5 Illustrate how one can represent a graph in a computer. (Cognitive Knowledge Level: Apply)
- CO6 Explain the Vertex Color problem in graphs and illustrate an example application for vertex coloring. (Cognitive Knowledge Level: Apply)

CST202COMPUTERORGANISATIONANDARCHITECTURE

- CO1 Recognize and express the relevance of basic components, I/O organization and pipelining schemes in a digital computer (Cognitive knowledge: Understand)
- CO2 Explain the types of memory systems and mapping functions used in memory systems(Cognitive Knowledge Level: Understand)
- CO3 Demonstrate the control signals required for the execution of a given instruction (Cognitive Knowledge Level: Apply)
- CO 4 Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it(Cognitive Knowledge Level: Apply)
- CO 5 Explain the implementation aspects of arithmetic algorithms in a digital computer (Cognitive Knowledge Level: Apply)
- CO 6 Develop the control logic for a given arithmetic problem (Cognitive Knowledge Level: Apply)

CST 204DATABASEMANAGEMENTSYSTEMS

- CO1 Summarize and exemplify fundamental nature and characteristics of database systems(Cognitive Knowledge Level: Understand)
- CO2 Model real word scenarios given as informal descriptions, using Entity Relationship diagrams. (Cognitive Knowledge Level: Apply)

- CO3 Model and design solutions for efficiently representing and querying data using relational model (Cognitive Knowledge Level: Analyze)
- CO4 Demonstrate the features of indexing and hashing in database applications (Cognitive Knowledge Level: Apply)
- CO5 Discuss and compare the aspects of Concurrency Control and Recovery in Database systems (Cognitive Knowledge Level: Apply)
- CO6 Explain various types of NoSQL databases (Cognitive Knowledge Level: Understand)

CST 206OPERATING SYSTEMS

- CO1 Explain the relevance, structure and functions of Operating Systems in computing devices. (Cognitive knowledge: Understand)
- CO2 Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems. (Cognitive knowledge: Understand)
- CO3 Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors (Cognitive knowledge: Understand)
- CO4 Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems. (Cognitive knowledge: Understand)
- CO5 Explain the memory management algorithms in Operating Systems. (Cognitive knowledge: Understand)
- CO6 Explain the security aspects and algorithms for file and storage management in Operating Systems. (Cognitive knowledge: Understand)

CSL 202 DIGITAL LAB

- CO1 Design and implement combinational logic circuits using Logic Gates (Cognitive Knowledge Level: Apply)
- CO2 Design and implement sequential logic circuits using Integrated Circuits (Cognitive Knowledge Level: Apply)
- CO3 Simulate functioning of digital circuits using programs written in a Hardware

Description Language (Cognitive Knowledge Level: Apply)

- CO4 Function effectively as an individual and in a team to accomplish a given task of designing and implementing digital circuits (Cognitive Knowledge Level: Apply)

CSL 204OPERATINGSYSTEMS LAB

- CO1 Illustrate the use of systems calls in Operating Systems. (Cognitive knowledge: Understand)
- CO2Implement Process Creation and Inter Process Communication in Operating Systems. (Cognitive knowledge: Apply)
- CO3 Implement Fist Come First Served, Shortest Job First, Round Robin and Priority based CPU Scheduling Algorithms. (Cognitive knowledge: Apply)
- CO4Illustrate the performance of First In First Out, Least Recently Used and Least Frequently Used Page Replacement Algorithms. (Cognitive knowledge: Apply)
- CO5Implement modules for Deadlock Detection and Deadlock Avoidance in Operating Systems. (Cognitive knowledge: Apply)
- CO6Implement modules for Storage Management and Disk Scheduling in Operating Systems. (Cognitive knowledge: Apply)

Course Outcomes – Semester 5

CSL 301FORMALLANGUAGES ANDAUTOMATATHEORY

- CO1Classify a given formal language into Regular, Context-Free, Context Sensitive, Recursive or Recursively Enumerable. [Cognitive knowledge level: Understand]
- CO2Explain a formal representation of a given regular language as a finite state automaton, regular grammar, regular expression and Myhill-Neroderelation. [Cognitive knowledge level: Understand]
- CO3Design a Pushdown Automaton and a Context-Free Grammar for a given context-free language. [Cognitive knowledge level : Apply]
- CO4Design Turing machines as language acceptors or transducers. [Cognitive knowledge level: Apply]

- CO 5 Explain the notion of decidability. [Cognitive knowledge level: Understand]

CST 303 COMPUTER NETWORKS

- CO1 Explain the features of computer networks, protocols, and network design models (Cognitive Knowledge: Understand)
- CO2 Describe the fundamental characteristics of the physical layer and identify the usage in network communication (Cognitive Knowledge: Apply)
- CO3 Explain the design issues of data link layer, link layer protocols, bridges and switches (Cognitive Knowledge: Understand)
- CO4 Illustrate wired LAN protocols (IEEE 802.3) and wireless LAN protocols (IEEE 802.11) (Cognitive Knowledge: Understand)
- CO5 Select appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for a network (Cognitive Knowledge: Apply)
- CO6 Illustrate the functions and protocols of the network layer, transport layer, and application layer in inter-networking (Cognitive Knowledge: Understand)

CST305 SYSTEM SOFTWARE

- CO1 Distinguish softwares into system and application software categories. (Cognitive Knowledge Level: Understand)
- CO2 Identify standard and extended architectural features of machines. (Cognitive Knowledge Level: Apply)
- CO3 Identify machine dependent features of system software (Cognitive Knowledge Level: Apply)
- CO4 Identify machine independent features of system software. (Cognitive Knowledge Level: Understand)
- CO5 Design algorithms for system softwares and analyze the effect of data structures. (Cognitive Knowledge Level: Apply)
- CO6 Understand the features of device drivers and editing & debugging tools.(Cognitive Knowledge Level: Understand)

CST 307MICROPROCESSORS ANDMICROCONTROLLER

- CO1 Illustrate the architecture, modes of operation and addressing modes of microprocessors (Cognitive knowledge: Understand)
- CO2 Develop 8086 assembly language programs. (Cognitive Knowledge Level: Apply)
- CO3 Demonstrate interrupts, its handling and programming in 8086. (Cognitive Knowledge Level: Apply))
- CO4 Illustrate how different peripherals (8255,8254,8257) and memory are interfaced with microprocessors. (Cognitive Knowledge Level: Understand)
- CO5 Outline features of microcontrollers and develop low level programs. (Cognitive Knowledge Level: Understand)

CST309 MANAGEMENT OFSOFTWARE SYSTEMS

- CO1 Demonstrate Traditional and Agile Software Development approaches (Cognitive Knowledge Level: Apply)
- CO2 Prepare Software Requirement Specification and Software Design for a given problem. (Cognitive Knowledge Level: Apply)
- CO3Justify the significance of design patterns and licensing terms in software development, prepare testing, maintenance and DevOps strategies for a project.(Cognitive Knowledge Level: Apply)
- CO4Make use of software project management concepts while planning, estimation, scheduling, tracking and change management of a project, with a traditional/agile framework. (Cognitive Knowledge Level: Apply)
- CO5Utilize SQA practices, Process Improvement techniques and Technology advancements in cloud based software models and containers & micro services(Cognitive Knowledge Level: Apply)

CSL 331 SYSTEM SOFTWARE AND MICROPROCESSORS LAB

- CO1 Develop 8086 programs and execute it using a microprocessor kit. (Cognitive Knowledge Level: Apply) .

- CO2 Develop 8086 programs and, debug and execute it using MASM assemblers (Cognitive Knowledge Level: Apply)
- CO3Develop and execute programs to interface stepper motor, 8255, 8279 and digital to analog converters with 8086 trainer kit (Cognitive Knowledge Level: Apply)
- CO4 Implement and execute different scheduling and paging algorithms in OS (Cognitive Knowledge Level: Apply)
- CO5 Design and implement assemblers, Loaders and macro processors. (Cognitive Knowledge Level: Apply)

CSL 333 DATABASE MANAGEMENT SYSTEMS LAB

- CO1 Design database schema for a given real world problem-domain using standard design and modeling approaches. (Cognitive Knowledge Level: Apply)
- CO2 Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)
- C03 Design and implement triggers and cursors. (Cognitive Knowledge Level: Apply)
- C04 Implement procedures, functions, and control structures using PL/SQL. (Cognitive Knowledge Level: Apply)
- CO5 Perform CRUD operations in NoSQL Databases. (Cognitive Knowledge Level: Apply)
- C06 Develop database applications using front-end tools and back-end DBMS. (Cognitive Knowledge Level: Create)

Course Outcomes – Semester 6

CST 302COMPILERDESIGN

- CO1Explain the phases in compilation process(lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimization and code generation) and model a lexical analyzer (Cognitive Knowledge Level: Apply)

- CO2Model language syntax using Context Free Grammar and develop parse tree representation using leftmost and rightmost derivations (Cognitive Knowledge Level: Apply)
- CO3Compare different types of parsers(Bottom-up and Top-down) and construct parser for a given grammar (Cognitive Knowledge Level: Apply)
- CO4Build Syntax Directed Translation for a context free grammar, compare various storage allocation strategies and classify intermediate representations (Cognitive Knowledge Level: Apply)
- CO5Illustrate code optimization and code generation techniques in compilation (Cognitive Knowledge Level: Apply)

CST 304 COMPUTER GRAPHICSAND IMAGEPROCESSING

- CO1Describe the working principles of graphics devices(Cognitive Knowledge level: Understand)
- CO2Illustrate line drawing, circle drawing and polygon filling algorithms(Cognitive Knowledge level: Apply)
- CO3Demonstrate geometric representations, transformations on 2D & 3D objects, clipping algorithms and projection algorithms(Cognitive Knowledge level: Apply)
- CO4Summarize visible surface detection methods(Cognitive Knowledge level: Understand)
- CO5Summarize the concepts of digital image representation, processing and demonstrate pixel relationships(Cognitive Knowledge level: Apply)
- CO6Solve image enhancement and segmentation problems using spatial domain techniques(Cognitive Knowledge level: Apply)

CST 306 ALGORITHMANALYSIS ANDDESIGN

- CO1Analyze any given algorithm and express its time and space complexities in asymptotic notations. (Cognitive Level: Apply)
- CO2Derive recurrence equations and solve it using Iteration, Recurrence Tree,

Substitution and Master's Method to compute time complexity of algorithms. (Cognitive Level: Apply)

- CO3Illustrate Graph traversal algorithms & applications and Advanced Data structures like AVL trees and Disjoint set operations. (Cognitive Level: Apply)
- CO4Demonstrate Divide-and-conquer, Greedy Strategy, Dynamic programming, Branch-and Bound and Backtracking algorithm design techniques (Cognitive Level: Apply)
- CO5Classify a problem as computationally tractable or intractable, and discuss strategies to address intractability (Cognitive Level: Understand)
- CO6Identify the suitable design strategy to solve a given problem. (Cognitive Level: Analyze)

CST 308COMPREHENSIVECOURSE WORK

- CO1 :Comprehend the concepts of discrete mathematical structures (Cognitive Knowledge Level: Understand)
- CO2 : Comprehend the concepts and applications of data structures (Cognitive Knowledge Level: Understand)
- CO3 : Comprehend the concepts, functions and algorithms in Operating System (Cognitive Knowledge Level: Understand))
- CO4 : Comprehend the organization and architecture of computer systems (Cognitive Knowledge Level: Understand)
- CO5 : Comprehend the fundamental principles of database design and manipulation (Cognitive Knowledge Level: Understand)
- CO6 : Comprehend the concepts in formal languages and automata theory Cognitive Knowledge Level: Understand)

CSL 332 NETWORKING LAB

- CO1: Use network related commands and configuration files in Linux Operating System. (Cognitive Knowledge Level: Understand).
- CO2: Develop network application programs and protocols. (Cognitive Knowledge Level: Apply)
- CO3: Analyze network traffic using network monitoring tools. (Cognitive Knowledge Level: Apply)
- CO4: Design and setup a network and configure different network protocols. (Cognitive Knowledge Level: Apply)
- CO5 : Develop simulation of fundamental network concepts using a network simulator. (Cognitive Knowledge Level: Apply)

CSD334MINI PROJECT

- CO1: Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)
- CO2 :Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes(Cognitive Knowledge Level: Apply)
- CO3: Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (Cognitive Knowledge Level: Apply)
- CO4Prepare technical report and deliver presentation (Cognitive Knowledge Level: Apply)
- CO5Apply engineering and management principles to achieve the goal of the project(Cognitive Knowledge Level: Apply)

CST 362 PROGRAMMING IN PYTHON

- CO1: Write, test and debug Python programs (Cognitive Knowledge level: Apply)

- CO2: Illustrate uses of conditional (if, if-else and if-else-if-else) and iterative (while and for) statements in Python programs. (Cognitive Knowledge level: Apply)
- CO3: Develop programs by utilizing the Python programming constructs such as Lists, Tuples, Sets and Dictionaries. (Cognitive Knowledge level: Apply)
- CO4:Develop graphical user interface for solutions using Python libraries. (Cognitive Knowledge level: Apply)
- CO5: Implement Object Oriented programs with exception handling. (Cognitive Knowledge level: Apply)
- CO6Write programs in Python to process data stored in files by utilizing Numpy, Matplotlib, and Pandas. (Cognitive Knowledge level: Apply)

CST 372 DATA ANDCOMPUTERCOMMUNICATION

- CO1 : Identify the characteristics of signals for analog and digital transmissions (Cognitive knowledge: Apply)
- CO2 Identify the issues in data transmission (Cognitive knowledge: Apply)
- CO3 Select transmission media based on characteristics and propagation modes (Cognitive knowledge: Apply)
- CO4 Choose appropriate signal encoding techniques for a given scenario (Cognitive knowledge: Apply)
- CO5 Illustrate multiplexing and spread spectrum technologies (Cognitive knowledge: Apply)
- CO6 Use error detection, correction and switching techniques in data communication (Cognitive knowledge: Apply)

Course Outcomes – Semester 7

CST401ARTIFICIALINTELLIGENCE

- CO1: Explain the fundamental concepts of intelligent systems and their architecture. (Cognitive Knowledge Level: Understanding)
- CO2 : Illustrate uninformed and informed search techniques for problem solving in intelligent systems. (Cognitive Knowledge Level: Understanding)
- CO3:Solve Constraint Satisfaction Problems using search techniques.(Cognitive Knowledge Level: Apply)
- CO4:Represent AI domain knowledge using logic systems and use inference techniques for reasoning in intelligent systems. (Cognitive Knowledge Level: Apply)
- CO5:Illustrate different types of learning techniques used in intelligent systems (Cognitive Knowledge Level: Understand)

CSL 411 COMPILER LAB

- CO1: Implement lexical analyzer using the tool LEX. (Cognitive Knowledge Level: Apply)
- CO2: Implement Syntax analyzer using the tool YACC. (Cognitive Knowledge Level: Apply)
- CO3: Design NFA and DFA for a problem and write programs to perform operations on it.
  (Cognitive Knowledge Level: Apply)
- CO4: Design and Implement Top-Down parsers. (Cognitive Knowledge Level: Apply)
- CO5: Design and Implement Bottom-Up parsers. (Cognitive Knowledge Level: Apply)
- CO6: Implement intermediate code for expressions. (Cognitive Knowledge Level: Apply)

CSQ413SEMINAR

- CO1Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply).
- CO2Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze).
- CO3Prepare a presentation about an academic document (Cognitive knowledge level: Create).
- CO4Give a presentation about an academic document (Cognitive knowledge level: Apply).
- CO5 Prepare a technical report (Cognitive knowledge level: Create).

CSD415PROJECT PHASE I

- CO1 Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
- CO2 Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
- CO3 Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
- CO4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
- CO5 Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
- CO6 Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

CST413MACHINE LEARNING

- CO1 Illustrate Machine Learning concepts and basic parameter estimation methods. (Cognitive Knowledge Level: Apply)
- CO2 Demonstrate supervised learning concepts (regression, linear classification).

(Cognitive Knowledge Level: Apply)

- CO3 Illustrate the concepts of Multilayer neural network and Support Vector Machine (Cognitive Knowledge Level: Apply)
- CO4 Describe unsupervised learning concepts and dimensionality reduction techniques. (Cognitive Knowledge Level: Apply)
- CO5 Solve real life problems using appropriate machine learning models and evaluate the performance measures (Cognitive Knowledge Level: Apply)

CST423CLOUD COMPUTING

- CO1Explain the various cloud computing models and services. (Cognitive Knowledge Level: Understand)
- CO2Demonstrate the significance of implementing virtualization techniques.(Cognitive Knowledge Level: Understand)
- CO3Explain different cloud enabling technologies and compare private cloud platforms (Cognitive Knowledge Level: Understand)
- CO4Apply appropriate cloud programming methods to solve big data problems. (Cognitive Knowledge Level: Apply)
- CO5Describe the need for security mechanisms in cloud (Cognitive Knowledge Level: Understand)
- CO6 Compare the different popular cloud computing platforms (Cognitive Knowledge Level: Understand)

CST463WEB PROGRAMMING

- CO1 :Use HyperText Markup Language (HTML) for authoring web pages and understand the fundamentals of WWW. (Cognitive Knowledge Level: Understand)
- CO2: Construct and visually format responsive, interactive web pages using CSS and JavaScript (JS) (Cognitive Knowledge Level: Apply)
- CO3 :Construct websites using advanced sever side programming tool PHP (Cognitive Knowledge Level: Apply)

- CO4 :Develop dynamic web applications using PHP and perform MySQL database operations. (Cognitive Knowledge Level: Apply)
- CO5 :Explain the importance of object exchange formats using JSON and the MVC based web application development frameworks (Laravel) (Cognitive Knowledge Level: Understand)

Course Outcomes – Semester 8

CST402DISTRIBUTEDCOMPUTING

- CO1:Summarize various aspects of distributed computation model and logical time. (Cognitive Knowledge Level: Understand)
- CO2:Illustrate election algorithm, global snapshot algorithm and termination detection algorithm. (Cognitive Knowledge Level: Apply)
- CO3:Compare token based, non-token based and quorum based mutual exclusion algorithms. (Cognitive Knowledge Level: Understand)
- CO4:Recognize the significance of deadlock detection and shared memory in distributed systems. (Cognitive Knowledge Level: Understand)
- CO5 Explain the concepts of failure recovery and consensus. (Cognitive Knowledge Level:
  Understand)
- CO6 Illustrate distributed file system architectures. (Cognitive Knowledge Level: Understand)

CSD416PROJECT PHASE II

- CO1 Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
- CO2 Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
- CO3 Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).

- CO4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
- CO5 Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
- CO6 Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

CST466DATA MINING

- CO1 Employ the key process of data mining and data warehousing concepts in application domains. (Cognitive Knowledge Level: Understand)
- CO2 Make use of appropriate preprocessing techniques to convert raw data into suitable format for practical data mining tasks (Cognitive Knowledge Level: Apply)
- CO3 Illustrate the use of classification and clustering algorithms in various application domains (Cognitive Knowledge Level: Apply)
- CO4 Comprehend the use of association rule mining techniques. (Cognitive Knowledge Level: Apply)
- CO5 Explain advanced data mining concepts and their applications in emerging domains(Cognitive Knowledge Level: Understand)

MEA ENGINEERING COLLEGE, PERINTHALMANNA
DEPARTMENT OF INFORMATION TECHNOLOGY

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY 2019 SCHEME

PROGRAM: B TECH IN INFORMATION TECHNOLOGY

Course Outcomes – Semester 3

MAT 203 Discrete Mathematical Structures

- CO 1 Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic (Cognitive Knowledge Level: Apply)
- CO 2 Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion (Cognitive Knowledge Level: Apply)
- CO 3 Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science (Cognitive Knowledge Level: Understand)
- CO 4 Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science (Cognitive Knowledge Level: Apply)
- CO 5 Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients (Cognitive Knowledge Level: Apply)
- CO 6 Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups (Cognitive Knowledge Level: Understand)

ITT 201 Data Structures

- CO 1 Summarize different categories of data Structures.
- CO 2 Identify different parameters to analyze the performance of an algorithm.

- CO 3 Explain the significance of dynamic memory management Techniques
- CO 4 Design algorithms to perform operations with Linear and Non linear data structures.
- CO 5 Illustrate various technique to for searching, Sorting and hashing.
- CO 6 Choose appropriate data structures to solve real world problems efficiently.

ITT 203 Digital System Design

- CO 1 To perform base conversion and arithmetic operations in various number systems.
- CO 2 To design digital circuits using simplified Boolean functions.
- CO 3 To develop simple design of combinational circuits.
- CO 4 To develop simple design of sequential circuits
- CO 5 To interpret the generalization of synchronous and asynchronous sequential circuits.

ITT 205 Problem Solving Using Python

- CO 1 Write programs using Python and learn its execution environment
- CO 2 Apply programs to implement various computational tasks which require sloops and conditional statements
- CO 3 Write programs using functions and packages
- CO 4 Apply programs to implement the concept of file handling using Python
- CO 5 Design object oriented programs to implement daily life problems
  And their solutions

EST 200 Design and Engineering

- CO 1 Explain the different concepts and principles involved in design engineering
- CO 2 Apply design thinking while learning and practicing engineering

- CO 3 Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering

HUT 200 Professional Ethics

- CO 1 Understand the core values that shape the ethical behaviour of a professional
- CO 2 Adopt a good character and follow an ethical life
- CO 3 Explain the role and responsibility in technological development by keeping personal ethics and legal ethics
- CO 4 Solve moral and ethical problems through exploration and assessment by established experiments
- CO 5 Apply the knowledge of human values and social values to contemporary ethical values and global issues

MCN 201 Sustainable Engineering

- CO 1 Understand the relevance and the concept of sustainability and the global initiatives in this direction
- CO 2 Explain the different types of environmental pollution problems and their sustainable solutions
- CO 3 Discuss the environmental regulations and standards
- CO 4 Outline the concepts related to conventional and non-conventional energy
- CO 5 Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

IT L 201 Data Structures Lab

- **CO 1** Compare various kinds of searching and sorting techniques
- **CO 2** Construct Linear and non linear data structures using arrays and linked list
- **CO 3** Develop Programs employing dynamic memory management
- **CO 4** Choose appropriate data structure to solve various computing problems.

- **CO 5** Originate hash tables and collision resolution Techniques
- **CO 6** Identify suitable data structure and algorithm to solve a real world problem.

IT L 203 Programming and System Utilities Lab

- CO 1 Develop readable* Python programs by making use of basicconstructs-Decisioncontrols,Loopingcontrols,Lists,TupleandStrings
- CO 2 Design modular Python programs using normal and recursive functions
- CO 3 Design programs using Dictionaries and Files
- CO 4 Experiment with the basic Windows/ Linux administration & network configuration utilities
- CO 5 Experiment with version control tools using it

Course Outcomes – Semester 4

MAT 208 Probability Statistics and Advanced Graph Theory

- CO 1 Understand the concept, properties and important models of discrete random variables and, using them, analyse suitable random phenomena
- CO 2 Understand the concept, properties and important models of continuous random variables and, using them, analyse suitable random phenomena
- CO 3 Perform statistical inferences concerning characteristics of a population based on attributes of samples drawn from the population
- CO 4 Understand the basic concept in Graph theory, Understand planar graphs and it's properties. Demonstrate the knowledge of fundamental concepts of matrix representation of graphs, Apply fundamental theorems on Eularian graphs and Hamiltonian graphs.
- CO 5 Understand the basic concept in Trees, coloring of graphs. Apply coloring of graphs, Apply algorithm to find the minimum spanning tree

ITT 202 Principles of Object Oriented Techniques

- CO 1 Describe the specific capabilities of Object-Oriented paradigm compared to procedure oriented paradigm
- CO 2 Explain the use of object oriented concepts to analyse the given problem
- CO 3 Describe the different inheritance features available in Java
- CO 4 Construct robust programs using Exception Handling
- CO 5 Construct applets utilising multithreading, event handling and Graphical User Interface, also model the problem scenarios using UML diagrams.

ITT 204 Computer Organization

- CO 1 Describe the basic organization of computer and different instruction formats and addressing modes
- CO 2 Analyze the basic operations and sequencing of control signals
- CO 3 Represent the design of registers and arithmetic logic unit
- CO 4 Examine the concept of pipe-lining and various hazards associated with it
- CO 5 Compare the performance of memory systems like cache and DRAM and Select appropriate interfacing standards for I/O devices.

ITT 206 Database Management Systems

- CO 1 Describe the fundamental concepts of databases.
- CO 2 Construct an Entity-Relationship (ER) model and transform to relational schema.
- CO 3 Develop queries for relational database in the context of practical applications.
- CO 4 Model and design relational databases following the design principles
- CO 5 Describe the concepts of control and recovery techniques in transaction processing and NoSQL database.

EST 200 Design and Engineering

- CO 1 Explain the different concepts and principles involved in design engineering
- CO 2 Apply design thinking while learning and practicing engineering
- CO 3 Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering

HUT 200 Professional Ethics

- CO 1 Understand the core values that shape the ethical behaviour of a professional
- CO 2 Adopt a good character and follow an ethical life.
- CO 3 Explain the role and responsibility in technological development by keeping personal ethics and legal ethics

- CO 4 Solve moral and ethical problems through exploration and assessment by established experiments
- CO 5 Apply the knowledge of human values and social values to contemporary ethical values and global issues

MCN 202 Constitution of India

- CO 1 Explain the background of the present constitution of India and features
- CO 2 Utilize the fundamental rights and duties
- CO 3 Understand the working of the union executive, parliament and judiciary
- CO 4 Understand the working of the state executive, legislature and judiciary
- CO 5 Utilize the special provisions and statutory institutions
- CO 6 Show national and patriotic spirit as responsible citizens of the country

IT L 202 Object Oriented Techniques Lab

- CO 1 Solve the given problem by applying Object oriented features and Java concepts.
- CO 2 Implement the concept of method and constructor overloading
- CO 3 Implement the concept of inheritance Apply
- CO 4 Use the concept of multithreading and modify an existing program with proper exception handling
- CO 5 Build Robust programs in JAVA using AWT and SWING

IT L 204 Database Management Systems Lab

- CO 1 Construct database using DDL, DCL and basic DML commands in SQL.
- CO 2 Build nested and join queries.
- CO 3 Apply procedural SQL concepts like view, exception handling, stored procedure, function, trigger, cursor in various database applications
- CO 4 Design and develop database applications.

Course Outcomes – Semester 5

ITT 301 Web Application Development

- CO 1 Identify HTML5 elements in web pages
- CO 2 Implement Cascading Style sheet to add style in HTML pages
- CO 3 Apply JavaScript to add functionality to web pages
- CO 4 Use Ajax & JQuery to enhance the functioning of web pages
- CO 5 Develop web applications with HTML, CSS, JavaScript, Node JS and MongoDB

ITT 303 Operating System Concepts

- CO 1 Explain the concepts and functionality of operating systems.
- CO 2 Describe the concepts of process management and process synchronization and apply them to solve problems.
- CO 3 Illustrate deadlock and deadlock – prevention and avoidance techniques.
- CO 4 Illustrate the memory management techniques.
- CO 5 Explain the file system and its implementation
- CO 6 Use the disk scheduling algorithms to solve problems.

ITT 305 Data Communication & Networking

- Discuss the basic concepts used in data communication and computer networking
- Identify the concepts of data transmission and apply signal encoding techniques in data transmission.
- Compare different transmission mode, multiplexing, and Spread Spectrum techniques.
- Describe the design issues and protocols in data link layer.
- Summarize the routing algorithms and congestion control techniques in network layer.

ITT 307 Formal Languages and Automata Theory

- CO 1 Understand the formal language hierarchy and its applications in the field of computation.
- CO 2 Construct automaton for any given regular language and find its equivalent regular expressions
- CO 3 Design a context free grammar for any given context free language
- CO 4 Construct Turing machines and understand their capability
- CO 5 Analyze P,NP class and various undecidable problems.

ITT 309 Management for Software Engineers

- CO 1 Understand about the basics of software process, software development life cycle and process models
- CO 2 Interpret the concepts of managing software projects
- CO 3 Make use of project evaluation techniques and choose software estimation approaches for effort and cost.
- CO 4 Explain on planning the project activities and describe the concepts of risk management and resource allocation.
- CO 5 Understand project monitoring and control, organize people and teams and describe the techniques for ensuring software quality.

MCN 301 Disaster Management

Define and use various terminologies in use in disaster management parlance and
organise each of these terms in relation to the disaster management cycle (Cognitive
knowledge level: Understand)

CO 1 Define and use various terminologies in use in disaster management parlance and

organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: **Understand**).

Define and use various terminologies in use in disaster management parlance and

organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: Understand)

Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: Understand)

CO 2 Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level:**Understand**).

CO 3 Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level:**Understand**).

CO 4 Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive knowledge level: **Apply**)

CO5

Identify factors that determine the nature of disaster response and discuss the various disaster response actions (Cognitive knowledge level: **Understand**).

CO 6

Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level: **Understand**).

IT L 331 Operating System and Network Programming Lab

- CO 1 Analyse CPU Scheduling Algorithms like FCFS, Round Robin, SJF and Priority.
- CO 2 Implement inter process communication and process synchronization problems.
- CO 3 Implement memory management schemes - first fit, best fit and worst fit
- CO 4 Implement client server communication using sockets
- CO 5 Implement MAC protocols
- CO 6 Familiarization of network simulation tool.

ITL 333 Web Application Development lab

- CO 1 Infer the structure of HTML elements in a webpage
- CO 2 Build Webpages using HTML and CSS
- CO 3 Utilize JavaScript to add functionality to webpages
- CO 4 Implement different Ajax &JQuery functionalities in Web development
- CO 5 Develop a web applications using Node JS and MongoDB

Course Outcomes – Semester 6

ITT 302 Internetworking with TCP/IP

- CO 1 Discuss internetworking concepts and internet address resolution.
- CO 2 Illustrate the functions of IPv4, IPv6, and ICMP protocols
- CO 3 Explain internet routing architecture and internet multicasting
- CO 4 Solve the design issues and protocols in transport layer
- CO 5 Explain application layer protocols, network virtualization and software defined networking

ITT 304 Algorithm Analysis and Design

- CO 1 Explain asymptotic notations used in the performance analysis of algorithms and to solve recurrence equations
- CO 2 Apply divide and conquer strategy to solve practical problems efficiently
- CO 3 Apply greedy and dynamic programming techniques in algorithm design
- CO 4 Apply backtracking and branch and bound techniques in algorithm design
- CO 5 Interpret sophisticated algorithms such as string matching and approximation algorithms

ITT 306 Data Science

- CO 1 Explain the fundamental concepts and various aspects of data science
- CO 2 Choose data validation techniques suitable for statistical analysis andpresent results using data visualization techniques.
- CO 3 Identify different statistical learning algorithm for solving a problem
- CO 4 Use statistical analysis to characterize and interpret data sets
- CO 5 Compare the pros/cons of various models and algorithms used for data analysis and data mining
- CO 6 Develop the ability to perform basic data analysis in Python and understand the fundamentals of deep learning.

ITT 332 Soft Computing

- CO 1 Explain various soft computing techniques and their roles in building intelligent machines
- CO 2 Discuss Artificial Neural Network Architectures and different Learning Methods
- CO 3 Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
- CO 4 Apply genetic algorithm to solve optimization problems
- CO 5 Explain the concepts of hybrid systems

HUT 300 Industrial Economics and Foreign Trade

- CO 1 Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare.
- CO 2 Take appropriate decision regarding volume of output and to evaluate the social cost of productions.
- CO 3 Determine the functional requirement of a firm under various competitive conditions.
- CO 4 Examine the overall performance of the economy , and the regulation of economic fluctuations and its impact on various sections in the society.

- CO 5 Determine the impact of changes in global economic policies on the business opportunities of a firm.

ITT 308 Comprehensive Course work

- CO 1 Explain the core concepts in the courses listed in the prerequisite section (ITT 201, ITT 202, ITT 206, ITT 303, ITT 305).
- CO 2 Interpret questions asked and answer them with confidence
- CO 3 Practice the comprehensive knowledge gained in basic courses in the field of Information Technology to build confidence for appearing for a competitive examination

ITL 332 Computer Networks Lab

- CO 1 Demonstrate internetworking and network components
- CO 2 Explain IPv4 addressing, IPv6 addressing, subnetting and design networks
- CO 3 Experiment with static, dynamic and inter VLAN routing
- CO 4 Make use of standard and extended access lists
- CO 5 Use Webserver, remote login, file transfer and automatic network configuration protocols
  Use network simulators

IT D 334 MiniProject

- CO 1 Make use of acquired knowledge within the selected area of technology for project development.
- CO 2 Identify, discuss and justify the technical aspects and design aspects of the project with a systematic approach.
- CO 3 Interpret, improve and refine technical aspects for engineering projects
- CO 4 Associate with a team as an effective team player for the development of technical projects.
- CO 5 Report effectively the project related activities and findings.

Course Outcomes – Semester 7

ITT 401 Data Analytics

- CO 1 Describe the introductory concepts of data analytics; integrate statistical learning into data analytic processing and tools
- CO 2 Summarize the big data concepts, methods, tools and applications; explain the evolution of NoSQL with popular NoSQL products like MongoDB
- CO 3 Illustrate the ideas of distributed processing with Hadoop, MapReduce paradigm and related projects namely HBase, Spark, YARN, Hive and Pig
- CO 4 Experiment with R language to perform data exploration, wrangling and modelling
- CO 5 Analyze how big data techniques could be used in diverse application domains of real world

ITT 453 Machine Learning

- CO 1 Identify machine learning applications such as learning associations, classification, regression, supervised, unsupervised learning and reinforcement Learning.
- CO 2 Explain supervised learning method such as classification, use Naive Bayes classifier and discuss classifier performance measures
- CO 3 Use theoretical foundations of decision trees as well as describe the basics of neural networks.
- CO 4 Describe the fundamental concepts of SVM and HMM and explain how to combine multiple learners.
- CO 5 Illustrate clustering algorithms like k-means clustering, hierarchical clustering and discuss density based clustering

MCN 401 Industrial Safety Engineering

- CO 1 Describe the theories of accident causation and preventive measures of industrial accidents. (Cognitive Knowledge level: Understand)
- CO 2 Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping. (Cognitive Knowledge level: Understand)
- CO 3 Explain different issues in construction industries. (Cognitive Knowledge level: Understand)
- CO 4 Describe various hazards associated with different machines and mechanical material handling. (Cognitive Knowledge level: Understand)
- CO 5 Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards. (Cognitive Knowledge level: Apply)

ITL 411 Data Analytics Lab

- CO 1 Solve simple problems of statistical analysis of data using Microsoft Exce
- CO 2 Analyze the textual data and time series data with the data visualization techniques in R
- CO 3 Implement the basic statistical techniques and machine learning algorithms using R
- CO 4 Execute HDFS commands and apply Map Reduce technologies associated with big data analytics using HADOOP
- CO 5 Analyze real world data by applying the suitable visualization techniques in Tableau

ITQ413 Seminar

- CO 1 Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply).
- CO 2 Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze)
- CO 3 Prepare a presentation about an academic document (Cognitive knowledge level: Create)

- CO 4 Give a presentation about an academic document (Cognitive knowledge level: Apply)
- CO 5 Prepare a technical report (Cognitive knowledge level: Create)

ITD415 Project Phase 1

- CO 1 Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply)
- CO 2 Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
- CO 3 Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
- CO 4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
- CO 5 Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
- CO 6 Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply)

Course Outcomes – Semester 8

ITT 402 Cryptography and Network Security

- CO 1 Apply the concepts of number theory in designing crypto systems
- CO 2 Explain various network security aspects, cryptanalytic attacks and classical cryptosystems
- CO 3 Describe various symmetric key cryptosystems, hash and message authentication functions.
- CO 4 Apply the principles of asymmetric key cryptosystems and digital signature.
- CO 5 Discuss various protocols to ensure Email Security and Network Security.

ITT 464 Computer Graphics

- CO 1 Illustrate line drawing and circle generation algorithms.
- CO 2 Explain the techniques used for various display technologies.
- CO 3 Illustrate the matrix corresponding to various 2D transformations.
- CO 4 Explain 2D line clipping and polygon clipping algorithms and 3D transformations.
- CO 5 Describe various visible surface detection methods and colour models.

ITT 426 Internet Of Things

- CO 1 Discuss the key techniques and theory behind Internet of Things
- CO 2 Distinguish between different IoT Protocols and their applications
- CO 3 Apply effectively the various enabling technologies (both hardware and software) for IoT.
- CO 4 Describe the integration of Cloud and IoT with data acquisition and analytics
- CO 5 Design and build IoT system for any one interesting Use case

ITT 438 Software Architecture

- CO 1 Explain software architecture and recognize its importance, various contexts and the role of stakeholders
- CO 2 Describe the quality attributes of a software system
- CO 3 Summarize the knowledge of various architectural tactics and patterns.
- CO 4 Use architectural concepts in the design (ADD), implementation and testing phases of software project life cycle in agile projects
- CO 5 Interpret the evaluation, economic analysis and documentation of architectures

ITD 416 Project Phase II

- CO 1 Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
- CO 2 Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).

- CO 3 Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply)
- CO 4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
- CO 5 Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
- CO 6 Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

MEA ENGINEERING COLLEGE, PERINTHALMANNA

DEPARTMENT OF MECHANICAL ENGINEERING

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY 2019 SCHEME

PROGRAM: B TECH IN MECHANICAL ENGINEERING

Course Outcomes – Semester 3

MAT 201 Partial Differential Equations and Complex Analysis

- CO 1 Understand the concept and the solution of partial differential equation
- CO 2 Analyse and solve one dimensional wave equation and heat equation
- CO 3 Understand complex functions, its continuity differentiability with the use of Cauchy- Riemann equations
- CO 4 Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function
- CO 5 Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals

MET 201 Mechanics of Solids

- CO 1 Determine the stresses, strains and displacements of structures by tensorial and graphical (Mohr's circle) approaches
- CO 2 Analyse the strength of materials using stress-strain relationships for structural and thermal loading
- CO 3 Perform basic design of shafts subjected to torsional loading and analyse beams subjected to bending moments
- CO 4 Determine the deformation of structures subjected to various loading conditions using strain energy methods

- CO 5 Estimate the strength of thin cylinders, spherical vessels and columns, and appreciate the theories of failures and its relevance in mechanical design

MET 203 Mechanics of Fluids

- CO1 Define Properties of Fluids and Solve hydrostatic problems
- CO2 Explain fluid kinematics and Classify fluid flows
- CO3 Interpret Euler and Navier-Stokes equations and Solve problems using Bernoulli's equation
- CO4 Evaluate energy loses in pipes and sketch energy gradient lines
- CO5 Explain the concept of boundary layer and its applications
- CO6 Use dimensional Analysis for model studies

MET 205 Metallurgy & Material Science

- CO 1 Understand the basic chemical bonds, crystal structures (BCC, FCC, and HCP), and their relationship with the properties
- CO 2 Analyze the microstructure of metallic materials using phase diagrams and modify the microstructure and properties using different heat treatments
- CO 3 How to quantify mechanical integrity and failure in materials
- CO 4 Apply the basic principles of ferrous and non-ferrous metallurgy for selecting materials for specific applications
- CO 5 Define and differentiate engineering materials on the basis of structure and properties for engineering applications

EST 200 Design and Engineering

- CO 1 Explain the different concepts and principles involved in design engineering
- CO 2 Apply design thinking while learning and practicing engineering
- CO 3 Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering

HUT 200 Professional Ethics

- CO 1 Understand the core values that shape the ethical behaviour of a professional
- CO 2 Adopt a good character and follow an ethical life
- CO 3 Explain the role and responsibility in technological development by keeping personal ethics and legal ethics
- CO 4 Solve moral and ethical problems through exploration and assessment by established experiments
- CO 5 Apply the knowledge of human values and social values to contemporary ethical values and global issues

MCN 201 Sustainable Engineering

- CO 1 Understand the relevance and the concept of sustainability and the global initiatives in this direction
- CO 2 Explain the different types of environmental pollution problems and their sustainable solutions
- CO 3 Discuss the environmental regulations and standards
- CO 4 Outline the concepts related to conventional and non-conventional energy
- CO 5 Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

MEL 201 Computer Aided Machine Drawing

- CO1 Apply the knowledge of engineering drawings and standards to prepare standard dimensioned drawings of machine parts and other engineering components
- CO2 Prepare standard assembly drawings of machine components and valves using part drawings and bill of materials.
- CO3 Apply limits and tolerances to components and choose appropriate fits for given assemblies
- CO 4 Interpret the symbols of welded, machining and surface roughness on the component drawings

- CO 5 Prepare part and assembly drawings and Bill of Materials of machine components and valves using CAD software

MEL 203 Materials Testing Lab

- CO 1 To understand the basic concepts of analysis of circular shafts subjected to torsion
- CO 2 To understand the behaviour of engineering component subjected to cyclic loading and failure concepts
- CO 3 Evaluate the strength of ductile and brittle materials subjected to compressive, Tensile shear and bending forces
- CO 4 Evaluate the microstructural morphology of ductile or brittle materials and its fracture modes (ductile /brittle fracture) during tension test
- CO 5 To specify suitable material for applications in the field of design and manufacturing

MET 285 Material Science and Technology (Minor)

- CO 1 Understand the basic chemical bonds, crystal structures and their relationship with the properties
- CO 2 How to quantify failure of materials
- CO 3 Given a hypothetical or real problem with an electronic materials device or process, explain the cause of the problem and propose solutions
- CO 4 Understand how materials interact at the nanoscale
- CO 5 Define and differentiate engineering materials on the basis of structure and properties for engineering applications

Course Outcomes – Semester 4

MAT 202 Probability, Statistics and Numerical Methods

- CO 1 Understand the concept, properties and important models of discrete random variables and, using them, analyze suitable random phenomena
- CO 2 Understand the concept, properties and important models of continuous random variables and, using them, analyze suitable random phenomena
- CO 3 Perform statistical inferences concerning characteristics of a population based on attributes of samples drawn from the population
- CO 4 Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques
- CO 5 Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations

MET 202 Engineering Thermodynamics

- CO1 Understand basic concepts and laws of thermodynamics
- CO2 Conduct first law analysis of open and closed systems
- CO3 Determine entropy and availability changes associated with different processes
- CO4 Understand the application and limitations of different equations of state
- CO5 Determine change in properties of pure substances during phase change processes
- CO6 Evaluate properties of ideal gas mixtures

MET 204 Manufacturing Process

- CO 1 Illustrate the basic principles of foundry practices and special casting processes, their advantages, limitations and applications
- CO 2 Categorize welding processes according to welding principle and material
- CO 3 Understand requirements to achieve sound welded joint while welding different similar and dissimilar engineering materials

- CO 4 Student will estimate the working loads for pressing, forging, wire drawing etc. processes
- CO 5 Recommend appropriate part manufacturing processes when provided a set of functional requirements and product development constraints

MET 206 Fluid Machinery

- CO1 Explain the characteristics of centrifugal and reciprocating pumps
- CO2 Calculate forces and work done by a jet on fixed or moving plate and curved plates
- CO3 Explain the working of turbines and Select a turbine for specific application
- CO4 Analyse the working of air compressors and Select the suitable one based on application
- CO5 Analyse gas turbines and Identify the improvements in basic gas turbine cycles
- CO6 Explain the characteristics of centrifugal and reciprocating pumps

EST 200 Design and Engineering

- CO 1 Explain the different concepts and principles involved in design engineering
- CO 2 Apply design thinking while learning and practicing engineering
- CO 3 Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering

HUT 200 Professional Ethics

- CO 1 Understand the core values that shape the ethical behaviour of a professional
- CO 2 Adopt a good character and follow an ethical life.
- CO 3 Explain the role and responsibility in technological development by keeping personal ethics and legal ethics
- CO 4 Solve moral and ethical problems through exploration and assessment by established experiments
- CO 5 Apply the knowledge of human values and social values to contemporary ethical values and global issues

MCN 202 Constitution of India

- CO 1 Explain the background of the present constitution of India and features
- CO 2 Utilize the fundamental rights and duties
- CO 3 Understand the working of the union executive, parliament and judiciary
- CO 4 Understand the working of the state executive, legislature and judiciary
- CO 5 Utilize the special provisions and statutory institutions
- CO 6 Show national and patriotic spirit as responsible citizens of the country

MEL 202 FM & HM Lab

- CO 1 Determine the coefficient of discharge of flow measuring devices (notches, orifice meter and Venturi meter)
- CO 2 Calibrate flow measuring devices (notches, orifice meter and Venturi meter)
- CO 3 Evaluate the losses in pipes
- CO 4 Determine the metacentric height and stability of floating bodies
- CO 5 Determine the efficiency and plot the characteristic curves of different types of pumps and Turbines

MEL 204 Machine Tools Lab I

- CO 1 The students can operate different machine tools with understanding of work holders and operating principles to produce different part features to the desired quality
- CO 2 Apply cutting mechanics to metal machining based on cutting force and power consumption
- CO 3 Select appropriate machining processes and process parameters for different metals
- CO 4 Fabricate and assemble various metal components by welding and students will be able to visually examine their work and that of others for discontinuities and defects
- CO 5 Infer the changes in properties of steel on annealing, normalizing, hardening and tempering

MET 286 Manufacturing Technology (Minor)

- CO 1 Illustrate the basic principles of foundry practices and special casting processes, their advantages, limitations and applications
- CO 2 Categorize welding processes according to welding principle and material
- CO 3 Understand the advantages of LBM and EBM over fusion welding process
- CO 4 An ability to understand the principles of the basic microelectronic processing technology
- CO 5 Learn about key aspects of the microelectronics industry, from device design, to processing, to photolithography, to manufacturing and packaging. Students will come out knowing the core processes of ion implantation, diffusion, oxidation, deposition, etching, including the fundamental physical mechanisms, and the necessary understanding for using these processes in a manufacturing environment

MEA ENGINEERING COLLEGE, PERINTHALMANNA

DEPARTMENT OF MECHANICAL ENGINEERING

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY 2019 SCHEME

PROGRAM: B TECH IN MECHANICAL ENGINEERING

Course Outcomes – Semester 5

MET 301 MECHANICS OF MACHINERY

- CO 1 Explain the fundamentals of kinematics, various planar mechanisms and interpret the basic principles of mechanisms and machines
- CO 2 Perform analysis and synthesis of mechanisms
- CO 3 Solve the problem on cams and gear drives, including selection depending on requirement.
- CO 4 Calculate the gyroscopic effect in various situations
- CO 5 Analyse rotating and reciprocating masses for its unbalance

MET 303 THERMAL ENGINEERING

- CO 1 Explain the working of steam power cycle and related components
- CO 2 Discuss the working of steam turbines and methods for evaluating the performance
- CO 3 Illustrate the performance testing and evaluation of IC engines
- CO 4 Explain the combustion phenomenon and pollution in IC engines
- CO 5 Discuss the principles of refrigeration and air-conditioning and basic design considerations

MET 305 INDUSTRIAL & SYSTEMS ENGINEERING

- CO 1 Implement various tools and techniques in industrial engineering
- CO 2 Calculate the inventory system for a given requirement

- CO 3 Explain the importance of industrial relations
- CO 4 Select the lean manufacturing tools to find and eliminate wastes
- CO 5 Identify the framework of agile manufacturing
- CO 6 Identify core and extended modules of enterprise resource planning

MET 307 MACHINE TOOLS AND METROLOGY

- CO 1 Analyze various machining process and calculate relevant quantities such us velocities, forces and powers.
- CO 2 Analyze of the tool nomenclature with surface roughness obtainable in each machining processes.
- CO 3 Understand the limitations of various machining process with regard to shape formation and surface texture.
- CO 4 Demonstrate knowledge of the underlying principles of measurement, as they relate to mechanical measurement, electronic instrumentation, and thermal effects.
- CO 5 Get an exposure to advanced measuring devices and machine tool metrology.

MEL 331 MACHINE TOOLS LAB II

- CO 1 Apply the procedures to measure length, angles, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness by using different instruments and by different indirect methods.
- CO 2 Determine limits and fits and allocate tolerances for machine components
- CO 3 CNC programming and to use coordinate measuring machine to record measurements of complex profiles with high sensitivity.
- CO 4 Use effective methods of measuring straightness, Squareness, flatness, roundness, profile, screw threads and gear teeth.
- CO 5 Securing knowledge of manufacturing components within the tolerance limit and surface roughness according to given drawings using various machine tools.

MEL 333 THERMAL ENGINEERING LAB 1

- CO 1 Measure thermo-physical properties of solid, liquid and gaseous fuels
- CO 2 Identify various systems and subsystems of Diesel and petrol engines
- CO 3 Analyse the performance characteristics of internal combustion engines
- CO 4 Investigate the emission characteristics of exhaust gases from IC Engines
- CO 5 Interpret the performance characteristics of air compressors / blowers

Course Outcomes – Semester 6

MET 302 HEAT &MASS TRANSFER

- CO 1 Apply principles of heat and mass transfer to engineering problems
- CO 2 Analyse and obtain solutions to problems involving various modes of heat transfer
- CO 3 Design heat transfer systems such as heat exchangers, fins, radiation shields etc.
- CO 4 Define laminar and turbulent boundary layers and ability to formulate energy equation inflow systems.

MET 304 DYNAMICS AND DESIGN OF MACHINERY

- CO 1 Do engine force analysis and to draw turning moment diagrams
- CO 2 Analyse free and forced vibrations of single degree of freedom systems
- CO 3 Determine the natural frequencies of a two degree of freedom vibrating system and to calculate the stresses in a structural member due to combined loading
- CO 4 Design machine elements subjected to fatigue loading and riveted joints
- CO 5 Design welded joint and close coiled helical compression spring

MET 306 ADVANCED MANUFACTURING ENGINEERING

- CO 1 To be conversant with the advanced machining process and to appreciate the effect of process parameters on the surface integrity aspects during the advanced machining process.
- CO 2 CNC programming, select appropriate tooling and fixtures.

- CO 3 To categorize the various nontraditional material removal process based on energy sources and mechanism employed.
- CO 4 Analyze the processes and evaluate the role of each process parameter during micro machining of various advanced material removal processes.
- CO 5 Explain the processes used in additive manufacturing for a range of materials and applications.

MET 308 COMPREHENSIVE COURSE WORK

- CO1 Learn to prepare for a competitive examination
- CO2 Comprehend the questions in Mechanical Engineering field and answer them with confidence
- CO3 Communicate effectively with faculty in scholarly environments
- CO4 Analyze the comprehensive knowledge gained in basic courses in the field of Mechanical Engineering

MEL 332 COMPUTER AIDED DESIGN & ANALYSIS LAB

- CO1 Gain working knowledge in Computer Aided Design and modelling procedures.
- CO2 Gain knowledge in creating solid machinery parts.
- CO3 Gain knowledge in assembling machine elements.
- CO4 Gain working knowledge in Finite Element Analysis.
- CO5 Solve simple structural, heat and fluid flow problems using standard software

MEL 334 THERMAL ENGINEERING LAB-II

- CO 1 Evaluate thermal properties of materials in conduction, convection and radiation
- CO 2 Analyse the performance of heat exchangers
- CO 3 Illustrate the operational performances of refrigeration and air conditioning systems
- CO 4 Perform calibration of thermocouples and pressure gauges

MET 312 NON DESTRUCTIVE TESTING

- CO 1 Have a basic knowledge of surface NDT which enables to carry out various inspections in accordance with the established procedures.
- CO 2 The students will be able to differentiate various defect types and select the appropriate NDT methods for the specimen.
- CO 3 Calibrate the instrument and evaluate the component for imperfections.
- CO 4 Have a basic knowledge of ultrasonic testing which enables them to perform inspection of samples.
- CO 5 Have a complete theoretical and practical understanding of the radiographic testing, interpretation and evaluation.

MET 352 AUTOMOBILE ENGINEERING

- CO1 Explain different automotive systems and subsystems
- CO2 Illustrate the principles of transmission, suspension, steering and braking systems of an automobile.
- CO3 Build a basic knowledge about the technology in electric vehicles
- CO4 Summarize the concept of aerodynamics in automobiles.

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DEPARTMENT OF MECHANICAL ENGINEERING

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY 2019 SCHEME

PROGRAM: B TECH IN MECHANICAL ENGINEERING

Course Outcomes – Semester 7

MET 401 Design of Machine Elements

- CO 1 Design shafts based on strength, rigidity and design for static and fatigue loads, design flat belts and connecting rod of IC engines
- CO 2 Design clutches and brakes
- CO 3 Analyse sliding contact bearings and understand design procedure of journal, ball and roller bearings.
- CO 4 Design Spur gear and helical gear
- CO 5 Design Bevel gears and worm gears

MCN 401 Industrial Safety Engineering

- CO1 Describe the theories of accident causation and preventive measures of industrial accidents (Cognitive Knowledge level: Understand)
- CO2 Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping (Cognitive Knowledge level: Understand)
- CO3 Explain different issues in construction industries (Cognitive Knowledge level: Understand)
- CO4 Describe various hazards associated with different machines and mechanical material handling (Cognitive Knowledge level: Understand)
- CO5 Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards (Cognitive Knowledge level: Apply)

MET 413 Advanced Methods In Non Destructive Testing

- CO 1 Understand the theoretical and practical knowledge in methods of non-destructive testing processes
- CO 2 Understand the knowledge of advanced methods in ultrasonic testing which enables them to perform inspection of samples
- CO 3 Illustrate complete theoretical and practical understanding of the radiographic testing, interpretation and evaluation
- CO 4 Understand the recent advances in the field of non-destructive testing
- CO 5 Outline the recent and advanced developments in radiography testing

MET 445 Renewable Energy Engineering

- CO1 Explain renewable energy sources and evaluate the implication of renewable energy. To predict solar radiation at a location
- CO2 Explain solar energy collectors, storages, solar cell characteristics and applications
- CO3 Explain the different types of wind power machines and control strategies of wind turbines
- CO4 Explain the ocean energy and conversion devices and different Geothermal sources
- CO5 Explain biomass energy conversion devices. Calculate the Net Present value and payback period

MEL 411 Mechanical Engineering Lab

- CO 1 Get practical knowledge on design and analysis of mechanisms in the machines
- CO 2 Measure the cutting forces associated with milling machining operations
- CO 3 Apply the basic concepts of hydraulic and pneumatic actuators and their applications in product and processes
- CO 4 Use appropriate systems for data acquisition and control of product and processes

MEQ 413 Seminar

- CO1 Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply)
- CO2 Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze)
- CO3 Prepare a presentation about an academic document (Cognitive knowledge level: Create)
- CO4 Give a presentation about an academic document (Cognitive knowledge level: Apply)
- CO5 Prepare a technical report (Cognitive knowledge level:Create)

MED415 Project Phase I

- CO1 Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply)
- CO2 Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply)
- CO3 Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply)
- CO4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply)
- CO5 Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze)
- CO6 Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply)

Course Outcomes – Semester 8

MET402 Mechatronics

- CO 1 Explain the sensors and actuators used in mechatronics
- CO 2 Design hydraulic and pneumatic circuits for automation
- CO 3 Explain the manufacturing processes used in MEMS 2
- CO 4 Demonstrate the various components of a CNC machine
- CO 5 Create a PLC program
- CO 6 Explain the robotic sensors and vision system 2

MET 414 Quality Management

- CO 1 To be conversant with important terms for quality management in organisations
- CO 2 Have a complete theoretical and practical understanding of the contributions of Quality Gurus
- CO 3 Demonstrate knowledge of the underlying principles of strategic quality management
- CO 4 Identify various human dimensions of TQM
- CO 5 Implement different tools and techniques in TQM
- CO 6 Identify core and extended modules of ISO 9000 family of standards

MET 458 Advanced Energy Engineering

- CO1 Explain the concept of various types of power generation
- CO2 Explain solar and wind power generation and its economics
- CO3 Explain biomass energy sources and its economics
- CO4 Explain various renewable energy sources
- CO5 Explain environmental impacts of various energy generation

MED 416 Project Phase II

- CO1 Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply)
- CO2 Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply)
- CO3 Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply)
- CO4 Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply)
- CO5 Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze)
- CO6 Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply)