

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

S.No	Department	PSO's No	Program Specific Outcomes
UG			
1	Aero	PSO 1	Apply engineering and management knowledge and techniques to estimate time and resources needed to complete Aerospace/Mechanical engineering projects.
		PSO 2	Recognize the challenging and rewarding careers in the field of Aerospace Engineering.
2	CSE	PSO 1	Understand the structure, evolutionary changes and development methodologies of software systems to address modern computing challenges.
		PSO 2	Develop intelligent and autonomous systems to cater societal needs especially in the fields of health care, ecommerce, banking, agriculture, cyber security, and insurance
3	ECE	PSO 1	Proficiency in Specialized software tools and computer programming useful for the analysis/design of Embedded systems and VLSI
		PSO 2	Capability to comprehend the Technological Advancements in Radio frequency (RF), Communication and Digital Signal Processing.
4	EEE	PSO 1	Apply principles of engineering, sciences, mathematics and laboratory skills for designing and developing solutions to problems of applications in the field of Electrical power and Energy systems.
		PSO 2	Engage in independent and lifelong learning in the technological advancements with the usage of modern design tools to analyze and design variety of complex applications in the field of Electrical Engineering.
		PSO3	Communicate effectively with good leadership and managerial skills to work in a team or as team leader for techno commercially viable sustainable development of society, exhibiting core professional ethics.
5	IT	PSO 1	Apply current technical concepts and practices in the core Information Technologies of Cloud Computing, Big data, Mobile Application Development and Internet of Things.
		PSO 2	Use appropriate techniques, modern programming languages, tools for quality software development.
6	Mech	PSO 1	To solve complex mechanical engineering problems which enables students employable in reputed industries or self-

			entrepreneurs
		PSO 2	To develop the new products/systems in collaboration with research & development centers and to continue higher education.
PG			
Program Outcomes			
<p>PO1. An ability to independently carry out research / investigation and development work to solve practical problems.</p> <p>PO2. An ability to write and present a substantial technical report/document.</p> <p>PO3. Students should be able to demonstrate a degree of mastery over the areas per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.</p>			
S.NO	Department	PSO's No	Program Specific Outcomes
1	Aerospace Engineering	PSO1	Applying their domain knowledge Aircraft Structures, Aerodynamics and Propulsion to address global needs in aerospace and allied area
		PSO2	Adopt multidisciplinary approach to develop new ideas/products with the help of modern engineering tools.
2	CSE	PSO1	Ability to apply good breadth of knowledge in modeling and developing software and hardware solutions to real world problems.
		PSO2	Demonstrate the knowledge of acquisition with learning environment and introducing with ethical codes and entrepreneurship for exhibiting good citizenship.
3	Embedded Systems	PSO1	Use the cutting-edge technologies in Embedded system to identify and solve real-world multi-disciplinary engineering problems.
		PSO2	Optimize the performance of Embedded systems by integrating multiple subsystems to independently carry out research and excel in Embedded system industry.
4	Thermal	PSO1	To train students with in-depth and advanced knowledge to become professional in areas of thermal science and related fields capable of identifying, analyzing and solving complex problems.
		PSO2	To enable graduates to carry out innovative and independent research work in academia/industry to develop thermal systems and process and to disseminate the knowledge.
5	MBA	PSO1	To ingrain ethics , sustainability, and inclusive growth in all its activities
		PSO2	To develop managers, leaders and entrepreneurs with vision and Values
		PSO3	To provide diversified corporate exposure in the form of summer training, consultancy and live projects

B. Tech in Aeronautical Engineering
MLR-16

Subject Name with code	CO	CO Statements
I YEAR		
Differential Equations and Applications A2HS01	C01	Identify the different types of differential equations of first order and solve them using appropriate methods.
	C02	Identify different types of higher order differential equations and their applications in engineering problem solving.
	C03	Find the Maxima and Minima of several variable functions.
	C04	Evaluate double integrals by changing variables and changing order of integration.
	C05	Apply Laplace transform to solve differential equations
Applied Physics-1 A2HS06	C01	Remediate the propagation of errors with different methods
	C02	Identify and describe crystal structures and size of the unit cell by diffraction methods
	C03	Classify various magnetic, dielectric materials and use them in designing small components.
	C04	Analyze why laser light is more powerful than normal light and how it is used as a surgical tool
	C05	Evaluate the advantages of imaging techniques.
Engineering Chemistry A2HS09	C01	Student will be able to analyze the functioning of different cells and also suggest corrosion preventive methods.
	C02	Student will be able to design various water treatment systems in order to identify the environmental issues related to domestic water use.
	C03	Student will be able to distinguish between different polymerization reactions mechanisms and also compare the structural properties of bulk materials and nano materials.
	C04	Student will be able to recognize the advantages of non renewable energy sources with respect to applications in different fields from fossil fuels.
	C05	Students will be able to analyze the various states of matter, the concepts of phase equilibrium and calculate degrees of freedom for systems with defined components and phase behavior
Computational Methods & Integral Calculus A2HS02	C01	Solve algebraic and transcendental equations using numerical techniques
	C02	Apply different types of interpolation techniques to find best fit the curves
	C03	Find the solution of ordinary differential equations using numerical techniques
	C04	Verify Vector Integral theorems
	C05	Apply the Random variable and different distributions of probability theory
Computer Programming A2CS01	C01	Develop algorithms for mathematical and scientific problems
	C02	Explore alternate algorithmic approaches to problem solving
	C03	Choose data types and structures to solve mathematical and scientific problem
	C04	Develop modular programs using control structures
	C05	Write programs to solve real world problems using object oriented features
Applied Physics and Engineering Chemistry lab A2HS10	C01	Demonstrate a working knowledge of fundamental physics / Chemistry and basic electrical and/or mechanical engineering principles to include advanced knowledge in one or more engineering disciplines;
	C02	Formulate, conduct, analyze and interpret experiments in engineering physics & chemistry
	C03	Use modern engineering physics / chemistry techniques and tools, including laboratory instrumentation.
	C04	Communicate their ideas effectively, both orally and in writing; and function effectively in multidisciplinary teams.

Computer Programming Using C lab A2CS02	C01	Create compile, and test programs in C language.
	C02	Design programs involving decision structures, loops, arrays and functions
	C03	Analyze and Solve problems using arrays, functions, strings and pointers
	C04	Apply different file operations to create/update basic datafiles
IT and Engineering Workshop A2HS20	C01	Prepare Half lap Joint using Carpentry
	C02	Prepare a parallel and series connections using house wiring
	C03	Develop sheet metal works by tin smithy and black smithy works
	C04	Prepare a Joint by using welding Techniques and make a single piece pattern using foundry
Technical Seminar & Computational Mathematics (FOSS) A2HS18	C01	Identify, understand and discuss current, real-world issues
	C02	Distinguish and integrate differing forms of knowledge and academic disciplinary approaches
	C03	Improve oral and written communication skills
	C04	Explore an appreciation of the self in relation to its larger diverse social and academic contexts and apply principles of ethics and respect in interaction with others
Linear Algebra and Integral Transforms A2HS03	C01	Solve the system of linear equations using rank of the matrices.
	C02	Compute eigen values and eigen vectors of square matrices
	C03	Identify the different types of Partial differential equations and solve them using appropriate methods.
	C04	Find the Fourier series of the periodic functions.
	C05	Determine Fourier transform, and Z -transforms of a function.
Technical English A2HS11	C01	Students will be able to construct sentences by using appropriate parts of speech
	C02	Students will be able to write letters/paragraph/reports etc., For meaningful communication
	C03	students will be able to use appropriate vocabulary in written and spoken
	C04	students will be able to comprehend and analyze different levels
	C05	student will be able to identify and correct common errors in spoken and written forms
Applied Physics-II A2HS07	C01	Conclude the dual nature of material particles and able to explain how moving particles are associated with its energies
	C02	Analyze how the semiconductors are classified and their applications in various domains
	C03	Summarize the principles and fundamentals of optical fibers and their engineering applications
	C04	Explain the production of ultrasonic and analyze engineering applications of ultrasonic and summarize superconducting phenomenon
	C05	Originate the basic idea of quantum computing and explain the applications in secured quantum information
Engineering Mechanics A2ME01	C01	Resolve various force systems and calculate reactions of various supports on rigid bodies in equilibrium
	C02	Analyze the frictional forces of rigid bodies on rough horizontal and inclined planes
	C03	Evaluate geometric properties of composite areas and solids
	C04	Analyze moment of inertia, mass moment of inertia for various sections
	C05	Develop principles of virtual work, applications to simple structures
Data Structures A2CS04	C01	Solve real time problems by using recursive, non recursive technique with respect to time and space complexity.
	C02	Design and implementation of various basic and advanced data structures

	C03	Distinguish between different sorting and searching techniques.
	C04	Illustrate the application of linear stack and queue
	C05	Solve real time problems by using recursive, non recursive technique with respect to time and space complexity.
English Communicant- ion Skills Lab A2HS12	C01	Apply various non linear data structures in solving real world problems
	C02	Listen and comprehend different spoken discourses/excerpts in different accents
	C03	Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies
	C04	Read different genres of texts adopting various reading strategies.
Data Structures Lab A2CS05	C01	Write effective letters. Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary
	C02	Design and analyze the time and space efficiency of the datastructure
	C03	Use the appropriate data structure for givenproblem
	C04	Develop programs using data structures like linked list, stacks, queues and trees
	C05	Analyze and implement various searching techniques suitable to resolve data searching problems
Technical Seminar-I A2HS19	C01	Analyze and discuss current, real-world issues
	C02	Distinguish and integrate differing forms of knowledge and academic disciplinary approaches
	C03	Improve oral and written communication skills
	C04	Explore an appreciation of the self in relation to its larger diverse social and academic contexts and apply principles of ethics and respect in interaction with others
II YEAR		
Introduction to Aerospace Engineering-A2AE01	C01	Compare the atmosphere conditions of different altitudes for spacecraft system
	C02	Analyze how lift, drag and thrust are generated and understand which components constitute them
	C03	Analyze the flight performance parameters with respective stability condition
	C04	Distinguish the different systems used in a satellite mission
	C05	Design lighter than air vehicle using CATIA software
Mechanics of Solids-A2ME08	C01	Apply the concept of stress and strain to analyze and design structural members
	C02	Develop the shear force and bending moment diagrams for different beams subjected to various loads.
	C03	Determine the bending stress and develop the shear stress distribution across various beam sections.
	C04	Determine the principal stresses and deflection of beams.
	C05	Design the circular shafts and analyze the thin cylinders.
Mechanics of Fluids-A2AE02	C01	Determine the fluid properties for different types of fluids
	C02	Evaluate the flow depends upon it's flow property
	C03	Choose the appropriate notch for the realtime applications
	C04	Estimate the type of flow such as laminar and turbulent flows
	C05	Choose the type of flows such as compressible or in compressible to determine the effect of compressibility on flow properties
Thermodynamics-A2ME10	C01	Apply first law of thermodynamics applied to engines
	C02	Evaluate the performance parameters of energy transfers
	C03	Evaluate the properties of gases during phase changes
	C04	Compare the process parameters in mixture of gases
	C05	Differentiate the processes of various power cycles
Aircraft Production	C01	Compare between primary shaping and joining processes

Technology A2AE03	C02	Analyze the working of various material removing techniques by conventional machining processes
	C03	Compare the working of various material removing techniques by unconventional machining processes
	C04	Analyze the various heat treatment technique used in aerospace industries
	C05	Determine the methods used to identify the manufacturing defects
Aircraft Production Technology Lab-I A2AE04	C01	Prepare various types of patterns used in sand casting
	C02	Preparation of sand mould by using various patterns
	C03	Manufacturing of a products by using various die casting methods
	C04	Manufacturing of a products by using various joining techniques
	C05	Analyze micro structure of ferrous and nonferrous material
Strength of Materials and Fluid Mechanics Lab A2AE05	C01	Determine the coefficient of discharge and coefficient of contraction for loss of head in a sudden contraction, orifice, Venturimeter, small orifice, external mouthpiece by variable head method.
	C02	Determine coefficient of discharge for flow through different notches
	C03	Justify the Bernoulli equation by calculating the total head and also calculate the impact force on different types of vanes
	C04	Calculate the performance test on Pelton wheel, Francis turbine., Kaplan turbine
	C05	Calculate the performance test on single stage centrifugal pump., multi stage centrifugal pump, performance test on reciprocating pump
CAD Lab-A2AE06	C01	Understand the importance of drawing and design process and phases involved in the design process.
	C02	Ability to draw various individual components, sub-assemblies and main assemblies in drawing lab
	C03	Ability to draw various orthographics and isometric projections in drawing sheets
	C04	Ability to develop and understand Basic Concepts of aircraft
	C05	Ability to draw various orthographics and isometric projections of an aircraft components by using auto-cad software.
Environmental Studies- A2HS16	C01	To classify ecosystem and construct various ecological pyramids.
	C02	To distinguish between resources of renewable and non renewable origin and justify the need for conservation of natural resources
	C03	To facilitate students in identifying the various families of biodiversity.
	C04	Classify pollution and also to identify various natural and anthropogenic sources of pollution.
	C05	To support eco-friendly projects and recommend environmental protection measures.
Electrical & Electronics Engineering-A2EC02	C01	Define basic electrical concepts, including electric charge, current, electrical potential, electrical Power and energy
	C02	Distinguish the relationship of voltage and current in resistors, capacitors, inductors, and mutual Inductors.
	C03	Differentiate circuits with ideal, independent, and controlled voltage and current sources and able to apply Kirchhoff's voltage and current laws to the analysis of electric circuits.
	C04	. Illustrate to apply concepts of electric network topology, nodes, branches, and loops to solve circuit problems, including the use of computer simulation.
	C05	Emphasize on basic laws and techniques to develop a working knowledge of the methods of analysis used.
Aerodynamics-I A2AE07	C01	Determine the flow similarities over different bodies like airfoil, cylinder and sphere
	C02	Explain the elementary flows with respective compressible and irrational flows.
	C03	Determine classical thin airfoil theory for symmetric and cambered airfoil section

		in an incompressible flow condition
	C04	Compare the flow over a arbitrary bodies over cylinder and sphere with respect to non-lifting and lifting flows
	C05	Explain the flow visualization techniques over an symmetrical and cambered airfoil by using piv and hot wire anemometers
Space Technology A2AE08	C01	Categorize space missions
	C02	Compare the working of solid and liquid propellant rockets
	C03	Identify suitable trajectory for the reentry vehicle
	C04	Analyze the transfer method of a spacecraft from one orbit to another
	C05	Apply various mechanisms for attitude control of satellite and space crafts
Aerospace Vehicle Structures-I A2AE09	C01	Develop the mathematical model for a physical structure subjected to external loads applied on it.
	C02	Calculate the degree of redundancy for statically determinate and indeterminate beam structure
	C03	Determine the curved deflection due to forces and moments on an aircraft fuselage structure
	C04	Illustrate the stresses and strains in members subjected to combined loading and apply the theories of failure for static loading
	C05	Estimate the buckling load equations for different boundary conditions of the columns
	C06	Analyze the shear flow distribution in an aircraft structures like wings & fuselage
Flight Mechanics-I A2AE10	C01	Compare and contrast between the performance parameters for civil transport and military aircrafts
	C02	Calculate the range and endurance of a fixedwing aircraft with either a jet or a propellerdriven propulsion system in straight and level flight and analyze the various types of cruise techniques
	C03	Evaluate the performance of an aircraft during its climb and descend
	C04	Evaluate the factors effecting the takeoff and landing performance of the aircraft
	C05	Apply flight mechanics analytical concepts and aircraft performance data to the preliminary design of a new aircraft to meet defined performance requirements
Electrical & Electronics Engineering. Lab- A2EC04	C01	Analyze basic concepts to electric circuits.
	C02	Apply electrical fundamentals to real time applications
	C03	Apply electronics components to electronics circuits.
	C04	Create circuits containing basic electrical elements.
	C05	Apply electrical and electronics engineering concepts to real time applications
Aerodynamics -LabA2AE11	C01	Evaluate the pressure distribution over different aerodynamic shapes
	C02	Apply the flow visualization techniques over different aerodynamic bodies
	C03	Determine the efficiency of axial and centrifugal compressor
	C04	Determine the efficiency of blower
	C05	Predict the aerodynamic forces
Air Craft Production Technology -II -LabA2AE12	C01	Operate conventional machines to remove material with single point cutting tools like lathe, shaping, planning and slotting.
	C02	Operate conventional machines to remove material with multi point cutting tools like milling, drilling, etc
	C03	Perform surface finishing using surface grinding machines
	C04	Develop codes for producing required part using CNC lathe and CNC milling
	C05	Create a riveted joint as per design specification
Gender Sensitization-A2HS17	C01	Develop a better understanding of important issues related to gender in contemporary India.
	C02	Sensitized to basic dimensions of the biological, sociological, psychological and

		legal aspects of gender
	C03	Attain a finer grasp of how gender discrimination works in our society and how to counter it
	C04	Men and Women students and professionals will be better equipped to work and live together as equals.
	C05	Develop a sense of appreciation of women in all walks of life.
III YEAR		
Aerospace Propulsion – I- A2AE13	C01	Analyze principles of various engines and thermodynamic cycles
	C02	Analyze the characteristics and performance of various types of jet engines.
	C03	Examine the various types of inlets and principle of axial flow compressors
	C04	Evaluate the performance of combustion chamber
	C05	Analyze the characteristics of turbine and nozzles
Aerodynamics- II-A2AE14	C01	Formulate governing equations for the given flow conditions based on governing law
	C02	Evaluate the flow inside the nozzle
	C03	Evaluate the aerodynamics characteristics of bodies in supersonic flows such as oblique shocks and expansion waves
	C04	Analyse the aerodynamics characteristics of bodies in hypersonic flows
	C05	Compare the experimental and computation methods in solving the flow problems
Flight mechanics – II-A2AE15	C01	Calculate airplane performance for steady and accelerated flights
	C02	Analysis the aircraft trim analysis. importance of the neutral point, maneuver point etc.
	C03	Distinguish between stick fixed and stick free stability conditions
	C04	Illustrate how an aircraft can maintain static and dynamic stability
	C05	Assess if a particular aircraft configuration is statically stable, and suggest design changes needed to affect the static stability of an aircraft
Aerospace Vehicle Structures- II-A2AE16	C01	Illustrate the tension field and axial flow diagrams
	C02	Explain the failure stresses in plates and stiffened panels.
	C03	Demonstrate a shear loaded thin walled beams general stress, strain and displacement relationships direct stress and shear flow system shear centre, twist and warping
	C04	Distinguish between buckling of thin plates and deflections due to bending
	C05	Develop wing spars and box beams tapered wing spar, open and closed section beam
Open Elective -I Fabrication Processes-A2AE17	C01	Exemplify the major metal casting processes used in aircraft industry.
	C02	Exemplify the major metal joining processes used in aircraft industry
	C03	Exemplify hot & cold working of metals including high energy rate forming.
	C04	Exemplify the major surface finishing processes used in aircraft industry.
	C05	Exemplify the major sheet metal forming processes used in aircraft industry.
Open Elective -I Fundamentals of Avionics-A2AE18	C01	To explain the instrumentation used in avionics.
	C02	To classify various ranges of the communication techniques used in aircraft.
	C03	To distinguish between network systems, controlling parts & surfaces
	C04	To compare various principles of navigation systems
	C05	To build phenomena of auto pilot control system
Open Elective -I Introduction to Jets And Rockets-A2AE19	C01	Explain the complexity in working of various engines
	C02	Interpret the elementary principles of thermodynamic cycles as applied to propulsion analysis
	C03	Analyze the process involved in individual components
	C04	Compare the nozzles with various operating conditions.

	C05	Determine Equations of motion in free space, Tsiokovsky_s equation.
Aircraft Interior design Lab- A2AE20	C01	Understand the importance of drawing and design process and phases involved in the design process.
	C02	Develop various individual components, subassemblies and main assemblies in drawing lab
	C03	Evaluate various orthographic and isometric projections in drawing sheets.
	C04	Develop and understand basic concepts of aircraft
	C05	Design various orthographic and isometric projections of aircraft components by using autocad software.
Propulsion Lab and Flight Simulation Lab-A2AE21	C01	Analyze the port timing and valve timing diagram, working principle, components and their functions of 2-s and 4-s piston engine
	C02	Analyze the working principle, components and their functions of jet engines
	C03	Determine the various efficiencies of 2-stroke and 4-stroke piston engine
	C04	Analyze the heat balance sheet for diesel engine
	C05	Calculate the dynamic and static engine balancing and analyze the calorific value of various fuels
Aerospace Vehicle Structures Lab-A2AE22	C01	Classify types of shear loads acting on beam
	C02	Estimate crippling load acting on column
	C03	Determine surface flaws using NDT techniques
	C04	Analyze the various strain pressure using thin walled pressure vessel
	C05	Determine the failures on riveted plates using UTM
Technical SeminarII(Micro Project/EPICS/Certification)/ Mooc's-A2AE23	C01	Analyze the difference between gestures and body language
	C02	Evaluate the public speaking skills
	C03	Differentiate between communication skills and presentation skill
Flight Vehicle Design-A2AE24	C01	Define the design process and compare the designing process involved in the design of different aircraft's
	C02	To distinguish the different types of aerodynamic geometries and determine the initial sizing weight estimations for fixed engine and rubber engine.
	C03	To apply the basic concepts of propulsion systems, fuel systems and landing gear system to determine the lift curve slope; maximum lift coefficient and complete drag build up.
	C04	To analyze the integrated product development, cost estimation, parametric analysis, optimization, refined sizing and principles of baseline design such as stability & control, performance and constraint analysis
	C05	To design an DC - 1, DC - 2, DC 3 aircraft airfoil geometry by using different design techniques like lofting, conic lofting, flat warp lofting
Aerospace Propulsion - II- A2AE25	C01	Analyze the basic concepts about planets and orbits
	C02	Determine rocket launching principle and concept of nozzles
	C03	Determine the selection criterion of various propellants.
	C04	Examine the configuration of propellants and thrust chamber performance.
	C05	Analyze the combustion instability in rockets and principles of electrical rockets.
Heat Transfer-A10332	C01	Distinguish modes of heat transfer, categorize the heat transfer problems
	C02	Perform the LMTD & NTU analysis to the heat exchanger problems, to analyze and design the boiling heat transfer problems
	C03	Design the one dimensional transient heat conduction system
	C04	Estimate the rate of heat transfer heat transfer coefficients for forced and free convection heat transfer
	C05	Derive the equation for temperature distribution in fins, to estimate the rate of heat transfer through conduction through slabs, cylindrical and spherical surface objects
OPEN ELECTIVE -II	C01	Understand the working process of a electrical systems.

Introduction to Aircraft Industry-A2AE27	C02	Demonstrate on direct energy conversion and their principles.
	C03	Understand the working process of mechanical systems.
OPEN ELECTIVE-II Non destructive Testing Methods-A2AE28	C01	Recognize various non-destructive techniques for engineering industries
	C02	Select appropriate non-destructive technique for defects detection in manufactured/operating parts.
	C03	Perform inspection using major non-destructive testing methods.
	C04	Understand the importance and application of NDT in Aerospace structural analysis.
OPEN ELECTIVE-II Fundamentals of Finite Element Methods-A2AE29	C01	Develop elastic equations, formulate and solve the axially loaded bar structures using FEM.
	C02	Apply finite element method to truss and beam analysis.
	C03	Implement finite element method to solve two dimensional problems and apply numerical integration to one and two dimensional problems.
	C04	Solve and analyze heat transfer problems using FEM.
	C05	Apply FEM to dynamic analysis of one dimensional bars and beams.
PROFESSIONAL ELECTIVE – I-Mechanisms and Machine Design-A12130	C01	Analyze the forces and motion of complex mechanisms
	C02	Analyze the mechanism for velocity and acceleration
	C03	Evaluate the gyroscopic effect of engine on various vehicles
	C04	Analyze the motion and design a cam based on required motion of follower
	C05	Evaluate and design a machine or a machine element such as gears, couplings etc. for the required constraints
PROFESSIONAL ELECTIVE – I- Space Mechanics-	C01	Should get the basic idea of reference frames and coordinate systems
	C02	Should know to solve General n-body problems
	C03	Should know to solve General 2-body problems
	C04	Ballistic missile trajectories
	C05	Planning of space missions
	C06	Planning of the simulation experiments
	C07	Low thrust and radial thrust acceleration
	C08	Have knowledge on special and general perturbations
PROFESSIONAL ELECTIVE – I- Helicopter Engineering)-A2AE31	C01	Distinguish the working characteristics of rotors and flight controllers for flights.
	C02	Evaluating the blade element theory and profile induced power estimation.
	C03	Analyze the stability and coefficient of performance of forward flight
	C04	Calculate the power requirement for jet machines and drag of hovercraft on land and water.
	C05	Determine the performance analysis of VTOL and STOL aircraft.
P E(Finite Element Method)- A2AE33	C01	Develop elastic equations, formulate and solve the axially loaded bar structures using FEM.
	C02	Apply finite element method to truss and beam analysis.
	C03	Implement finite element method to solve two dimensional problems and apply numerical integration to one and two dimensional problems.
	C04	Apply FEM to dynamic analysis of one dimensional bars and beams.
	C05	Solve and analyze heat transfer problems using FEM.
P E(Fatigue and Fracture Mechanics)-A2AE32	C01	Predict material failure for the combination of applied stress
	C02	Identify and exemplify the basic fatigue mechanisms and apply that knowledge to failure analysis
	C03	Predict lifetimes for fatigue and environmentally assisted cracking
	C04	Apply stress analysis to calculate the crack driving force in linear and nonlinear materials and formulate appropriate fracture criteria for stationary and growing cracks
	C05	Evaluate well defined fracture mechanics problems for both linear and nonlinear

		materials subjected to both monotonic and cyclic loading
Advanced English Communication Skills Lab- A2HS13	C01	Better perception of nuances of English language through audio visual experience.
	C02	Neutralization of accent for intelligibility.
	C03	Participate in group activities.
	C04	Speaking skills with clarity and confidence which in turn enhances their employability
Flight Vehicle Design Lab- A2AE34	C01	Distinguish and understand the design phases of an aircraft
	C02	Analyze and estimate of different types of aircraft
	C03	Develop layout sketch of different aircraft
	C04	Calculate total takeoff weight and other sub categories of weights for an aircraft
	C05	Evaluate the sensitivity analysis of design parameters
	C06	Estimate sizing of an aircraft
	C07	Calculate performance characteristics of an aircraft
Heat Transfer Lab-A2ME41	C01	To define the various modes of heat transfer with basics laws and application of conduction heat transfer correlations in engineering field.
	C02	To distinguish the modes of heat transfer conduction, convection, radiation, heat exchangers, different condensations.
	C03	To calculate the rate of heat transfer ,properties of modes of heat transfer, lmtd,ntu values
	C04	To analyze the concepts of lmtd,ntu,different regimes in boiling curve,different types of condensation,free convection and forced convection
	C05	To justify the when we use forced or free convection in different condition to justify the when we use lmtd and ntu in heat exchangers
Comprehensive Viva-I- A2AE35	C01	Solve competitive exam questions.
	C02	Adapt interview facing skills
	C03	Make use of technical skills to solve aeronautical problems
IV YEAR		
Aero Materials -A2AE36	C01	identify and explain the types of composite materials and their characteristic features
	C02	understand the differences in the strengthening mechanism of composite and its corresponding effect on performance and application;
	C03	understand and explain the methods employed in composite fabrication;
	C04	learn simple micromechanics and failure modes of composites.
Computational Fluid Dynamics-A2AE37	C01	Describe the major theories, approaches and methodologies used in CFD
	C02	Apply CFD methods (e.g. boundary conditions, turbulence modeling etc.) in commercial cfd codes and describe the limitations on accuracy
	C03	Apply CFD analysis to real engineering designs
	C04	Use finite difference and finite volume methods in CFD modeling
	C05	Generate and optimize the numerical mesh
Mechanical Vibrations and structural Dynamics-A2AE38	C01	Analyze the problem and estimate the governing equation of motion
	C02	apply linear mathematical models of reallife engineering systems
	C03	Determine vibratory responses of single degree of freedom and multidegree of freedom systems to the harmonic, periodic and nonperiodic excitation
	C04	Develop the mathematical model of dynamic systems with a single degree of freedom,
	C05	Develop mathematical model of dynamic systems with multiple degrees of freedom
OPEN ELECTIVE-III-Guidance and Control of Aerospace	C01	Understand and apply the knowledge of non conventional energy sources asses the criteria of non conventional energy sources
	C02	Analyze the working of solar energy collector and solar energy storage systems.

Vehicles-A2AE39		apply the concept of solar system, its radiation, and measurement
	C03	Apply and analyze the principles of energy conversion from wind and differentiate, evaluate the importance of wind mills
	C04	Understand, classify geothermal sources, biomass renewable energy sources. analyze and evaluate the methods of harnessing the geothermal resources
	C05	Understand, differentiate between wave, tidal and otec energy and design otec.
Open Elective-III Wind tunnel Techniques-A2AE40	C01	Ability to understand basics of aerodynamics and to identify the type of wind tunne
	C02	Ability to develop and understand flow visualization techniques over model
	C03	Ability to understand concepts of low speed and high speed wind tunnels
	C04	Ability to understand measurement and balancing of loads on model
	C05	Ability to understand the different types of equipment's for measuring pressure and velocity
Open Elective-III Introduction to Aerospace Technology-A2AE41	C01	Ability to describe the air vehicles used in the history
	C02	Ability to explain the commercial use of space
	C03	Ability to explain the Elements of airplane performance
	C04	Ability to understand the Standard atmosphere
	C05	Ability to explain the requirements of a satellite
	C06	Ability to determine the sub systems of a satellite
	C07	Ability to explain the missions sent to explore space
Professional Electives) Airport management-A2AE45	C01	Analyze the various rules, ownership structures, components & facilities located on airfields at airports
	C02	Analyze various enhancements in air traffic control, airport terminal and ground access
	C03	Analyze the methods involved in airport security and ARFF and safety inspection programs
	C04	Compare the revenue strategies and pricing of airport facilities & services for airport financial management
	C05	Analyze the airport capacity and delay
PE-II(Mechanisms and Machine Design)-A2AE42	C01	Analyze the forces and motion of complex mechanisms
	C02	Analyze the mechanism for velocity and acceleration
	C03	Evaluate the gyroscopic effect of engine on various vehicles
	C04	Evaluate and design a machine or a machine element such as gears, couplings etc. for the required constraints
	C05	Analyze the motion and design a cam based on required motion of follower
PROFESSIONAL ELECTIVE – II- Operations Research- A2AE44	C01	Understand the different linear programming problem techniques which have a broad experience in finding the optimum profit.
	C02	Illustrate the need of dynamic programming and apply the knowledge of the course in solving industrial problems.
	C03	Analyze and synthesize the best suitable mathematical model depending upon the problem for solving managerial problems in industry.
	C04	Categorize the characteristics of game theory and determine the optimal strategies.
	C05	Reconstruct towards the modelling and evaluation of solutions for the dynamic problems.
PROFESSIONAL ELECTIVE – II- Product Life Cycle Management)-A2ME40	C01	List, justify and interpret productivity models in Manufacturing and service organization.
	C02	Judge product development and industrial process design.
	C03	Predict facility location and network models.
	C04	Interpret and solve data from aggregate output planning models.

	C05	Select and analyze an inventory control model based upon given data.
Computational Structural Analysis Lab-A2AE46	C01	Understand the basic features of ANSYS software tools.
	C02	Analyze the torsion and shear stress for a section beams
	C03	Analyze and design the various models in ANSYS.
	C04	Analyze and design of fuselage and wing box
	C05	Understand the different types design methodologies in CATIA
Computational Fluid Dynamics Lab-A2AE47	C01	Understanding modeling of geometries in computational tools
	C02	analyze internal and external flow using various geometries
	C03	Develop a code for solution for the onedimensional wave equation using explicit method of lax
	C04	Generation of the algebraic grids and elliptic grids using MATLAB using ANSYS FLUENT
	C05	Evaluate supersonic flow over axisymmetric bodies
Aero Materials Lab-A2 AE48	C01	Able to prepare composite materials.
	C02	Able to identify mechanical properties of composites.
	C03	Able to analyze surface and internal defects of composite materials.
	C04	Able to prepare polymer, metal matrix and ceramic matrix based composites.
	C05	Able to perform metallographic study of polymer, metal matrix and ceramic matrix based composites.
Industrial orientated Mini Project-A2AE49	C01	Demonstrate a sound technical knowledge of their selected mini project topic.
	C02	Undertake problem identification, formulation and solution
	C03	Design engineering solutions to complex problems utilizing a systems approach
	C04	Conduct an experiments in the engineering mini project and analysis the data results
	C05	Communicate with engineers and the community at large in written an oral forms..
	C06	Demonstrate the knowledge, skills and attitudes of a professional engineer.
Management Science-A2HS15	C01	To relate the concepts of management, administration and organization and different theories of management
	C02	To plan operations & marketing management
	C03	To extend market and business structures
	C04	To examine network of a project with time management.
	C05	To support on strategic alternatives.
PROFESSIONAL ELECTIVE – III-A2AE49 Rockets and Missiles	C01	Interpret new technology for staging of rockets and missiles.
	C02	Develop methods for altitude control.
	C03	Identify material for nozzle of rockets and missiles.
	C04	Analyse the missile guidance system.
	C05	Determine 2-D motion rocket equation
PROFESSIONAL ELECTIVE – III-A2AE50 Propellant Technology	C01	Exemplify the testing procedure of liquid fuels used in aviation sector.
	C02	Classify the major types of solid propellant and their major parameters governing it.
	C03	Comprehend and illustrate the basic challengesinvolved in the usage and storage of cryogenic propellants.
	C04	Understand and examine major types of liquid propellants used in chemical rocket.
	C05	Relate the significance of propellant testing and their associated parameters
PROFESSIONAL ELECTIVE – III-A2AE51 Aero Elasticity	C01	Identify the aeroelastic phenomena flutter, divergence and aileron reversal arise and how they affect aircraft performance,coller triangle
	C02	Demonstrate a basic understanding of modern numerical methods and the state-of-the-art in structural dynamics and aeroelasticity.

	C03	Differentiate between static aeroelasticity and dynamic aeroelasticity
	C04	Develop equation of motion for linear motion and rotary motion
	C05	Analyze the wing flutter, under the over damping and critical damping conditions
PROFESSIONAL ELECTIVE – III-A2AE52 Advanced Computational Fluid Dynamics	C01	Develop an understanding of numerical methods involved in computational fluid dynamics
	C02	Apply method of characteristics for solving various problems of CFD.
	C03	Determine time dependent methods to solve computational fluid problems.
	C04	4Apply time dependent methods to solve Boundary Layer Problems
	C05	Solve numerical methods involving transonic flows
PROFESSIONAL ELECTIVE – III-A2AE53 Experimental Stress Analysis	C01	Understand the basic concepts of experimental stress analysis
	C02	Demonstrate the principles of major types of extensometers
	C03	Apply the knowledge of Strain gauges in aeronautical domain
	C04	Understand the principles of Rosette analysis and fringe techniques
	C05	Understand NDT techniques used in the structural analysis
PROFESSIONAL ELECTIVE – III-A2AE54 Turbo Machines	C01	Explain the working principles of turbo machines and apply it to various types of machines
	C02	Determine the performance parameters in turbo machinery stages operating at design and offdesign conditions
	C03	Exemplify the importance of gas dynamics in turbo machinery
	C04	Explain the working principle of turbines, compressor and nozzles and know their application range
	C05	Perform the preliminary design of turbo machines (pumps, compressors, turbines) on a 1-D basis
PROFESSIONAL ELECTIVE – III-A2AE55 Avionics and Flight control Systems	C01	Compare and contrast avionics systems between the civil and military aircrafts
	C02	Illustrate the various types of navigation systems used in aircraft
	C03	Develop the transfer function of the feedback control systems
	C04	The modern era of flight control system
	C05	Analyze the time response and stability criteria for an aircraft
PROFESSIONAL ELECTIVE – IV-A2AE56 CAD/CAM	C01	Explain the working principles of turbo machines and apply it to various types of machines
	C02	Determine the performance parameters in turbo machinery stages operating at design and offdesign conditions
	C03	Exemplify the importance of gas dynamics in turbo machinery
	C04	Explain the working principle of turbines, compressor and nozzles and know their application range
Comprehensive Viva-II-A2AE57	C01	Solve competitive exam questions.
	C02	Adapt interview facing skills
	C03	Make use of technical skills to solve aeronautical problems
Project Work (Stage – II)- A2AE58	C01	Demonstrate a sound technical knowledge of their selected mini project topic.
	C02	Undertake problem identification, formulation and solution
	C03	Design engineering solutions to complex problems utilizing a systems approach
	C04	Conduct an experiments in the engineering mini project and analysis the data results
	C05	Communicate with engineers and the community at large in written an oral forms.
	C06	Demonstrate the knowledge, skills and attitudes of a professional engineer.
Seminar-A2AE59	C01	Analyze the difference between gestures and body language
	C02	Evaluate the public speaking skills
	C03	Differentiate between communication skills and presentation skill

Course Name & Code	COs	Course Outcomes
DIFFERENTIAL EQUATIONS AND APPLICATIONS A2HS01	C01	Specify standard methods for solving differential equations and their applications in geometrical and physical problems.
	C02	Identify different types of higher order differential equations and their applications in engineering problem solving.
	C03	Apply partial derivatives to study maxima and minima of functions of two variables
	C04	Apply partial differential equations to solve the linear and nonlinear partial differential equations.
	C05	Have a fundamental understanding of Fourier series and able to give Fourier expansions of a given function.
	C06	Participate and succeed in competitive examinations like GATE, GRE.
APPLIED PHYSICS - I A2HS06	C01	Justify the propagation of errors with different methods.
	C02	Identify and describe crystal structures and size of the unit cell by diffraction methods.
	C03	Classify various magnetic, dielectric materials and apply knowledge gained in various fields.
	C04	Analyze why Laser light is more powerful than normal light and how it is used as a surgical tool.
	C05	Evaluate the advantages of imaging techniques.
ENGINEERING CHEMISTRY A2HS09	C01	Analyze the functioning of different cells and also suggest corrosion preventive methods. electrode including corrosion of metals.
	C02	Design various water treatment systems in order to identify the environmental issues related to domestic water use.
	C03	Distinguish between different polymerization reactions mechanisms and also compare the structural properties of bulk materials and nano materials.
	C04	Recognize the advantages of non renewable energy sources with respect to applications in different fields from fossil fuels.
	C05	Analyze the various states of matter, the concepts of phase equilibria and calculate degrees of freedom for systems with defined components and phase behavior
COMPUTATIONAL METHODS AND INTEGRAL CALCULUS A2HS02	C01	Classify discrete and continuous distribution functions.
	C02	Determine numerical solution of Non Linear equations.
	C03	Discuss the Stability of a system of equations.
	C04	Demonstrate the use of curve fitting in correlation and regression analysis.
	C05	Explain numerical differentiation and integration.
	C06	Examine numerical interpolation and approximation of functions.
	C07	Interpret errors in Numerical Methods.
	C08	Evaluate double integrals by changing variables, changing order and triple integration to find the area and volume of given region.
	C09	Apply Beta and Gamma functions to evaluate improper integrals.
	C010	Apply Green's theorem to evaluate line integrals along simple closed contours on the plane, Stoke's theorem to give physical interpretation of the curl of a vector field and Divergence theorem to give physical interpretation of the divergence of a vector field.
COMPUTER PROGRAMMING A2CS01	C01	Explore computer system functionality and develop algorithms for scientific problems.

	C02	Test and execute the programs using control structures.
	C03	Decompose; synthesize a problem using functions and use arrays to solve complex problems.
	C04	Design programs involving pointers and strings.
	C05	Create and perform various operations on structures and files
COMPUTER PROGRAMMING USING C LAB A2CS02	C01	Create compile, and test programs in C language.
	C02	Design programs involving decision structures, loops, arrays and functions.
	C03	Analyze and Solve problems using arrays, functions, strings and pointers.
	C04	Apply different file operations to create/update basic data files.
	C05	Solve complex problems using structures and unions
APPLIED PHYSICS LAB A2HS08	C01	Identify elastic materials and modulus by its properties
	C02	Select LED or SOLAR CELL for variety of applications
	C03	Analyze energy gap of semiconductor, Resonance of LCR and Time Constant of RC circuits
	C04	Analyze the wavelength of laser source using diffraction grating
	C05	Evaluate the magnetic field along the axis of a current carrying coil by using Stewart&Gee's apparatus and Speed of light in glass
	C06	Compare the interference phenomenon by using Newton's ring apparatus
	C07	Analyze how Haidinger fringes are used to measure thickness of given thin film
IT AND ENGINEERING WORKSHOP A2HS20	C01	Describe various components and peripherals of computer and perform Assembly and Disassembly of a computer
	C02	Create documents and spread sheets using MS Word, MS Power Point and MS Excel
	C03	Evaluate various browsers based on their performance and security parameters.
	C04	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
	C05	Apply suitable tools for machining processes including turning, facing, thread cutting and tapping
TECHNICAL SEMINAR AND COMPUTATIONAL MATHEMATICS (FOSS) A2HS18	C01	Identify, understand and discuss current, real-world issues.
	C02	Distinguish and integrate differing forms of knowledge and academic disciplinary approaches.
	C03	Improve oral and written communication skills.
	C04	Explore an appreciation of the self in relation to its larger diverse social and academic contexts
	C05	Apply principles of ethics and respect in interaction with others.
COMPUTATIONAL MATHEMATICS (FOSS)	C01	Identify, understand and discuss current, real-world issues
	C02	Distinguish and integrate differing forms of knowledge and academic disciplinary approaches
	C03	Improve oral and written communication skills
	C04	Explore an appreciation of the self in relation to its larger diverse social and academic contexts

	C05	Apply principles of ethics and respect in interaction with others
LINEAR ALGEBRA AND INTEGRAL TRANSFORMS A2HS03	C01	Use elementary transformations to reduce matrices to echelon form, normal form and hence find their rank.
	C02	Make use of echelon forms in finding the solution of system of linear equations
	C03	Compute eigen values and eigen vectors of square matrices. Reduce the quadratic form to canonical form
	C04	Apply Laplace transform to solve differential equations which will be converted To algebraic equation.
	C05	Determine Fourier transform, Fourier sine and cosine transform of a function
		Apply partial differential equations to solve engineering problems
TECHNICAL ENGLISH A2HS11	C01	Construct sentences by using appropriate parts of speech
	C02	Write letters/paragraph/reports ect,. For meaningful communication
	C03	Use appropriate vocabulary in written and spoken
	C04	Build creativity for career planning and entrepreneurship
	C05	Identify and correct common errors in spoken and written forms
BASIC ELECTRICAL ENGINEERING A2EC03	C01	To distinguish the relationship of voltage and current in resistors, capacitors, inductors, and mutual Inductors.
	C02	To differentiate circuits with ideal, independent, and controlled voltage and current sources and able to apply Kirchoff's voltage and current laws to the analysis of electric circuits.
	C03	To apply concepts of electric network topology, nodes, branches, and loops to solve circuit problems, including the use of computer simulation.
	C04	To use basic laws and techniques to develop a working knowledge of the methods of analysis used.
	C05	To Interpret solve series and parallel magnetic circuits.
APPLIED PHYSICS - II A2HS07	C01	Prove that energies of electron is quantized when particle is moving in a potential box
	C02	Analyze the type of semiconductors and construction of LCD with different material.
	C03	Justifying the optical fiber is more advantage than cables and optical fiber in sensor application.
	C04	Analyze the engineering applications of ultrasonics.
	C05	Analyze the impossibility of faster than light transfer of information
DATA STRUCTURES A2CS04	C01	Solve real time problems by using recursive, non recursive technique with respect to time and space complexity.
	C02	Design and implementation of various basic and advanced data structures
	C03	Distinguish between different sorting and searching techniques.
	C04	Illustrate the application of linear stack and queue
	C05	Apply various non linear data structures in solving real world problems
ENGLISH COMMUNICATION SKILLS LAB A2HS12	C01	Listen and comprehend different spoken discourses/excerpts in different accents
	C02	Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies
	C03	Read different genres of texts adopting various reading strategies.

	C04	Write effective letters. Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary
DATA STRUCTURES LAB A2CS05	C01	Design and analyze the time and space efficiency of the data structure
	C02	Use the appropriate data structure for given problem
	C03	Develop programs using data structures like linked list, stacks, queues and trees.
	C04	Analyze and implement various searching techniques suitable to resolve data searching problems
	C05	Apply non linear data structures for solving complex problems
ENGINEERING DRAWING A2ME05	C01	Sketch the conic sections, special curves, and draw orthographic views from pictorial views and models.
	C02	Apply the principles of orthographic projections of points in all quadrants, lines and planes in first quadrant.
	C03	Sketch the projections of simple solids like prisms, pyramids, cylinder and cone and obtain the traces of plane figures
	C04	Practice the sectional views of solids like cube, prisms, pyramids, cylinders & cones and extend its lateral surfaces
	C05	Sketch the perspective projection of simple solids, truncated prisms, pyramids, cone and cylinders and sketch the isometric projection of simple machine parts.
TECHNICAL SEMINAR-I (MICRO PROJECT/EPICS/CERTIFICATION) A2HS19	C01	Identify, understand and discuss current, real-world issues
	C02	Distinguish and integrate differing forms of knowledge and academic disciplinary approaches
	C03	Improve oral and written communication skills.
	C04	Explore an appreciation of the self in relation to its larger diverse social and academic contexts.
	C05	Apply principles of ethics and respect in interaction with others
COMPUTER ARCHITECTURE AND ORGANIZATION A2CS06	C01	Demonstrate various components of computer and their interconnection
	C02	Analyze the design of the CPU: the ALU and control unit
	C03	Compare and select various Memory devices as per requirement
	C04	Infer Parallel processing approach in real time applications
	C05	Compare various types of IO mapping techniques
	C06	Critique the performance issues of cache memory and virtual memory
DIGITAL LOGIC DESIGN A2EC19	C01	Use number systems and complements
	C02	Identify the importance of SOP and POS canonical forms in the minimization or other optimization of Boolean formulas in general and digital circuits.
	C03	Minimize functions using any type of minimizing algorithms (Boolean algebra, Karnaugh map or Tabulation method).
	C04	Analyze the design procedures of Combinational and Sequential circuits.
	C05	Design the finite state machine using algorithmic state machine charts and perform simple projects with a few flip-flops.
ELECTRONIC DEVICES A2EC70	C01	Identify, formulate & solve Engineering problems by making use of modern software/hardware tools.
	C02	Analyze behavior of electronic devices.
	C03	Design and analyze various rectifiers, filter circuits.
	C04	Design an amplifier circuit with proper biasing techniques (BJT and FET)
	C05	Analyze Field effect transistor (FET) and mosfet characteristics.
DISCRETE MATHEMATICAL STRUCTURES A2CS07	C01	Examine the validity of argument by using propositional and predicate calculus.
	C02	Analyze the basic concepts of relations, functions, sets, relations and

		digraphs to solve applied problems.
	C03	Apply basic counting techniques to solve the combinatorial problems.
	C04	Apply different recurrence relation solving methods to solve real time applications.
	C05	Use the basic concepts of graph theory and some related theoretical problems.
OBJECT ORIENTED PROGRAMMING USING C++ A2CS08	C01	Use different paradigms in solving the problems and explain the importance of object oriented over procedure oriented programming.
	C02	Solve various computing problems by applying object oriented features.
	C03	Apply the concept of pointers and streams in design and development of programs.
	C04	Compare OOP and POP with respect to ease of programming, data access, error handling, and reusability.
	C05	Design data base applications using Files.
PROBABILITY & STATISTICS A2HS05	C01	Identify distribution in certain realistic situation. Also able to differentiate among many random variable involved in the probability models.
	C02	Calculate the moment generating functions of three distributions and sample mean and sample variance.
	C03	Calculate mean and proportions (small and large sample) and to make important decisions from few samples which are taken out of unmanageably huge populations .It is mainly useful for non-circuit branches of engineering.
	C04	Test the hypothesis (small and large sample) and to make important decisions.
	C05	Find the expected queue length, the ideal time, the traffic intensity and the waiting time. These are very useful tools in many engineering and data management problems in the industry. It is useful for all branches of engineering.
ELECTRONIC DEVICES AND DIGITAL CIRCUITS LAB A2EC71	C01	Identify and use various electronic components, test and measuring instruments that are frequently used in experimentation of various circuits.
	C02	Interpret the V - I characteristics of various electronic devices so as to realize the applications like switching, regulation and amplification.
	C03	Design a simple regulated power supply by making use of rectifiers, filters and regulators.
	C04	Apply various biasing techniques to fix the operating point and stabilize the given transistor.
	C05	Analyze the transient and frequency response of single stage amplifier circuits.
OBJECT ORIENTED PROGRAMMING using C++ LAB A2CS09	C01	Apply an object oriented approach to programming and identify potential benefits of object oriented programming over other approaches and in real world applications.
	C02	Design applications using classes which work like built-in types.
	C03	Design applications which are easier to debug and maintain
	C04	Design data base applications using Files.
	C05	Design reusable components.
ENVIRONMENTAL STUDIES A2HS16	C01	Understand the character of environmental problems and ways of addressing them, including interactions across local to global scales.
	C02	Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
	C03	Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies.
	C04	Appraise the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems

	C05	Evaluate the concepts and methods from ecological and physical sciences and their application in environmental problem solving.
THEORY OF COMPUTATION A2CS10	C01	Acquire a fundamental understanding of the core concepts in automata theory and formal languages.
	C02	Design grammars and automata (recognizers) for different language classes.
	C03	Identify formal language classes and prove language membership properties.
	C04	Prove and disprove theorems establishing key properties of formal languages and automata.
	C05	Solve NP problems using computational models including (but not limited to) decidability and intractability.
DESIGN AND ANALYSIS OF ALGORITHMS A2CS11	C01	Demonstrate the importance various algorithmic notations and their usage to give asymptotic upper, lower bounds on time and space complexity of algorithms.
	C02	Apply divide and conquer strategy to solve various computing problems.
	C03	Estimate all feasible solutions using greedy strategy and recite an algorithm that employs this strategy.
	C04	Construct algorithms for solving real world problems using dynamic programming.
	C05	Apply fundamental graph traversal techniques to solve various applications using backtracking.
	C06	Analyze Branch and Bound techniques and explain the significance of NP Completeness.
OPERATING SYSTEMS A2CS12	C01	Analyze the different structures and services of operating system
	C02	Compare various algorithms used for OS services with respect to defined/chosen criteria
	C03	Solve the resource allocation and sharing problems
	C04	Assess different methods to solve OS problems.
	C05	Analyze the memory management approaches of operating systems
JAVA PROGRAMMING A2CS13	C01	Understand the necessity for OOP paradigm over structured programming and become familiar with the fundamental concepts in OOP
	C02	Design and develop java programs using OOP Concepts.
	C03	Analyze the concepts of multi threaded programming and synchronization
	C04	Use GUI controls and event handling mechanism to develop interactive desktop applications
	C05	Analyze the need of applets, swings to develop simple web application
DATABASE MANAGEMENT SYSTEMS A2CS14	C01	Use the basic concepts of Database Systems in Database design
	C02	Apply SQL queries to interact with Database
	C03	Design a Database using ER Modeling.
	C04	Apply normalization on database design to eliminate anomalies
	C05	Analyze database transactions and can control them by applying ACID properties

JAVA PROGRAMMING LAB A2CS15	C01	Develop java applications using OOP concepts.
	C02	Develop programs using multithreading
	C03	Develop error free programs by handling exceptions.
	C04	Develop interactive window/desktop applications using event handling mechanisms
	C05	Develop interactive window/desktop applications using Swings.
DATABASE MANAGEMENT SYSTEMS LAB A2CS16	C01	Apply the basic concepts of Database Systems and Applications.
	C02	Develop an ER model for a given database.
	C03	Use the basics of SQL and construct queries using SQL in

		database creation and interaction.
	C04	Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.
	C05	Analyze and Select storage and recovery techniques of database system.
OPERATING SYSTEMS LAB A2CS17	C01	Analyze The Different Structures And Services Of Operating System
	C02	Various Algorithms Used For OS Services With Respect To Defined/Chosen Criteria.
	C03	Solve The Resource Allocation And Sharing Problems.
	C04	Different Methods To Solve OS Problems.
	C05	The Memory Management Approaches Of Operating Systems
GENDER SENSITIZATION A2HS17	C01	Understanding of important issues related to gender in contemporary India.
	C02	Sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research facts everyday life, literature and film.
	C03	Attain a finger grasp of how gender discrimination works in our society and how to counter it.
	C04	Acquire insight into the gendered division of labour and its relation to politics and economics.
	C05	Equipped to work in our society to work and live together as equals
COMPUTER NETWORKS A2CS18	C01	Understand the components of networks and link layer services
	C02	Classify different Media Access Control and Internetworking Protocols
	C03	Illustrate various types of routing techniques.
	C04	Compare the TCP and UPD protocols of transport layer.
	C05	Select appropriate application layer protocol based on chosen/defined criteria
LINUX PROGRAMMING A2CS19	C01	Understand various Linux System utilities.
	C02	Demonstrate the shell scripts in shell Environment.
	C03	Understand the basic principles of file system architecture.
	C04	Apply the core concept of Process management and implement in the Linux Environment.
	C05	Compare various Inter-Process communication and Client-Server Application techniques in Linux environment.
WEB TECHNOLOGIES A2CS20	C01	Use html and PHP to design server side applications.
	C02	Apply the concepts of Javascript to perform client side validation and create dynamic web pages.
	C03	Understand the handling of asynchronous requests using AJAX programming
	C04	Infer the role of XML in web applications and use them.
	C05	Create server side applications using servlet, jsp and JDBC.
SOFTWARE ENGINEERING A2CS21	C01	Use the right process model to develop a software system.
	C02	Gather requirements and analyze them scientifically in order to develop the right product, besides authoring software

		requirements document.
	C03	Propose design as per functional and non-functional requirements using design principles.
	C04	Select appropriate testing strategies for application being developed.
	C05	Use right set of umbrella activities for quality management and assurance.
OOAD AND DESIGN PATTERNS A2CS22	C01	Identify the right process model to develop a software system.
	C02	Gather requirements and analyze them scientifically in order to develop the right product, besides authoring software requirements document.
	C03	Propose design as per functional and non-functional requirements using design principles.
	C04	Propose testing strategies for application being developed.
	C05	Identify right set of umbrella activities for quality management and assurance
CASE TOOLS	C01	Use software's to design an application using Object Oriented approach
	C02	Apply suitable design patterns in system design
	C03	Critique Object Oriented Analysis and system design using Object Oriented Principles
WEB TECHNOLOGIES LAB A2CS23	C01	Apply various HTML tags used to design static web pages.
	C02	Apply CSS and JavaScript Constructs to perform Client side validation and designing of dynamic web pages.
	C03	Apply various PHP construct to develop server side applications and also familiar of transporting data among applications using XML.
	C04	Understand how to configure Web servers and deployment of applications
	C05	Create server side database and MVC based applications using Servlet, JSP and JDBC.
	C06	Understand Handling of asynchronous requests using AJAX programming.
LINUX PROGRAMMING LAB A2CS24	C01	Apply built in commands for file processing.
	C02	Implement Linux shell scripts.
	C03	Develop the programs to implement system calls.
	C04	Apply the core concept of Processes and implement in the Linux Environment by handling signals.
	C05	Implement the Inter-Process communication and Client-Server Application techniques in Linux environment.
TECHNICAL SEMINAR-III (MICRO PROJECTS/EPICS/CERTIFICATION/MOOCs) A2CS64	C01	Identify, understand and discuss current, real-world issues.
	C02	Distinguish and integrate differing forms of knowledge and academic disciplinary approaches
	C03	Improve oral and written communication skills
	C04	Explore an appreciation of the self in relation to its larger diverse social and academic contexts.
	C05	Apply principles of ethics and respect in interaction with others.
COMPILER DESIGN A2CS25	C01	Use compiler construction tools and describes the Functionality of each stage of compilation process
	C02	Represent language tokens using regular expressions, context free grammar and finite automata and design lexical analyzer for a language.
	C03	Design and implement Syntax Analyzer using top down or

		bottom up techniques.
	C04	Construct syntax directed translation schemes and implement intermediate code generation.
	C05	Apply type checking rules to implement semantic analyzer
	C06	Analyze various code optimization and code generation techniques
DATA MINING AND WAREHOUSING A2CS26	C01	Apply various data pre-processing techniques on the diverse data types, attributes to explore the task relevant knowledge
	C02	Design data warehouse using various schemas for enterprise applications.
	C03	Apply supervised learning techniques on various data sets.
	C04	Apply supervised learning techniques on various data sets.
	C05	Understand the significance and methodologies of outlier detection
MOBILE APPLICATION DEVELOPMENT A2CS27	C01	Describe the components and compare different mobile application models/architectures and patterns.
	C02	Apply the mobile development framework knowledge to develop an application for android devices.
	C03	Use the various layout structures to design an Android application with rich uses interactive interfaces.
	C04	Develop an application that focus on user experience design, native data handling and background tasks and notification.
	C05	Develop applications for Android Devices and deploy in mobile stores(ex: Google playstore).
MICRO PROCESSORS AND MICRO CONTROLLER A2EC29	C01	Create software and hardware programs using assembly language programming
	C02	Interface peripheral devices like 8255, 8259etc.
	C03	Understand and describe Interfacing external devices like memory and other hardware devices.
	C04	Analyze the different I/O interfacing with the help of 8086
	C05	Create simple programs using ARM assembly level programming
INTRODUCTION TO ANALYTICS A2CS37	C01	Make use of R tool for data analytics and solve real world problems
	C02	Solve the statistical data problems easily using R Studio IDE
	C03	Distinguish various databases and Select an appropriate database for variety of data
	C04	Apply the skills of Team work, Professionalism and Communication in career development
	C05	Analyze the importance of Analytics in business perspective.
ADVANCED ENGLISH COMMUNICATION SKILLS LAB A2HS13	C01	Improve the student's fluency in English, through a well-developed vocabulary
	C02	Withstand the global competition in the job market with proficiency in English Communication.
	C03	Face Interviews and skillfully manage through group discussions.
	C04	Communicate their ideas relevantly and coherently in writing.
	C05	Prepare all the students for their placements.
DATA MINING AND WAREHOUSING LAB A2CS28	C01	Understand and get familiarize with open source machine learning tool WEKA GUI and pre-process the data sets.
	C02	Apply various objective measures of pattern interestingness on data set and derive associations manually
	C03	Apply supervised learning algorithms on various data sets.

	C04	Apply unsupervised learning algorithms on various data sets.
	C05	Perform an ETL on employee database and apply various transformations on the data
MOBILE APPLICATION DEVELOPMENT USING ANDRIOD A2CS29	C01	Identify various concepts of mobile programming that make it unique from programming for other platforms,
	C02	Critique mobile applications on their design pros and cons,
	C03	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
	C04	Program mobile applications for the Android operating system that use basic and advanced phone features, and
	C05	Deploy applications to the Android marketplace for distribution.
COMPREHENSIVE VIVA -I A2CS65	C01	Communicate orally about analyzing a problem.
	C02	Express effectively to accomplish a common goal.
	C03	Recapitulate fundamentals from across all semesters of B.Tech course work [4 years of learning].
	C04	Handle difficult scenario during Viva Voce in the event of plenty of subjects under question
	C05	Meet industrial requirement and to improve technical interview skills of a student
CRYPTOGRAPHY AND NETWORK SECURITY A2CS30	C01	Explain various types of security threats attacks, consequences and apply security mechanisms.
	C02	Apply various cryptographic and authentication techniques for secure transmission of data
	C03	Compare different security algorithms with respect feasibility, cost and security service
	C04	Choose the most suitable security mechanisms based on the nature of data and complexity of algorithm
	C05	Examine the issues and structure of Authentication Service and Electronic Mail Security
DISTRIBUTED SYSTEMS A2CS31	C01	Comprehend and design a new distributed system with the desired features.
	C02	Conduct investigation using literature survey leading to further research in any subarea.
	C03	Develop new distributed applications.
	C04	Apply the knowledge of Operating systems concepts in processing shared memory and case studies.
	C05	Implement the knowledge of distributed systems in Transaction control and distributed transactions.
MACHINE LEARNING A2CS32	C01	Define the basic concepts of machine learning ,decision tree and explain them
	C02	Understand neural networks and genetic algorithms along with their strength and weaknesses explain and apply AAN concept
	C03	Understand a range of machine learning algorithms along with Bayesian and computational learning and apply these methods
	C04	Understand the basic theory underlying instant based learning and be able to compare with other learning techniques
	C05	Understand different learning rules and analytical learning and solve problems to generate rules.
ELEMENTS OF CLOUD COMPUTING A2CS57	C01	Demonstrate the benefits of various distributed computing platforms.
	C02	Use modern tools to build distributed applications.
	C03	Apply the middleware architectures used in distributed

		computing platforms
	C04	Analyze various distributed computing architectures with respect to security, performance and cost.
	C05	Illustrate the benefits of open source cloud computing platforms
BIG DATA ENGINEERING (ASSOCIATE ANALYTICS-2) A2CS42	C01	Demonstrate various sources of data and design an architecture for management of data.
	C02	Apply data preprocessing methods to store and process data in cloud by following safety rules at work place.
	C03	Implement knowledge of Hadoop and NoSQL Databases to work with different data formats and Generate reports in standard formats.
	C04	Make use of Machine learning algorithms to process any data and analyze results for decision making.
	C05	Compare various Data visualization tools and Select the best visualization tool for generating reports on given dataset
CRYPTOGRAPHY AND NETWORK SECURITY LAB A2CS33	C01	Apply various cipher techniques .
	C02	Understands and develop programs for implementing various security algorithms
	C03	Utilize different open source tools for network security and analysis
	C04	Analyze the performance of various security algorithms
	C05	Examine the issues and structure of Authentication Service and Electronic Mail Security
CLOUD COMPUTING LAB A2CS34	C01	Demonstrate the benefits of various distributed computing platforms.
	C02	Use modern tools to build distributed applications.
	C03	Apply the middleware architectures used in distributed computing platforms
	C04	Create virtual machine and templates.
	C05	Illustrate the benefits of open source cloud computing platforms
BIG DATA ENGINEERING LAB USING HADOOP A2CS35	C01	Connect to hadoop cluster, experiment with various Linux and HDFS commands to store data
	C02	Apply the knowledge of MapReduce programming to process the stored data in HDFS.
	C03	Make use of database operations to store results in tables and generate reports.
	C04	Connect to web data sources for data gathering, Integrate data sources with hadoop components to process streaming data.
	C05	Generate reports using data visualization tools.
INDUSTRY ORIENTED MINI PROJECT A2CS66	C01	Gather the requirements of the problem.
	C02	Analyze, design and develop the application, tool with the learned technologies.
	C03	Initiate efforts to solve real time problems.
	C04	Contribute as an individual or in a team in development of technical projects
	C05	Develop effective communication skills for presentation of project related activities
MANAGEMENT SCIENCE A2HS15	C01	Knowledge on management theories and practices.
	C02	Understanding designing organizational structure.
	C03	Understanding on the methods & charts used in operations management.
	C04	Ability to understand the market and its environment.

	C05	Understand the processes, functions etc in Human Resources Management.
	C06	Ability to solve problems in managing the Project.
	C07	Knowledge on Strategic alternatives.
	C08	Familiar with the practices implemented in management.
	C09	Understand the social responsibilities of Management.
	C010	Understand the basic concepts of Management.
PREDICTIVE ANALYTICS A2CS47	C01	Demonstrate the concepts of regression for business modeling
	C02	Apply the machine learning concepts in statistical analysis for problem solving.
	C03	Solve the real world problems in data analysis for classification and prediction.
	C04	Build skills in business modeling, professional empowerment and documentation.
	C05	Analyze complex problems in data analysis using data mining techniques using R.
INFORMATION RETRIEVAL SYSTEM A2CS50	C01	Understand the information retrieval strategies.
	C02	Analyze and use the various retrieval utilities for improving searching concepts
	C03	Apply various retrieval utilities on crossing language barrier
	C04	Evaluate space and time efficiency using indexing and compressing the documents
	C05	Comprehend and appreciate the different applications of information retrieval techniques in the Internet or Web Environment
COMPREHENSIVE VIVA-II A2CS67	C01	Communicate orally about analyzing a problem
	C02	Express effectively to accomplish a common goal
	C03	Recapitulate fundamentals from across all semesters of B.Tech course work [4 years of learning].
	C04	Handle difficult scenario during Viva Voce in the event of plenty of subjects under question
	C05	Meet industrial requirement and to improve technical interview skills of a student
PROJECT WORK-II A2CS68	C01	Demonstrate a sound technical knowledge of their selected mini project topic.
	C02	Undertake problem identification, formulation and solution
	C03	Design engineering solutions to complex problems utilizing a systems approach
	C04	Conduct an experiments in the engineering mini project and analysis the data results
	C05	Communicate with engineers and the community at large in written an oral forms..
	C06	Demonstrate the knowledge, skills and attitudes of a professional engineer.
SEMINAR A2CS69	C01	Express and learn public speaking during technical presentations
	C02	An opportunity , where in individuals can meet others with the same Interests/problems/concerns and also to envisage emerging technologies.
	C03	A sense of renewed hope and inspiration , as sometimes business concerns are lessened by sharing experiences with others
	C04	A great morale booster for students for career making

		advancement
	C05	Ability to become able speaker and motivating students in facing technical and HR interview rounds

Department Of Electronics and Communication Engineering

MLR16

Course Name & Code	COs	Course Outcomes
A2HS01 Differential Equations and Applications	C01	Specify standard methods for solving differential equations and their applications in geometrical and physical problems.
	C02	Identify different types of higher order differential equations and their applications in engineering problem solving.
	C03	Understand Rolle's and the Mean value theorems and to verify the Mean value theorems Apply partial derivatives to study maxima and minima of functions of two variables
	C04	Evaluate double integrals by changing variables , changing order and triple integration to find the area and volume of given region
	C05	Apply Laplace transform to solve differential equations which will be converted to algebraic
	C06	Calculate line integrals along piecewise smooth paths, interpret such quantities as work done by a force
	C07	Evaluate the improper integrals using Beta and Gamma functions.
	C08	Participate and succeed in competitive examinations like GATE, GRE.
A2HS11 Technical English	C01	Acquire the use of grammar effectively (vocabulary and so on) through extensive coursework on writing reports and reading comprehensions, articles, essays, general discussion etc.
	C02	To bring an awareness among the future entrepreneurs about the risks in the running enterprises.
	C03	To inculcate profound knowledge through BEC for practical, everyday use in business.
	C04	Assess the skills of writing business letters in various situations and generate skills of writing business letters, essays and memos.
	C05	Categorize the various structures of reports and compose to use them in the professional scenario.
A2HS06 Applied Physics - I	C01	Identify and describe crystal structures and properties of various materials. Analyze the principles of quantum mechanics.
	C02	Analyze the behavior of Free electrons and how they are responsible for exhibition of various properties and describe the classification of semiconductors.
	C03	Classify various magnetic, dielectric materials and apply knowledge gained in various fields.
	C04	Analyze why Laser light is more powerful than normal light and how it is used for communications in optical fiber network.
A2EC01 Network Analysis	C01	Define basic electrical concepts, including electric charge, current, electrical potential, electrical Power and energy.
	C02	Distinguish the relationship of voltage and current in resistors, capacitors, inductors, and mutual Inductors.
	C03	Differentiate circuits with ideal, independent, and controlled voltage and current sources and able to apply Kirchhoff's voltage and current laws to the analysis of electric circuits.
	C04	Illustrate to apply concepts of electric network topology, nodes, branches, and loops to solve circuit problems, including the use of computer simulation.

	C05	Emphasize on basic laws and techniques to develop a working knowledge of the methods of analysis used.
	C06	Interpret to solve series and parallel magnetic circuits
	C07	Design various two port network parameters and relations between them
A2CS01 Computer Programming	C01	Write, compile and debug programs in C language.
	C02	Use different data types in a computer program.
	C03	Design programs involving decision structures, loops, arrays and functions.
	C04	Explain the difference between call by value and call by reference
	C05	Understand the dynamics of memory by the use of pointers.
	C06	Use different file operations to create/update basic data files.
A2HS12 English Communication Skills Lab	C01	Learners learn how to pronounce words using the rules they have been taught.
	C02	Students learn the importance of speaking English using rhythm and intonation.
	C03	Students learn to overcome stage fear and make presentations with ease.
	C04	Students learn to use right words and phrases in keeping the demands of occasion.
	C05	Students learn to face different types of interviews with confidence.
	C06	Students learn to participate in group discussions.
	C07	Students learn to distinguish informal speech from formal speech through role plays.
	C08	Students learn to use the telephone etiquettes.
A2CS02 Computer Programming using C Lab	C01	Understand the basic terminology used in computer programming and to write, compile and debug programs in C language.
	C02	Design programs involving decision structures, loops ,arrays and functions.
	C03	Understand the dynamics of memory by the use of pointers.
	C04	Use different file operations to create/update basic data files
A2ME05 Engineering Drawing	C01	Students will be able to prepare and understand drawings.
	C02	The drawing skills of students will be improved.
	C03	Students will get an idea about various curves used in Engineering and their applications.
	C04	Students can understand and use the principles of orthographic projections.
	C05	By studying about projections of solids students will be able to visualize three dimensional objects and that will enable them to design new products.
	C06	Development of surfaces enables the student to design and fabricate surfaces of different shapes.
	C07	With a good knowledge in isometric projections the student will be able to represent the objects in three dimensional appearances
A2HS03 Linear Algebra and Integral Transforms	C01	Use elementary transformations to reduce matrices to echelon form, normal form and hence find their rank.
	C02	Make use of echelon forms in finding the solution of system of linear equations.
	C03	Compute eigen values and eigen vectors of square matrices. Reduce the quadratic form to canonical form.
	C04	Apply Partial differential equations to solve engineering problems.
	C05	Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.

	C06	Determine Fourier transform, Fourier sine and cosine transform of a function. Apply Z transforms for analyzing linear time-invariant systems.
A2HS07 Applied Physics - II	C01	Identify and describe crystal structures and properties of various materials. Analyze the principles of quantum mechanics.
	C02	Analyze the behavior of Free electrons and how they are responsible for exhibition of various properties and describe the classification of semiconductors.
	C03	Classify various magnetic, dielectric materials and apply knowledge gained in various fields.
	C04	Analyze why Laser light is more powerful than normal light and how it is used for communications in optical fiber network.
	C05	Produce various nano particles, functional materials and apply the same to different fields.
A2HS09 Engineering Chemistry	C01	Extrapolate the knowledge of cell, electrode, cathode, anode, electrolysis, electromotive force and reference electrode including corrosion of metals.
	C02	Under standing and Explore the engineering applications of polymeric materials, cement, lubricants and refractories.
	C03	Interpret the vitality of phase rule in metallurgy.
	C04	Summarize the application of colloids and nanoparticles on industry level in controlling pollution
A2HS02 Computational Methods and Integral Calculus	C01	Recall the basics of permutations and combinations in probability.
	C02	Classify discrete and continuous distribution functions.
	C03	Determine numerical solution of Non Line are quations.
	C04	Discuss the Stability of a system of equations.
	C05	Demonstrate the use of curve fitting in correlation and regression analysis.
	C06	Explain numerical differentiation and integration.
	C07	Examine numerical interpolation and approximation of functions.
	C08	Interpret errors in Numerical Methods.
	C09	Computer Numerical solutions of Partial differential equations.
	C010	Apply Green's theorem to evaluate line integrals along simple closed contours on the plane, Stoke's theorem to give physical interpretation of the curl of a vector field and Divergence theorem to give physical interpretation of the divergence of a vector field.
A2CS04 Data structures	C01	Student will be able to choose appropriate data structure as applied to specified problem definition.
	C02	Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
	C03	Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
	C04	Students will be able to use linear and non-linear data structures like stacks , queues , linked list.
A2HS13 Engineering Physics Lab	C01	Remember the property of elastic materials and modulus.
	C02	Understanding of characteristics of LED and SOLAR CELL.
	C03	Analyzing of energy gap of semiconductor.
	C04	Analyzing the wavelength of laser source using diffraction grating.
	C05	Explaining the magnetic field along the axis of a current carrying coil by using stewart&Gee'sapparatus.
	C06	Understanding numerical aperture of optical fiber.

	C07	Explaining the interference phenomenon by using Newton's ring apparatus.
A2CS05 Data Structures Lab	C01	Be able to design and analyze the time and space efficiency of the data structure
	C02	Be capable to identify the appropriate data structure for given problem
	C03	Have practical knowledge on the application of data structures
A2HS18 Technical Seminar & Computational Mathematics (FOSS).	C01	After completion of this lab course, student will be well acquainted with the programming skills in C/MATLAB and able to write the codes for the problems they come across in engineering courses
A2HS21 Probability and Complex Analysis	C01	An ability to apply knowledge of mathematics, science and engineering as appropriate to the field of electronics communication engineering practice.
	C02	Recall the basics of permutations and combinations in probability
	C03	Understand concept of limit, continuity differentiability and analyticity.
	C04	Calculate line integrals along piece wise smooth paths, interpret such quantities as work done by a force.
	C05	Calculate series solution by using Taylors and Maclaurin's series.
	C06	Evaluate Residues by Laurent series
	C07	Participate and succeed in competitive examinations like GATE, GRE.
A2EC05 Electronic Devices and Circuits	C01	Apply the concepts of junction diodes in various applications
	C02	Design the regulated power supply
	C03	Analyze and build the small signal hybrid model of BJT
	C04	Design biasing circuits for BJT and use in various audio circuits
	C05	Design amplifier circuits using FET
A2EC06 Signals and systems	C01	Understand different types of signals and frequency domain analysis of different signals
	C02	Evaluate transfer function of different inputs of systems
	C03	Compare the similarities between two signals in frequency domain
	C04	Knowledge of converting continuous signal to discrete signal by learning sampling theorem
	C05	Solve the problems which are involving convolution, filtering, modulation and sampling
A2EC07 Random Variables and Stochastic Process	C01	Understand the fundamental of probability and random variables
	C02	Analyze the Distribution & Density Functions and Operation on One Random Variable
	C03	Study the Multiple Random Variables and Operations of Multiple Random Variables
	C04	Understanding various statistical function characteristics
	C05	Impart the concepts of autocorrelation and cross correlation
A2EC08 Electrical Technology	C01	Knowledge on basics of circuit concepts, electrical parameters
	C02	explain single phase ac circuits
	C03	Analyze magnetic circuits , resonance frequency
	C04	Evaluate network topology
	C05	Knowledge on network theorems with which he/she can able to apply the above conceptual things to real-world problems and applications
A2EC09	C01	Demonstrate the transient response of series RL and RC circuit and obtain the time

Electrical Technology lab		constant
	C02	Determine the efficiency of DC shunt generator by conducting load test
	C03	Estimate equivalent circuit parameters, efficiency, and voltage regulation of a single phase transformer by conducting open circuit and short circuit test.
	C04	Understand the open circuit characteristics of DC shunt generator
	C05	Understand transmission and hybrid parameters along with its governing equations.
A2EC10 Electronic Devices & Circuits Lab	C01	Analyze the diode and transistor characteristics.
	C02	Understand the principles of rectifier circuits using diodes and implement them using hardware.
	C03	Understand the importance of h-parameters of BJT using various configurations
	C04	Computing frequency of various amplifiers.
	C05	Examine the characteristics of transistor as operated in different modes.
A2EC11 Basic Simulation Lab	C01	Perform various operations on the signals including Time shifting, Scaling, Reversal, Amplitude Scaling
	C02	Determine the correlation & Convolution between Signals and sequences.
	C03	Verification of Weiner-Khinchine Relations i.e Auto Correlation and Power Spectral Density forms Fourier transform pair.
	C04	Verification of time shifting and time reversal properties of Fourier Transform.
	C05	Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew
A2HS18 Gender Sensitization	C01	Understanding of important issues related to gender in contemporary India
	C02	Sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research facts everyday life, literature and film
	C03	Equipped to work in our society to work and live together as equals
	C04	Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women
	C05	develop sense of appreciation of women in all walks of life
A2EC12 Switching Theory and Logic Design	C01	Illustrate the switching algebra theorems and apply them for reduction of Boolean function.
	C02	Evaluate functions using various types of minimizing algorithms like Boolean algebra.
	C03	Analyze the design procedures of Combinational logic circuits like adder, binary adder, carry look ahead adder.
	C04	Analyze and apply the design procedures of small sequential circuits to build the gated latches.
	C05	Understand and analyze the design of a finite state machine and implement Moore and mealy machine.
	C06	Apply the concept of digital logic circuits to understand and analyze real time applications.
A2EC13 Analog Communications	C01	Discuss about the basic elements of communication system, importance of modulation and different types of modulation.
	C02	Analyze the time domain, frequency domain description of Double Side Band Suppressed Carrier (DSB SC), various generation techniques and detection techniques of DSB SC, Noise in DSB SC
	C03	Analyze the basic concepts of Frequency modulation like single tone , spectrum analysis of frequency modulated wave and transmission bandwidth of FM.
	C04	Knowledge of analog pulse modulation techniques is obtained

	C05	Discuss the concept of receivers in communication system and receiver types like tuned radio frequency receiver and super heterodyne receiver
A2EC14 Electronic Circuit Analysis	C01	Knowledge on both single and multistage amplifiers, feedback amplifiers, power amplifiers, tuned amplifiers and oscillators
	C02	Understand the behavior of various amplifiers like af, rf, tuned and power amplifiers and also observe their frequency response characteristics.
	C03	Solve the problems or concepts related to both positive and negative feedback in an electronic amplifier circuits, oscillators
	C04	Analyze small and large signal amplifiers, tuned amplifier and oscillator circuits at various frequency ranges
	C05	Determine the gains for different amplifiers oscillators with bjt and mos and justifying the practical applications of desired specifications
A2EC15 Pulse and Digital Circuits	C01	Explain the Complete Response of R-C and R-L-circuit
	C02	Analyze the responses of sinusoidal and non sinusoidal signals to various responses
	C03	Demonstrate the concept of switching characteristics of diodes and transistors
	C04	Construct the various Multivibrators Using Transistors and demonstrate time base generators
	C05	Discuss and realize the Logic Gates using Diodes and Transistors
A2EC16 Electromagnetic Waves and Transmission Lines	C01	Understand about the electromagnetic fields and Maxwell's equations
	C02	Describe the basic concepts of electric and magnetic fields in static and time varying conditions
	C03	Examine electromagnetic fields equations using Maxwell's condition
	C04	Analysis the wave propagation characteristics and compute power calculations
	C05	Evaluate wave parameters in various mediums and transmission lines
A2EC17 Electronic Circuit Analysis Lab	C01	Apply the concepts of amplifiers in the design of Public Addressing System
	C02	Design various Audio frequency Oscillators.
	C03	Design Amplifier using feedback concepts.
	C04	Design various applications using amplifier.
A2EC18 Pulse and Digital Circuits Lab	C01	Apply the concepts of amplifiers in the design of Public Addressing System
	C02	Design various Audio frequency Oscillators.
	C03	Design Amplifier using feedback concepts.
	C04	Design various applications using amplifier.
A2EC19 Analog Communications Lab	C01	Verify the operation of amplitude modulation, frequency modulation techniques
	C02	Verify the operation of multiplexing techniques
	C03	Design modulators, demodulators, multiplexers and frequency synthesizers by using analog circuits
	C04	Design transmitter and receiver in analog communication system
	C05	Implement radio transmitters and receivers for real world applications
A2HS16 Environmental Studies	C01	Identify various components of ecosystem and understand their interconnections.
	C02	Understand the issues of non renewable energy resources and try to apply gained knowledge in energy efficiency projects.
	C03	Understand species which are endangered and endemic. Students will develop conservation skills and learn the ecosystems the animals adapt.

	C04	Implement knowledge about pollution and analyze or examine which areas are more polluted through analysis of data by cpcb.
	C05	Understand various acts formulated by govt. of India and analyze various scenarios for evaluating and applying their knowledge in conserving energy and environmental protection
A2EC20 Linear & Digital IC Applications	C01	Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develops skill to solve engineering problems
	C02	Develop skills to design linear and non linear applications circuits using op-amp.
	C03	Develop skills to design the active filters circuits.
	C04	Gain knowledge about PLL, and develop the skills to design the simple circuits using IC 555 timer and can solve problems related to it.
	C05	Acquired the knowledge about the CMOS logic, combinational and sequential circuits
	C06	Learn about various techniques to develop A/D and D/A converters.
A2EC21 Electronic Measurements and Instrumentation	C01	Understand operation of different instruments
	C02	Identify the industrial and laboratory applications of instruments
	C03	Distinguish between the analog and digital meters
	C04	Perform experiments to determine various types of errors in measurements
	C05	Practice for design of testing and measuring set up for electronic systems
A2EC22 Control Systems	C01	Ability to design a system or component or process through concepts of block diagram reduction, time domain analysis solutions to time invariant systems and different aspects of stability analysis in frequency & time
	C02	domains with the help of Mathematics. Apply Routh-Hurwitz criterion to determine the domain of stability of linear time-invariant systems in the parameter space.
	C03	Able to Design sampled data systems using discrete equivalents; understand the effects of sample rate selection.
	C04	Able to correlate the pole-zero configurations of transfer functions and their time-domain response to known test inputs.
	C05	Able to apply the concept of state space analysis for LTI and LTV systems to find stability
A2EC23 Antennas and Wave Propagation	C01	Aware of the parameter considerations viz. antenna efficiency, beam efficiency, radiation resistance etc. in the design an antenna.
	C02	Capable to analyzes the designed antenna and field evaluation under various conditions and formulate the electric as well as magnetic field equation set for far field and near filed conditions.
	C03	Understand the Array system of different antennas and filed analysis like Yagi-uda, Horn antennas and Helical structure and also their operation methodology in practice.
	C04	Design a lens structure and also the bench setup for antenna parameter measurement of testing for their effectiveness.
	C05	Knowledge about the means of propagation of electromagnetic wave i.e. free space propagation and also about frequency dependent layer selection, its respective issues for an effective transmission of information in the form of EM wave to a remote location and related issues.
A2EC24 Digital design through Verilog HDL	C01	Up on successful completion of this course, student will be able to:
	C02	Able to design, simulate, and synthesize computer hardware using the Verilog hardware description language.
	C03	Able to develop program codes for gate level and data flow modelling of combinational and sequential logic using
	C04	Verilog HDL in any problem identification, formulation and solution.

	C05	Able to develop program codes for behavioral modeling of combinational and sequential logic using Verilog HDL in any problem identification, formulation and solution.
	C06	Able to develop program codes for circuit level modelling using Verilog HDL
	C07	Able to design complex state machines (present in all practical computers) that are functional.
A2CS75 Object Oriented Programming LAB	C01	Understand and Apply Object oriented features and C++ concepts
	C02	Apply the concept of polymorphism and inheritance.
	C03	Implement exception handling and templates
	C04	Develop applications using Console I/O and File I/O, GUI applications with JDBC Connectivity
A2EC28 IC Applications Lab	C01	Design various applications using Op-Amps
	C02	Design various applications with specific ICs like 555 timer, IC741
	C03	Design various sequential and Combinational circuits using digital ICs
	C04	Design applications using ASLKV 2010 Starter Kit
A2EC29 Microprocessors and Microcontrollers	C01	Understand the architecture of micro processors and micro controller
	C02	Understand the programming model of micro processors and micro controllers
	C03	Interface different external peripheral devices with micro processors and micro controllers
	C04	Analyze a problem and formulate appropriate computing solution for processor or controller based application.
	C05	Develop an assembly language program for specified application
A2EC30 Digital Signal Processing	C01	Memorize the different types of signals and systems
	C02	Understand the significance of various digital filter structure
	C03	Solve DFT using various FFT algorithms
	C04	Apply the knowledge of multi-rate signal processing in the real time applications
	C05	Design a digital filter using various techniques
A2EC31 Digital Communications	C01	Remembering the building blocks of communication systems
	C02	Understand the transmitters and receivers of digital modulation systems
	C03	Apply data encoding and decoding techniques for error free transmission
	C04	Analyze the error performance of digital modulation techniques
	C05	Evaluate the transmission rate for reliable communication of the channel
A2HS13 Advanced English Communication Skills Lab	C01	To improve fluency in English through a well developed vocabulary and enable them to listen at normal conversational speed by educated English speakers and respond appropriately in different socio cultural and professional context
	C02	Further, they would be required to communicate their ideas relevantly and coherently in writing
	C03	To prepare all the students for their placements.
	C04	Learn to overcome stage fear and make presentations with ease
	C05	Learn how to pronounce words using the rules they have been taught.
A2EC38 Digital Signal	C01	Apply knowledge of digital filter design for various applications.
	C02	Analyze various signals in transform domain

processing Lab	C03	Apply multirate concepts in sampling rate conversion applications
	C04	Implement real time experiments on DSP processors
	C05	Verify basic properties of multi rate systems.
A2EC39 Microprocessors and Microcontrollers Lab	C01	Develop the basic skills on hardware and software/programming of microprocessor
	C02	Enhance assembly language programming skills for simple and complex calculations used in various engineering disciplines
	C03	Capable to innovative and design intelligent systems, called embedded systems, using microprocessor for special purpose.
	C04	Involve in verification of functionality, speed and power of microprocessor based system.
	C05	Interpret specifications for any microprocessor or peripheral chip
A2EC40 Embedded Systems	C01	Knowledge about the basic functions, structure, concepts and applications of embedded systems
	C02	Develop familiarity with 8051 microcontrollers and their applications in an embedded environment
	C03	Knowledge about the development of embedded software using rtos
	C04	Implement small programs to solve well-defined problems on an embedded platform
	C05	Implement real time applications on embedded platform
A2EC41 Microwave Engineering	C01	Develop the knowledge on transmission lines for microwaves, strip lines, its types and characteristics of waveguides
	C02	Analysis & design passive microwave components such as directional couplers, power dividers / combiner and etc, with given characteristics
	C03	Understand and analyze operating principles of basic microwave tubes such as klystrons and helix TWTs
	C04	Understand the operating principles of basic passive and active microwave devices.
	C05	Evaluate the key skill of Designing the microwave bench using waveguides
A2EC42 VLSI Design	C01	Knowledge on various I.C fabrication technologies like NMOS, PMOS, CMOS and Bi-CMOS and their Electrical properties
	C02	Draw the stick diagrams and layout diagrams of various logic circuits and analyze various design rules.
	C03	Design various combinational gate level logics
	C04	Implement and design of building blocks of data path and array sub systems
	C05	Design and implement different programmable logic devices
A2EC50 Digital Communications and Microwaves Lab	C01	Evaluate the performance of various modulations
	C02	Demonstrate use of microwave sources.
	C03	Analyze performance characteristics of microwave components
	C04	Analyze microwave junctions using scattering parameters
	C05	Design a microwave communication link using microwave bench
A2EC51 Embedded Systems Lab	C01	Develop and execute the program to blink the LED using logic gates
	C02	Develop and execute the program to blink of LEDs using logic operations
	C03	Develop and execute the program for Converting BCD to ASCII
	C04	Develop and execute the program to toggle all the bits of port P1 continuously with some delay in between. Using Timer 0, 16-bit mode to generate the delay.

	C05	Develop and execute the program for serial communication
A2EC52 HDL Simulation Lab (Verilog)	C01	The ability to code and simulate any digital function in Verilog HDL.
	C02	Know the difference between synthesizable and non-synthesizable code.
	C03	Understand library modelling, behavioral code and the differences between them.
	C04	Understand the differences between simulator algorithms.
	C05	Learn good coding techniques per current industrial practices.
	C06	Understand logic verification using Verilog simulation.
A2HS15 Management Science	C01	Knowledge on management theories and practices
	C02	Understanding designing organizational structure
	C03	Understanding on the methods & charts used in operations management.
	C04	Ability to understand the market and its environment.
	C05	Understand the processes, functions etc in human resources management.
	C06	Ability to solve problems in managing the project.
A2EC35 Radar Engineering	C01	Students come to know about the block diagram of RADAR , radar frequencies and applications.
	C02	Students come to know about False Alarm Time and Probability, Radar Cross Section, system losses.
	C03	Students come to know about Doppler Effect, CW and Frequency Modulated Radar.
	C04	Students come to know about FM-CW Radar, Multiple Frequency CW Radar
	C05	Students come to know about MTI and Pulse Doppler Radar, Parameters
A2EC36 Industrial Electronics	C01	Students are able to understand the theory of various power electronic devices.
	C02	Can learn how to convert single phase and three phase AC voltage into DC voltage,
	C03	Can understand how to get a variable AC voltage and variable frequency, how to get a DC variable voltage from a fixed DC voltage,
	C04	Can understand how to convert DC voltage into AC voltage.
	C05	Can understand about DC-DC converters
A2EC37 Optical Communications	C01	Analyze the structures of Optical fiber and types.
	C02	Classify the Optical sources and detectors and to discuss their principles.
	C03	Learn the channel impairments like losses and dispersion.
	C04	Analyze the various coupling losses.
A2CS18 Computer Networks	C01	Defining, using and implementing Computer Networks and the basic components of a Network system
	C02	Knowing and Applying pieces of hardware and software to make networks more efficient, faster, more secure, easier to use, able to transmit several simultaneous messages, and able to interconnect with other networks.
	C03	Defining the concept of local area networks, their topologies, protocols and applications
	C04	Analyzing why networks need security and control, what errors might occur, and how to control networks
	C05	Defining and analyzing the circuits available for voice and data networks, their transmission speeds (bandwidth), and how they are packaged for commercial use
A2EC46	C01	Knowledge of working of various communication satellites and its sub systems

Satellite communications	C02	Knowledge on tracking techniques and performance of satellite
	C03	Compare different types of accessing techniques
	C04	Design the power budget for satellite links
	C05	Know about the GPS
A2EC47 Digital Image Processing	C01	Understand the building blocks of image processing systems
	C02	Analyze the characteristics of different image transforms
	C03	Capable to analyzes the image enhancement technique
	C04	Understand the concepts of image restoration
	C05	Understand the methodology of image segmentation and morphological image processing
A2EC48 RF Circuit Design	C01	Graduates will demonstrate the ability to design and conduct experiments, analyze and interpret data.
	C02	Graduates will demonstrate the ability to design a system, component or process as per needs and specifications
	C03	Graduates will show the ability to participate and try to succeed in competitive examinations
A2EC49 Network Security	C01	Should be able to identify network security threats and determine efforts to counter them
	C02	Should be able to write code for relevant cryptographic algorithms.
	C03	Should be able to write a secure access client for access to a server
	C04	Should be able to send and receive secure mails
	C05	Should be able to determine firewall requirements, and configure a firewall.
A2EC54 CELLULAR AND MOBILE COMMUNICATIONS	C01	Find limitations of conventional mobile system and basic elements of cellular system design
	C02	Demonstrate the measurement of co-channel interference and non- co-channel interference and different diversity techniques
	C03	Identify the cell site components and mobile antennas for improving cell coverage for signal and traffic.
	C04	Analyze outline the near and long distance propagation and measuring path loss from point to point prediction model in different conditions.
	C05	Appraise the knowledge on hand off and dropped cell concepts
	C06	Estimate the concepts of frequency management and channel assignments
A2EC55 DSP PROCESSORS AND ARCHITECTURE	C01	Comprehends the knowledge & concepts of digital signal processing techniques.
	C02	Acquire knowledge of DSP computational building blocks and knows how to Achieve speed in DSP architecture or processor.
	C03	Develop basic DSP algorithms using DSP processors.
	C04	Acquire knowledge about various addressing modes of DSP TMS320C54XX and are able to program DSP processor.
	C05	Discuss about interfacing of serial and parallel communication devices
A2EC56 BIO MEDICAL INSTRUMENTATIONS	C01	Gain the knowledge about human physiology system.
	C02	Understand the principle operation and design of biomedical instruments
	C03	Understand the recording of biomedical and its block schematics.
	C04	Understand the biomedical telemetry systems.
	C05	Learn the concepts of patient safety in hazardous situations

A2CS39 BUILDING INTERNET OF THINGS	C01	Upon the completion of the course the student should be able to Design a portable IoT using Arduino/ equivalent boards and relevant protocols
	C02	Develop web services to access/control IOT devices.
	C03	Deploy an IOT application and connect to the cloud
	C04	Analyze applications of IOT in real time scenario
A2EC58 WIRELESS COMMUNICATIONS AND NETWORKS	C01	Identify concepts of frequency reuse, hand-off strategies and cell-splitting in mobile radio propagation.
	C02	Demonstrate the measurement of co-channel interference and non- co-channel interference and different diversity
	C03	Calculate the large-scale path loss and small scale path loss in multipath channel by computation methods and algorithms for mobile radio propagation
	C04	Analyze the traffic theories, mobile radio propagation, channel coding, and cellular concepts.
	C05	Estimate classification of network protocols, ad hoc and sensor networks, wireless MANS, LANS and PANS
	C06	Design the environment of WIFI (802.11 standards set), Bluetooth (802.15) and mobile networks (GSM, UMTS) with focus on physical and access layer
A2EC59 GLOBAL NAVIGATION SATELLITE SYSTEM	C01	Introduction to global positioning
	C02	Types of signals used in the GPS systems and accuracy limits
	C03	Latest versions of GPS and its application
A2EC60 CMOS VLSI	C01	Understand semiconductor device fabrication process.
	C02	2. Analyze the characteristics of CMOS circuits Construction and the comparison between different state-of-the-art CMOS technologies and processes
	C03	3. Implement the a complete design verification process using computer- automated tools for scaling, layout, extraction, simulation, and timing analysis.
	C04	4. Verify a complete a significant VLSI project and testing principles using CAD tools.
A2EC61 NEURAL NETWORKS AND FUZZY LOGIC	C01	Describe models of the brain and neuron function with mathematical methods.
	C02	Design and develop artificial neural networks in software.
	C03	Describe more complex neural networks and the training methods for the same.
	C04	Compare and analyze various associative memory architectures
A2CS54 Fundamentals of Databases	C01	Learn the basic concepts of Database Systems and Applications.
	C02	Master the basics of SQL and construct queries using SQL.
	C03	Be familiar with a commercial relational database system (Oracle, MySQL) by writing SQL using the system.
	C04	Be familiar with the storage and recovery techniques of database system.
A2CS55 Software Engineering Principles	C01	Explain fundamental knowledge in mathematics, programming and computer systems.
	C02	Apply basic knowledge and understanding of the analysis, synthesis and design of complex systems.
	C03	Apply software engineering principles and techniques.
	C04	Design and evaluate large-scale software systems.
	C05	Apply the notations used to analyze the performance of algorithms.
	C06	Demonstrate ethical standards and legal responsibilities.
	C07	Explain to communicate and coordinate competently by listening, speaking, reading and writing.

	C08	Explain the principles, tools and practices of IT project management.
	C09	Illustrate the managing time, processes and resources effectively by prioritizing competing demands.
	C010	Apply the fundamental knowledge of science in emerging technologies.
	C011	Develop as an effective member or leader of software engineering teams.
	C012	Experiment different testing methods
A2CS56 Core Java Programming	C01	Develop confidence for self education and ability for life-long learning needed for advanced java technologies
	C02	Able to participate and succeed in competitive examinations like GATE, Engineering services, recruitment interviews etc
	C03	Demonstrate an ability to design an object oriented system, AWT components and multithreaded processes as per needs and specifications
	C04	Demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks like console and windows applications both for stand alone and Applets programs.
	C05	Demonstrate skills to use latest object oriented programming language and software like java to analyze OOP problems
A2CS57 Elements of Cloud Computing	C01	Understand the fundamental principles of distributed computing
	C02	Understand how the distributed computing environments known as can be built from lower level services.
	C03	Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing
	C04	Understand the business models that underlie Cloud Computing.
A2CS58 Computer Organization and Operating Systems	C01	Explain different types of Addressing modes
	C02	Explain different synchronous and asynchronous data transfer techniques?
	C03	Explain different I/O data transfer techniques with performance comparison?
	C04	Differentiate I/O mapped I/O and memory mapped I/O?
	C05	Explain the communication between I/O devices and IOP and Processor?
	C06	Explain the Memory Hierarchy and performance and cost comparison of different types of memory?
	C07	Describe how the data is transferred from virtual memory to Cache memory?
	C08	Explain cache memory mapping techniques and compare?
A2CS59 Fundamentals of Artificial Intelligence	C01	Able to describe the design of a compiler and the phases of program translation from source code to executable code and the files produced by these phases.
	C02	Able to explain lexical analysis phase and its underlying formal models such as finite state automata, push-down automata and their connection to language definition through regular expressions and grammars.
	C03	Able to explain the syntax analysis phase and identify the similarities and differences among various parsing techniques and grammar transformation techniques.
	C04	Able to use formal attributed grammars for specifying the syntax and semantics of programming languages.
	C05	Able to identify the effectiveness of optimization and explain the differences between machine dependent and machine -independent translation.
	C06	Able to use the powerful compiler generation toolssuch as Lex and YACC.
A2CS60 Soft Computing	C01	To understand neural network (NN) paradigms
	C02	To learn fuzzy logic To have a knowledge of evolutionary computations, genetic algorithm(GA), evolutionary programming, classifier systems, genetic programming parse trees, mathematical foundation of GA variants of GA.

A2CS61 Problem solving Techniques	C01	To solve problem in the UG projects;
	C02	To develop SRS in the UG projects;
	C03	To solve problems for multi-core or distributed or concurrent/Parallel/Embedded environments
A2CS62 Discrete Structures	C01	Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, and integers.
	C02	Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions).
	C03	Synthesize induction hypotheses and simple induction proofs.
	C04	Prove elementary properties of modular arithmetic and explain their applications in Computer Science, for example, in cryptography and hashing algorithms.
	C05	Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction, for example, scheduling
	C06	Apply the method of invariants and well-founded ordering to prove correctness and termination of processes and state machines.
	C07	Derive closed-form and asymptotic expressions from series and recurrences for growth rates of processes.
	C08	Calculate numbers of possible outcomes of elementary combinatorial processes such as permutations and combinations.
	C09	Calculate probabilities and discrete distributions for simple combinatorial processes; calculate expectations.
	C010	Problem solves and study in a small team with fellow students.
A2IT05 Fundamentals of Information Technology	C01	Define information technology and information systems
	C02	Describe the role of information technology and information systems within organizations
	C03	Describe job opportunities and career paths
	C04	Identify popular classes of organizational information technology systems and discuss the role of each: networks, client-server, enterprise, web-based
	C05	Identify basic approaches to developing application software
	C06	Describe computer programming and its role in the software world
	C07	Describe data organization, databases, and their role in computer applications
	C08	Explain network topologies and how the Internet works
	C09	Describe website construction
	C010	Identify and briefly describe components and applications associated with Website development. Explain requirements analysis, system development, and project management
A2IT06 Basics of Mobile Application Development	C01	Describe the components and compare different mobile application models/architectures and patterns
	C02	Apply mobile development framework knowledge to develop a mobile application.
	C03	Use the various layout structures to design an Android application with rich uses interactive interfaces
	C04	Develop an application that focus on user experience design, native data handling and background tasks and notification
	C05	Develop applications for Android Devices and deploy in mobile stores(ex:googleplaystore)
A2IT07 Fundamentals of E- Commerce	C01	Defining and analyzing the principles of E-commerce and basics of World Wide Web.
	C02	Defining and analyzing the concept of electronic data interchange and its legal, social and technical aspects.
	C03	Defining and analyzing the security issues over the web, the available solutions and future aspects of e-commerce security.
	C04	Defining and analyzing the concept of E-banking, electronic payment system

A2IT09 Principles of Programming Languages	C01	Analyze fundamental concepts of most programming languages & the tradeoffs Programming Languages between language design and implementation.
	C02	Compare programming languages, assess programming languages critically and scientifically.
	C03	Use formal description for a programming language and the essence of program execution by evaluators: interpreter, compiler.
	C04	Apply different programming paradigms: analyze the principles of imperative, object-oriented, functional and logic programming.
	C05	Design a new programming language in principle.
A2IT10 Human Computer Interface Design Basics	C01	Explain the human components functions regarding interaction with computer
	C02	Explain Computer components functions regarding interaction with human
	C03	Demonstrate Understanding of Interaction between the human and computer components.
	C04	Use Paradigms
	C05	Implement Interaction design basics
	C06	Use HCI in the software process
	C07	Apply Design rules
	C08	Produce Implementation supports
	C09	Use Evaluation techniques
A2IT11 Computer and Network Security Fundamentals	C01	Should be able to identify network security threats and determine efforts to counter them
	C02	Should be able to write code for relevant cryptographic algorithms.
	C03	Should be able to write a secure access client for access to a server
	C04	Should be able to send and receive secure mails
	C05	Should be able to determine firewall requirements, and configure a firewall.
A2IT17 Software Testing Fundamentals	C01	Have an ability to apply software testing knowledge and engineering methods.
	C02	Have an ability to design and conduct a software test process for a software testing project.
	C03	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.
	C04	Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.
	C05	Have an ability to use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.
	C06	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems
	C07	Have an ability to use software testing methods and modern software testing tools for their testing projects.
A2IT18 Basics of Multimedia Systems	C01	describe different realizations of multimedia tools and the way in which they are used
	C02	analyze the structure of the tools in the light of low-level constraints imposed by the adoption of various QoS schemes (ie bottom up approach)
	C03	analyze the effects of scale and use on both presentation and lower-level requirements (i.e. top down approach)
	C04	state the properties of different media streams
	C05	Compare and contrast different network protocols and to describe mechanisms for providing QoS guarantees in the network.
A2IT19 Basic Introduction to Game Development	C01	Understand the properties and architectural specifics of modern technology
	C02	Have hands-on knowledge of the basic principles of software development
	C03	Have hands-on knowledge of the basic principles of game programming

A2EC25 Logic Design	C01	Design and analyze combinational and sequential circuits for various practical problems using basic gates and flip flops
	C02	Implement LSI and MSI circuits using programmable logic devices (PLDs)
	C03	Demonstrate knowledge of hazards and race conditions generated within asynchronous circuits.
	C04	Understand the process of integration and characteristics of different logic families.
A2EC26 Principles of Communications	C01	Basic working of communication system
	C02	Analog Modulation Techniques and their comparative analysis and applications suitability.
	C03	Process of Modulation and Demodulation.
	C04	Types, characterization and performance parameters of transmission channels.
	C05	Analog to digital conversion and Digital data transmission.
	C06	Multiplexing Techniques.
	C07	Basic working principles of existing and advanced communication technologies
A2EC27 Measurements And Instrumentation	C01	Apply knowledge of electronic instruments for measurement of electrical quantities.
	C02	Apply the principles and practices for instrument design.
	C03	Select and use latest hardware for measurements
A2EC32 Micro Processor and Interfacing	C01	student will be able to describe the architecture of 8086 microprocessor
	C02	student will be able to write software and hardware programs using assembly language programming
	C03	Student will be able to interface peripheral devices like 8255, 8259 etc.
	C04	Student will be able to understand and describe Interfacing external devices like memory and other hardware devices.
	C05	student will be able to write simple programs using ARM assembly level programming
A2EC33 Signals Transmission Through Linear Systems	C01	Design solutions for complex input signals
	C02	Analyze statistical parameters for a given signal.
	C03	Apply transform domain knowledge for design of systems.
	C04	Apply the mathematical modeling to LTI systems
A2EC34 Fundamentals of VLSI Design	C01	Learn IC Fabrication process steps required for MOS and Ids- Vds relationship.
	C02	Understand VLSI Design flow for fabrication of a chip , layout design rules , Stick diagrams and scaling of MOS transistor.
	C03	Learn the time delays, driving large capacitive loads. wiring capacitance, Choice of layers
	C04	Able to learn different data path subsystems design of combinational circuits.
	C05	Understand CMOS testing, Design Strategies for Testing
A2EC43 Analog IC Design	C01	Understand the techniques of design and layout of analog circuits using CMOS.
	C02	Apply the concepts of circuit design problems in real time applications
A2EC44 Fundamentals of Image Processing	C01	Understand image formation and the role human visual system plays in perception of gray and color image data.
	C02	Get broad exposure to and understanding of various applications of image processing in industry, medicine, and defense.
	C03	Learn the signal processing algorithms and techniques in image enhancement and image restoration.

	C04	Acquire an appreciation for the image processing issues and techniques and be able to apply these techniques to real world problems.
	C05	Be able to conduct independent study and analysis of image processing problems and techniques.
A2EC45 TV Engineering	C01	Get knowledge in the area of TV Engineering.
	C02	Describe the requirements for the following aspects of satellite communications system: satellite subsystems, satellite orbits between earth station and satellite.
A2ME25 Fundamentals of Mechatronics	C01	Articulate what the essence of mechatronics is and provide examples of mechatronic systems.
	C02	Explain the concepts of input and output impedance, voltage division, and circuit loading
	C03	Explain the concept and characteristics of a signal source.
	C04	Design and analyze the performance of RC low-pass and high-pass filter circuits.
	C05	Explain the basic structure of a microcontroller, the nature of IO ports, and the common peripheral subsystems found in most microcontrollers.
	C06	Write embedded software to successfully interact with sensors, power interfaces, analog and digital IO ports, and other peripheral elements in the control of a mechatronic system.
	C07	Explain what analog-to-digital-conversion (A/D) is and how to implement it using a microcontroller.
	C08	Select and configure operational amplifier circuits to achieve desired interfacing requirements between a signal source and a downstream device such as a microcontroller or data acquisition system.
	C09	Explain the practical limitations of operational amplifiers and quantitatively estimate the effects of these limitations on output voltage and current of the op-amp.
	C010	Explain the basic operation of bipolar and MOS field-effect transistors and design with them to activate solenoids, relays, motors, etc. from signal sources.
	C011	Explain the input/output characteristics of digital logic devices and design a logic circuit to accomplish a given task.
	C012	Explain the underlying operational principles and construction of electromagnetic actuators such as DC, AC, and stepping motors.
	C013	Determine the torque and speed requirements for a given motion control application considering system inertia, external forces or torques, and motion profiles and select an appropriate motor.
	C014	Function effectively as part of a team in carrying out laboratory experiments and open-ended projects.
	C015	Document a laboratory experiment and open-ended projects clearly and completely in written form.
A2ME26 Basics of Thermodynamics	C01	Demonstrate knowledge of energy transfer and work done and heat equation in different processes, power cycles and thermodynamic laws.
	C02	Demonstrate knowledge of ability to identify & apply fundamentals to solve problems like system properties, amount of work transfer and heat during various processes, steam properties at different temperatures and pressures using steam tables.
	C03	Demonstrate their knowledge & ability to design the thermal related components in various fields of energy transfer equipments.
	C04	An ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, and safety manufacturability and sustainability related thermal fields like I.C engines, different types of power plants etc.
	C05	The ability to use modern engineering tools, software and equipment to analyze energy transfer in required applications.
	C06	A knowledge of impact of engineering solutions on the society and also on

		contemporary issues related to different types of power cycles.
	C07	Recognition of the need for, and an ability to engage in self education and life-long learning.
A2ME27 Fundamentals of Engineering Materials	C01	This subject gives student a technical knowledge about behavior of metals.
	C02	Identify the crystalline structure of steel.
	C03	Understand the theory of time temperature and transformation.
	C04	Determination of different uses of heat treatment in steel.
	C05	Distinguish between the various forms of steel.
	C06	Understand the properties of non-ferrous alloys.
	C07	Describe the various uses of composite materials
A2ME34 Fundamentals of Operation Research	C01	Applying a different linear programming problem technique which has a broad experience in finding the optimum profit.
	C02	Apply the knowledge of the course in solving real life problems.
	C03	Identify areas for research-oriented work based on the course content.
	C04	Calculate the knowledge that tries to optimize total return by maximizing the profit and minimizing the cost or loss.
	C05	Recognize the best (optimum) decisions relative to largest possible portion of the total organization.
	C06	Discuss towards the development of better working procedure and systematic approach in problem analysis, modeling and implementation of solutions at the workplace.
A2ME35 Economics for Engineers	C01	At the end of the course, the student will understand the market dynamics namely, demand and supply, demand forecasting, elasticity of demand and supply, pricing methods and pricing in different market structures
A2ME36 Basics of Robotics	C01	Graduates will demonstrate basic knowledge in mathematics, science and engineering
	C02	Graduates will demonstrate an understanding of their professional and ethical responsibilities
	C03	Graduates will demonstrate the ability to function on engineering and science laboratory teams, as well as on multidisciplinary design teams
	C04	Graduates will demonstrate the ability to identify, formulate and solve mechanical engineering problems
	C05	Graduates will have the confidence to apply engineering solutions in global and societal contexts. Graduates should be capable of self-education and clearly understand the value of life-long learning. Graduates will have ability to communicate in written, oral and graphical forms.
A2ME46 Introduction to Material Handling	C01	Demonstrate ability to successfully complete Fork Lift Certification to safely and effectively operate in the manufacturing environment.
	C02	Demonstrate proficiency in supply chain operations, utilizing appropriate methods to plan and implement processes necessary for the purchase and conveyance of goods in a timely and cost-effective manner
	C03	It explains about the different types of material handling, advantages and disadvantages. It also suggests the selection procedure for the material handling along with its specifications.
	C04	Need for Material handling also explained with different techniques like Automated Material handling Design Program, Computerized material handling Planning will be dealt.
	C05	The Material handling are explained with models, selection procedure of material handling is depending on different function oriented systems. This also related with plant layout by which the minimization of the handling charges will come down.

	C06	The ergonomics related to material handling equipment about design and miscellaneous equipments.
A2ME47 Non-Conventional Energy Sources	C01	Introduction to Renewable Energy Sources, Principles of Solar Radiation, Different Methods of Solar Energy Storage and its Applications, Concepts of Solar Ponds, Solar Distillation and Photo Voltaic Energy Conversion
	C02	Introduction to Flat Plate and Concentrating Collectors, Classification of Concentrating Collectors
	C03	Introduction to Wind Energy, Horizontal and Vertical Access Wind Mills, Bio-Conversion
	C04	Types of Bio-Gas Digesters and Utilization for Cooking Geothermal Energy Resources
	C05	Types of Wells and Methods of Harnessing the Energy, Ocean Energy and Setting of OTEC Plants
	C06	Tidal and Wave Energy and Mini Hydel Power Plant, Need and Principles of Direct Energy Conversion
	C07	Concepts of Thermo-Electric Generators and MHD Generators
A2ME48 Aspects of Heat & Mass Transfer	C01	Students are able to model the given heat transfer problem mathematically, categorize the heat transfer problems
	C02	Students are able to derive the equation for temperature distribution in fins, to estimate the rate of heat transfer through conduction through slabs, cylindrical and spherical surface objects.
	C03	Students are capable to design the thickness of insulation based on the requirement of heat transfer
	C04	Students are able to estimate the rate of heat transfer heat transfer coefficients for forced and free convection Heat transfer problems
	C05	Students are able to perform the LMTD & NTU analysis to the heat exchanger problems, to analyze and design the boiling heat transfer problems.
A2AE17 Fabrication Processes	C01	Understand the various manufacturing methods employed in the industry.
	C02	Get knowledge in Basic welding & finishing operations
	C03	Get knowledge in Hot & Cold working of metals including High Energy Rate forming.
	C04	Get knowledge in Plastic manufacturing
A2AE18 Fundamentals of Avionics	C01	Technical & practical understanding about Airplane
	C02	Communication from ground and others means to the airplanes
	C03	Network systems, controlling parts & surfaces, Memory, Black box
	C04	Pilots control facility and communication to engine can be defined
	C05	Navigation aids and methods can be understood
	C06	Control systems, Astrionics can be processed
	C07	Advancements in Navigation and it techniques
A2AE19 Introduction to Jets And Rockets	C01	To determine work of the OTTO, DIESEL, and BRAYTON cycles
	C02	To make connections between these cycles and aerospace propulsion systems
	C03	Calculate the key fluid properties at each component of an air-breathing and rocket engine.
	C04	Perform an analysis of the turbine and Compressor
	C05	V's required for space missions and relate these to total propellant consumption using the rocket equation.
	C06	Calculate thrust, throat and exit areas, and nozzle profile of a rocket engine.

A2AE27 Introduction to Aircraft Industry	C01	Discuss the importance of conceptual design process and studying the different phases of designing process involved in the design.
	C02	Understand the Integrated product development and principles of baseline design-stability & control, performance and constraint analysis
	C03	Understand the working process of a electrical systems.
	C04	Demonstrate on direct energy conversion and their principles.
	C05	Understand the working process of mechanical systems.
A2AE28 Non destructive Testing Methods	C01	This subject gives student a technical knowledge about different types of tests carried out on components or material.
	C02	Identify the requirements of testing criteria as per material composition.
	C03	Understand the theory of non destructive testing methods are used.
	C04	Determine the type of requirement of non destructive test.
	C05	Distinguish between the various NDT test as Ultrasonic and Eddy current methods.
	C06	Understand the properties of radiation used in engineering.
	C07	Describe the various types of non destructive test used to determine the surface cracks.
A2AE29 Fundamentals of Finite Element Methods	C01	Know the Macro and Micro mechanical models
	C02	Understand the Generalized coordinates
	C03	Understand the concepts of Discretization
	C04	Know the properties and derivations
	C05	Understand the concepts of Approximations and error control
	C06	Understand the concepts of Mathematical tools and fem tools
	C07	Understand the Symmetries in fields
	C08	Understand the Mesh generation Techniques
A2AE39 Guidance and Control of Aerospace Vehicles	C01	To derive models of dynamic systems and obtain transfer functions;
	C02	To analyze stability of linear time-invariant systems
	C03	To perform time domain analysis and design a controller to meet time-domain specifications
	C04	To apply the root locus method to the analysis of systems and design of controllers
	C05	To apply frequency response methods to the analysis of systems and design of controllers
	C06	To analyze simple modern multiple-input multiple output systems using state-space methods
	C07	To Appreciate how complex aerospace vehicles navigate in air and space
	C08	To Analyze the control systems which assist in maneuvering these vehicles
A2AE40 Wind tunnel Techniques	C01	Ability to develop and understand basic of aerodynamics
	C02	Ability to develop and understand flow visualization techniques over model
	C03	Ability to understand concepts of low speed and high speed wind tunnels
	C04	Ability to understand measurement and balancing of loads on model
	C05	Ability to understand the different types of equipments for measuring pressure and velocity
	C06	Ability to design and consideration of wind tunnels

A2AE41 Introduction to Aerospace Technology	C01	Ability to describe the air vehicles used in the history
	C02	Ability to explain the commercial use of space
	C03	Ability to explain the Elements of airplane performance
	C04	Ability to understand the Standard atmosphere
	C05	Ability to explain the requirements of a satellite
	C06	Ability to determine the sub systems of a satellite
	C07	Ability to explain the missions sent to explore space

Department of Information Technology

MLR-16

Course Name & Code	COs	Course Outcomes
PROBABILITY AND STATISTICS & A2HS05	C01	Demonstrate the distribution of random variables
	C02	Calculate the moment generating functions of three distributions and sample mean and sample variance
	C03	Find mean and proportions (small and large samples).
	C04	Test the hypothesis (small and large sample) and conclude the result.
	C05	Find the expected queue length, the ideal time, the traffic intensity and the waiting time.
DIGITAL LOGIC DESIGN & A2EC19	C01	Able to define different number systems and binary codes present in digital circuits.
	C02	Able to understand the simplification of boolean expressions by using boolean algebra laws, theorems & postulates
	C03	Able to implement digital circuits by simplifying the boolean function using methods present in digital design.
	C04	Able to classify different types of semiconductor memories.
	C05	Able to design combinational and sequential digital circuits.
	C06	Able to describe about programmable logic devices and to implement it.
ELECTRONIC DEVICES AND DIGITAL ELECTRONICS LAB & A2EC70	C01	Students will be able to apply the concepts of junction diodes in various applications
	C02	Students will be able to design the regulated power supply
	C03	Students will be able to analyze and build the small signal hybrid model of BJT.
	C04	Students will be able to design biasing circuits for BJT and use in various audio circuits.
	C05	Students will be able to design FET.
	C06	Students will be able to design fet amplifiers.
DISCRETE MATHEMATICAL STRUCTURES & A2CS07	C01	Students will be able to construct truth tables for well formed formulas
	C02	Students will be able to identify partial order relations and able to draw hasse diagrams
	C03	Students will be able to apply the knowledge of combinations to real time problems
	C04	Students will be able to solve recurrence relations.
	C05	Students will be able to identify hamiltonian circuits and find out the chromatic numbers
COMPUTER ARCHITECTURE AND ORGANIZATION & A2CS06	C01	Demonstrate various components of computer and their interconnection
	C02	Analyze the design of the central processing unit and arithmetic logic unit
	C03	Compare and select various memory device as per equipment

	C04	Infer parallel processing approach in real time applications.
	C05	Compare various types of input/output mapping techniques
JAVA PROGRAMMING & A2CS13	C01	Analyze the necessity for object oriented programming paradigm over structured programming and become familiar with the fundamental concepts in oop like encapsulation, inheritance and polymorphism
	C02	Design and develop java programs using OOP concepts.
	C03	Design an object oriented system, awt components and multithreaded processes as per needs and specifications.
	C04	Participate and succeed in competitive examinations like gate, engineering services, recruitment interviews etc
	C05	Participate and succeed in competitive examinations like gate, engineering services, recruitment interviews
ELECTRONIC DEVICES AND DIGITAL ELECTRONICS LAB & A2EC71	C01	Able to identify different electronic devices
	C02	Able to explain semiconductor devices
	C03	Able to construct different logic gates using discrete components
	C04	Able to design combinational and sequential devices
JAVA PROGRAMMING LAB & A2CS15	C01	Implement object oriented features using java
	C02	Apply the concept of polymorphism and inheritance.
	C03	Implement exception handling
	C04	Develop network and window application using AWT and swings.
ENVIRONMENTAL STUDIES & A2HS16	C01	Students will be able to identify various components of ecosystem and compare their interconnections.
	C02	Students will be able to outline the issues of non renewable energy resources and try to apply gained knowledge in energy efficiency projects.
	C03	Differentiate between communication skills and presentation skill
	C04	Students will be able to illustrate species which are endangered and endemic and will choose conservation methods best suited for wildlife.
	C05	Students will be able to list sources of pollution and conclude which areas are more polluted through analysis of data by cpcb.
	C06	Students will be able to identify the impact of development activities and defend the need for environmental protection.
DESIGN AND ANALYSIS OF ALGORITHMS & A2CS11	C01	Analyze the time and space complexity of algorithms.
	C02	Use a divide-and-conquer algorithm and greedy approach to solve an appropriate problem and determine if the greedy rule chosen leads to an optimal solution.
	C03	Understand the major graph algorithms and their analysis and employ graphs to model application problems.
	C04	Use dynamic programming to develop the recurrence relations and to solve an appropriate problem.
	C05	Understand the concept of deterministic and non-deterministic algorithms.
DATABASE MANAGEMENT SYSTEMS & A2CS14	C01	Use the basic concepts of database systems in database design
	C02	Apply SQL queries to interact with database
	C03	Design a database using ER modeling
	C04	Apply normalization on database design to eliminate anomalies
	C05	Analyze database transactions and can control them by applying acid properties
COMPUTER NETWORKS & A2CS18	C01	Understand and explain computer networks, its components and reference models
	C02	Compare the concept of protocol suite of hdlc, bluetooth, wirelesslan and ethernet
	C03	Design, calculate, and apply sub net masks and addresses to fulfill networking requirements and also analyzes basic protocols of computer networks
	C04	Identify the difference of data transmission using udp and tcp model

	C05	Analyze the features and operations of various application layer protocols such as http, dns, and smtp
WEB TECHNOLOGIES & A2CS20	C01	Design web application using php
	C02	Understand the engineering structural design of xml and parse tree
	C03	Design web application using java script
	C04	Design web application using servlet
	C05	Design web application using jsp
COMPUTER GRAPHICS & A2IT01	C01	Understand the structure of modern computer graphics systems
	C02	Apply the basic principles of implementing computer graphics primitives
	C03	Apply the techniques used in 3d computer graphics and viewing transformations.
	C04	Construct interactive computer graphics programs using open GL
	C05	Develop designs and problem solving skills with application to computer graphics.
DATABASE MANAGEMENT SYSTEMS LAB & A2CS16	C01	Learn the basic concepts of database systems in database systems and applications
	C02	Master the basic of SQL queries to interact with database
	C03	Be familiar with a commercial relational database system (oracle, mysql) by writing sql using the system.
	C04	Be familiar with the storage and recovery techniques of database system..
WEB TECHNOLOGIES LAB & A2IT03	C01	Create web pages using php
	C02	Identify difference between the html and javascript.create web pages using javascript
	C03	Identify the engineering structural design of xml and parse tree
	C04	Servlets technology for writing business logic
	C05	Design web application using mvc architecture using jsp
COMPUTER GRAPHICS LAB & A2IT02	C01	Students will have an appreciation of the history and evolution of computer graphics, both hardware and software. assessed by written homework assignment.
	C02	Students will have an understanding of 2d graphics and algorithms including: line drawing, polygon filling, clipping, and transformations. they will be able to implement these. assessed by tests and programming assignments.
	C03	Students will understand the concepts of and techniques used in 3d computer graphics, including viewing transformations, hierarchical modeling, color, lighting and texture mapping. students will be exposed to current computer graphics research areas. assessed by tests, homework and programming assignments.
	C04	Students will be able to use a current graphics api (open gl). assessed by programming assignments.
	C05	Students will be introduced to algorithms and techniques fundamental to 3d computer graphics and will understand the relationship between the 2d and 3d versions of such algorithms. students will be able to reason about and apply these algorithms and techniques in new situations. assessed by tests and programming assignments.
GENDER SENSITIZATION & A2HS17	C01	Develop a better understanding of important issues related to gender in contemporary India.
	C02	Sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender
	C03	Attain a finer grasp of how gender discrimination works in our society and how to counter it
	C04	Men and Women students and professionals will be better equipped to work and live together as equals.
	C05	Develop a sense of appreciation of women in all walks of life.
DATA MINING & WAREHOUSING & A2CS26	C01	Extract knowledge using data mining techniques
	C02	Design a data mart or data warehouse for any organization.
	C03	Understand the need for mining frequent patterns and apply different association rules

	C04	Understand and apply different algorithms for classification and prediction methods
	C05	Solve real data mining problems by using the right tools to apply them on clustering
SOFTWARE ENGINEERING & A2CS21	C01	Students will be able to differentiate various software process models
	C02	Students will be able to analyze requirements of the client and choose suitable process model
	C03	Students will be able to apply principles of interface design and suitable testing strategy
	C04	Students will be able to explain product, process and project metrics
	C05	Students will be able to identify the quality management and improvement techniques.
LINUX PROGRAMMING & A2CS19	C01	student will be able to understand how to work with linux utilities and how to write shell scripts
	C02	student will be able to apply the knowledge of linux file and directory system and kernel related system calls interfaces to successfully develop new features of the kernel.
	C03	student will be able to apply the concepts of process & signals in real time scenarios.
	C04	student will be able to demonstrate inter process communication using pipes, shared memory, semaphores and messages.
	C05	student will be able to design various client server application using sockets to support communication interfaces.
OPERATING SYSTEMS & A2CS12	C01	Identify various operating systems and their working
	C02	understand the operations of kernel –os as a resource manager
	C03	Analyze performances of cpu scheduling algorithms (fcfs,sjf,roundrobin,priority),
	C04	explain memory management techniques, paging, page table page replacement algorithms
	C05	Examine various classic problems of synchronization and select suitable solution.
	C06	Examine various classic problems of synchronization and select suitable solution
AUTOMATA AND COMPLIER DESIGN & A2IT04	C01	Understand the requirement of compiler design.
	C02	Apply and examine working skills in theory and application of finite state machines, recursive descent, production rules, parsing, and language semantics.
	C03	Understand about powerful compiler generation tools.
	C04	Apply different representations of intermediate code.
	C05	Apply the ideas, the techniques, and the knowledge acquired for the purpose of other software design.
FUNDAMENTALS OF ENGINEERING MATERIALS & A2AE29	C01	Students will be able to apply the design ,fabrication and optimal selection of engineering materials..
	C02	Students will be able to apply the knowledge based on the engineering principles relevant to materials
	C03	Students will be able to understand and draw different microstructure and recognize the properties of materials
	C04	Students will be able to understand how to apply design and conduct experiments, and to analyze data
	C05	Students will be able to understand able to apply general math, science and engineering skills to the solution of engineering problems
	C06	Students will be able to reconstruct and possess the skills and techniques necessary for modern materials engineering practice
DATA MINING AND DATA WAREHOUSING LAB & A2CS28	C01	Implement different classification algorithms on the datasets
	C02	extract knowledge using data mining techniques
	C03	implement association rule mining on given datasets
	C04	implement different clustering methods

	C05	apply knowledge of etl and implement it.
LINUX PROGRAMMING LAB & A2CS24	C01	use shell script to create files and handle text documents
	C02	Create child processes, background process and zombies
TECHNICAL SEMINAR-II (STUDENT PORTFOLIO) & A2IT08	C01	Implement fundamental domain knowledge of core courses for developing effective computing solutions by incorporating creativity and logical reasoning
	C02	Develop leadership skills and incorporate ethics, team work with effective communication & time management in the profession
	C03	Conduct research among computing professionals as per market needs
OBJECT ORIENTED ANALYSIS AND DESIGN PATTERNS & A2CS22	C01	Perform object oriented analysis.
	C02	analyze the requirements and generate use cases
	C03	Apply the unified modeling language (UML) towards analysis and design.
	C04	Be familiar with alternative development processes.
	C05	Apply suitable design patterns in system design
MOBILE APPLICATION DEVELOPMENT & A2CS27	C01	Describe those aspects of mobile programming that make it unique from programming for other platforms
	C02	Critique mobile applications on their design pros and cons
	C03	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces
	C04	Program mobile applications for the android operating system that use basic and advanced phone features.
	C05	Deploy applications to the android marketplace for distribution
MACHINE LEARNING & A2CS32	C01	Define the basic concepts of machine learning , decision tree and explain them
	C02	Understand neural networks and genetic algorithms along with their strengths and weaknesses,explain and apply ann concept
	C03	Understand a range of machine learning algorithms along with bayesian and computational learning and apply these methods.
	C04	Understand the basic theory underlying instant based learning and be able to compare with other learning techniques
	C05	Understand different learning rules and analytical learning and solve problems to generate rules
MICROPROCESSORS AND INTERFACING & A2EC32	C01	Able to describe the basic architecture and internal organization of microprocessor
	C02	Able to classify the instructions of 8086 processor
	C03	By apply the knowledge of instruction set to write assembly language programs
	C04	Able to study and analyze the interrupts in 8086 microprocessor
	C05	Able to understand and realize the interfacing of memory and various i/o devices with 8086 microprocessor
	C06	Able to design simple embedded applications by making use of processors.
INTRODUCTION TO ANALYTICS & A2CS37	C01	Identify various application areas of data analytics and methods.
	C02	Apply statistical analysis methods on datasets using r.
	C03	Analyze and interpret business requirements by effective utilization of time and team spirit
ADVANCED ENGLISH COMMUNICATION SKILLS LAB & A2HS13	C01	Students will be able to give oral presentations and receive feedback on other performance
	C02	Students will be able to improve their speaking ability in english both in terms of fluency and comprehensibility
	C03	Students will be able to heighten their awareness of correct usage of english pronunciation in speaking
ORIENTED ANALYSIS AND DESIGN PATTERNS LAB & A2IT14	C01	Identify principles of oo programming
	C02	Use key principles in oo analysis, design, and development
	C03	Apply design patterns in system design
	C04	Be familiar with alternative development processes

	C05	Be familiar with group/team projects and presentations.
	C06	Be exposed to technical writing and oral presentations
MOBILE APPLICATION DEVELOPMENT LAB & A2CS29	C01	Describe those aspects of mobile programming that make it unique from programming for other platforms
	C02	Critique mobile applications on their design pros and cons
	C03	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
	C04	Program mobile applications for the android operating system that use basic and advanced phone features
	C05	Deploy applications to the android marketplace for distribution
COMPREHENSIVE VIVA-I & A2IT15	C01	Solve competitive exam questions.
	C02	Adapt interview facing skills
	C03	Make use of technical skills to solve computational problems
CRYPTOGRAPHY AND INFORMATION SECURITY & A2CS30	C01	Identify and explain various types of security threats/vulnerabilities attacks, consequences and apply security mechanisms
	C02	Apply various cryptographic and authentication techniques for secure transmission of data.
	C03	Compare different security algorithms with respect feasibility, cost and security service
	C04	Choose the most suitable security mechanisms based on the nature of data and complexity of algorithm.
DISTRIBUTED SYSTEMS & A2CS31	C01	Comprehend and design a new distributed system with the desired features
	C02	Conduct investigation using literature survey leading to further research in any sub area.
	C03	Develop new distributed applications.
	C04	Apply the knowledge of operating systems concepts in processing shared memory and case studies.
	C05	Implement the knowledge of distributed systems in transaction control and distributed transactions.
HUMAN COMPUTER INTERACTION & A2IT16	C01	Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.
	C02	Recognize how a computer system may be modified to include human diversity.
	C03	Select an effective style for a specific application.
	C04	Design mock ups and carry out user and expert evaluation of interfaces.
	C05	Carry out the steps of experimental design, usability and experimental testing, and evaluation of human computer interaction systems.
SOFT COMPUTING & A2CS60	C01	Identify and describe soft computing techniques and their roles in building intelligent machines
	C02	Analyze fuzzy logic and reasoning to handle uncertainty and solve various engineering problems
	C03	Apply neural networks and genetic algorithms to combinatorial optimization problems
	C04	Evaluate and compare solutions by various soft computing approaches for a given problem
	C05	Understand the fuzzy object oriented databases.
BIG DATA ENGINEERING & A2CS42	C01	Demonstrate various sources of data and design an architecture for management of data.
	C02	Apply data preprocessing methods to store and process data in cloud by following safety rules at work place
	C03	Implement knowledge of hadoop and nosql databases to work with different data formats and generate reports in standard formats

	C04	Make use of machine learning algorithms to process any data and analyze results for decision making
	C05	Compare various data visualization tools and select the best visualization tool for generating reports on given dataset
CRYPTOGRAPHY AND NETWORK SECURITY LAB & A2CS33	C01	Apply the cipher techniques
	C02	Develop the various security algorithms
	C03	Utilize different open source tools for network security and analysis
BIG DATA ENGINEERING LAB USING HADOOP & A2CS35	C01	Connect to hadoop cluster, experiment with various linux and hdfs commands to store data.
	C02	Apply the knowledge of mapreduce programming to process the stored data in hdfs.
	C03	Make use of database operations to store results in tables and generate reports
	C04	Connect to web data sources for data gathering, integrate data sources with hadoop components to process streaming data
	C05	Generate reports using data visualization tools
CLOUD APPLICATION DEVELOPMENT LAB & A2CS34	C01	Demonstrate the benefits of various distributed computing platforms.
	C02	Use modern tools to build distributed applications.
	C03	Apply the middle ware architectures used in distributing computing platforms
	C04	Create virtual machine and templates
	C05	Illustrate the benefits of open source cloud computing platforms
INDUSTRIAL ORIENTATED MINI PROJECT & A2IT21	C01	Demonstrate a sound technical knowledge of their selected mini project topic.
	C02	undertake problem identification, formulation and solution
	C03	Design engineering solutions to complex problems utilizing a systems approach
	C04	Conduct an experiments in the engineering mini project and analysis the data results
	C05	Communicate with engineers and the community at large in written an oral forms.
	C06	Demonstrate the knowledge, skills and attitudes of a professional engineer.
MANAGEMENT SCIENCE IV-II & A2HS15	C01	To relate the concepts of management, administration and organization and different theories of management
	C02	To plan operations & marketing management
	C03	To extend market and business structures
	C04	To examine network of a project with time management.
	C05	To support on strategic alternatives.
PYTHON PROGRAMMING & A2IT23	C01	Students will be able to describe the numbers, math functions, strings, list, tuples and dictionaries in python
	C02	Students will be able to co-relate the concept of oo programming and the corresponding data structure while implementing programs using oo paradigm
	C03	Students will be able to demonstrate different decision making statements and functions.
	C04	Students will be able to design and develop client server network applications using python.
	C05	Students will be able to design web applications in python and evaluate different database operations
INFORMATION RETRIEVEL SYSTEM & A2CS50	C01	Understand the information retrieval strategies.
	C02	Analyze and use the various retrieval utilities for improving searching concepts.
	C03	Apply various retrieval utilities on crossing language barrier.
	C04	Evaluate space and time efficiency using indexing and compressing the documents
	C05	Comprehend and appreciate the different applications of information retrieval techniques in the internet or web.
COMPREHENSIVE VIVA-II & A2IT36	C01	Solve competitive exam questions.
	C02	Adapt interview facing skills
	C03	Make use of technical skills to solve computational problems
PROJECT WORK(STAGE II)	C01	Demonstrate a technical knowledge of their selected project topic.

& A2IT37	C02	Undertake problem identification, formulation and solution
	C03	Design engineering solutions to complex problems utilizing a systems approach
	C04	Conduct an experiments in the engineering project and analysis the data results
	C05	Communicate with engineers and the community at large in written an oral forms.
	C06	Demonstrate the knowledge, skills and attitudes of a professional engineer.
SEMINAR &A2IT38	C01	Demonstrate the skills in identifying, analyzing and presenting a topic.
	C02	Develop a quality literature survey on the recent technologies
	C03	Apply the knowledge gained for effective communication in the engineering community and design the technical report

Department Of Mechanical Engineering

MLR16

Course Name & Code	COs	Course Outcomes
DIFFERENTIAL EQUATIONS AND APPLICATIONS(CODE: A2HS01)	C01	Specify standard methods for solving differential equations and their applications in geometrical and physical problems
	C02	Identify different types of higher order differential equations and their applications in engineering problem solving
	C03	Apply partial derivatives to study maxima and minima of functions of two variables
	C04	Apply partial differential equations to solve the linear and nonlinear partial differential equations.
	C05	Apply partial differential equations to solve engineering problems
TECHNICAL ENGLISH (CODE: A2HS11)	C01	Construct sentences by using appropriate parts of speech
	C02	Write letters/paragraph/reports etc., for meaningful communication.
	C03	Use appropriate vocabulary in written and spoken
	C04	Comprehend and analyze different levels.
	C05	Identify correct common errors in spoken and written forms.
APPLIED PHYSICS-I CODE: A2HS06)	C01	Justify the propagation of errors with different methods
	C02	Identify and describe crystal structures and size of the unit cell by diffraction methods
	C03	Classify various magnetic, dielectric materials and apply knowledge gained in various fields.
	C04	Analyze why Laser light is more powerful than normal light and how it is used as a surgical too
	C05	Evaluate the advantages of imaging techniques.
ENGINEERING CHEMISTRY (CODE: A2HS09)	C01	Extrapolate the knowledge of cell, electrode, cathode, anode, electrolysis, electromotive force and reference electrode including corrosion of metals
	C02	Understand and explore the engineering applications of polymeric materials, cement, lubricants and refractories
	C03	Interpret the vitality of phase rule in metallurgy.
	C04	Summarize the application of colloids and nanoparticles on industry level in controlling pollution.
COMPUTER PROGRAMMING (CODE: 2CS01)	C01	Develop algorithms for mathematical and scientific problems
	C02	Explore alternate algorithmic approaches to problem solving
	C03	Choose data types and structures to solve mathematical and scientific problem
	C04	Develop modular programs using control structures
	C05	Write programs to solve real world problems using object oriented features

ENGLISH COMMUNICATION SKILLS LAB (CODE: A10007)	C01	Listen and comprehend different spoken discourses/excerpts in different accents
	C02	Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
	C03	Read different genres of texts adopting various reading strategies.
	C04	Write effective letters. Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary.
COMPUTER PROGRAMMING USING C LAB (CODE: A2CS02)	C01	Design and test programs to solve mathematical and scientific problems
	C02	Develop and test programs using control structures
	C03	Implement modular programs using functions
	C04	Develop programs using classes
ENGINEERING GRAPHICS (A2ME03)	C01	Sketch the conic sections, special curves, and draw orthographic views from pictorial views and models
	C02	Apply the principles of orthographic projections of points in all quadrants, lines and planes in first quadrant.
	C03	Sketch the projections of simple solids like prisms, pyramids, cylinder and cone and obtain the traces of plane figures.
	C04	Practice the sectional views of solids like cube, prisms, pyramids, cylinders & cones and extend its lateral surfaces.
	C05	Sketch the perspective projection of simple solids, truncated prisms, pyramids, cone and cylinders & sketch the isometric projection of simple machine parts.
LINEAR ALGEBRA AND INTEGRAL TRANSFORMS(CODE: A2HS03)	C01	Use elementary transformations to reduce matrices to echelon form, normal form and hence find their rank
	C02	Make use of echelon forms in finding the solution of system of linear equations
	C03	Compute Eigen values and Eigen vectors of square matrices. Reduce the quadratic form to canonical form
	C04	Apply Laplace transform to solve differential equations which will be converted to algebraic equation.
	C05	Determine Fourier transform, Fourier sine and cosine transform of a function
	C06	Apply partial differential equations to solve engineering problems.
APPLIED PHYSICS-II (CODE: A2HS07)	C01	Prove that energies of electron is quantized when particle is moving in a potential box.
	C02	Analyze the type of semiconductors and construction of LCD with different material.
	C03	Justifying the optical fiber is more advantage than cables and optical fiber in sensor application.
	C04	Analyze the engineering applications of ultrasonics.
	C05	Analyze the impossibility of faster than light transfer of information.
ELECTRICAL & ELECTRONICS ENGINEERING(CODE: A2EC02)	C01	Define basic electrical concepts, including electric charge, current, electrical potential, electrical Power and energy.
	C02	Distinguish the relationship of voltage and current in resistors, capacitors, inductors, and mutual Inductors.
	C03	Differentiate circuits with ideal, independent, and controlled voltage and current sources and able to apply Kirchoff's voltage and current laws to the analysis of electric circuits
	C04	Illustrate to apply concepts of electric network topology, nodes, branches, and loops to solve circuit problems, including the use of computer simulation.
	C05	Emphasize on basic laws and techniques to develop a working knowledge of the methods of analysis used.

	C06	Interpret to solve series and parallel magnetic circuits	
	C07	Design various two port network parameters and relations between them	
COMPUTATIONAL METHODS & INTEGRAL CALCULUS(CODE: A2HS02)	C01	Classify discrete and continuous distribution functions.	
	C02	Determine numerical solution of Non Linear equations.	
	C03	Discuss the Stability of a system of equations	
	C04	Demonstrate the use of curve fitting in correlation and regression analysis.	
	C05	Explain numerical differentiation and integration	
	C06	Examine numerical interpolation and approximation of functions	
	C07	Interpret errors in Numerical Methods	
	C08	Evaluate double integrals by changing variables, changing order and triple integration to find the area and volume of given region.	
	C09	Apply Beta and Gamma functions to evaluate improper integrals	
	C010	Apply Green's theorem to evaluate line integrals along simple closed contours on the plane, Stoke's theorem to give physical interpretation of the curl of a vector field and Divergence theorem to give physical interpretation of the divergence of a vector field.	
ENGINEERING MECHANICS (CODE: A2ME01)	C01	Resolve various force systems and calculate reactions of various supports on rigid bodies in equilibrium.	
	C02	Analyze the frictional forces of rigid bodies on rough horizontal and inclined planes.	
	C03	Evaluate geometric properties of composite areas and solids.	
	C04	Analyze moment of inertia, mass moment of inertia of various sections.	
APPLIED PHYSICS & ENGINEERING CHEMISTRY LAB(CODE: A2HS10)	C01	Identify elastic materials and modulus by its properties	
	C02	Select LED or SOLAR CELL for variety of applications	
	C03	Analyze energy gap of semiconductor, Resonance of LCR and Time Constant of RC circuits	
	C04	Analyze the wavelength of laser source using diffraction grating	
	C05	Evaluate the magnetic field along the axis of a current carrying coil by using Stewart&Gee's apparatus and Speed of light in glass	
	C06	Compare the interference phenomenon by using Newton's ring apparatus.	
	C07	Analyze how Haidinger fringes are used to measure thickness of given thin film	
		ENGINEERING CHEMISTRY LAB	
	C01	Describe the advantages of Conductometry and Potentiometry	
	C02	Handle sophisticated instruments, to interpret the results and to calculate other parameters	
	C03	Correlate the impurities with hardness of water	
	C04	Analyze the importance of temperature for Viscosity and Surface Tension.	
	C05	Know to maintain different reaction conditions to get maximum yield	
	ADVANCED ENGINEERING GRAPHICS (CODE: A2ME04)	C01	Sketch the conic sections, special curves, and draw orthographic views from pictorial views and models.
		C02	Apply the principles of orthographic projections of points in all quadrants, lines and planes in first quadrant.
C03		Sketch the projections of simple solids like prisms, pyramids, cylinder and cone and obtain the traces of plane figures.	
C04		Practice the sectional views of solids like cube, prisms, pyramids, cylinders & cones and extend its lateral surfaces.	

	C05	Sketch the perspective projection of simple solids, truncated prisms, pyramids, cone and cylinders & sketch the isometric projection of simple machine parts.
WORKSHOP PRACTICES (CODE: A2ME07)	C01	Students are able to assembling and disassembling of pc
	C02	Students are able to how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.
	C03	Thorough knowledge of various tools, machines, devices used in engineering practice for creating objects from material.
	C04	Thorough knowledge of carrying out various operations in basic engineering shops.
	C05	Ability of interpretation of job drawing, application of processes and operations to produce basic components from raw material.
PROBABILITY THEORY AND COMPLEX ANALYSIS(CODE: A2HS04)	C01	An ability to apply knowledge of mathematics, science and engineering as appropriate to the field of electronics communication engineering practice.
	C02	Specify Random variables discrete and continuous distribution.
	C03	Understand concept of limit, continuity differentiability and analyticity.
	C04	Calculate line integrals along piece wise smooth paths, interpret such quantities as work done by a force.
	C05	Calculate series solution by using Taylors and Maclaurin's series.
	C06	Evaluate Residues by Laurent series
Mechanics of Solids (A2ME08)	C01	Analyze for stresses and strains of deformable bodies subjected to simple and complex loads
	C02	Calculate the shear force and bending moment values of beams under various loads
	C03	Analyze the bending and shear stresses in beams
	C04	Evaluate the slope and deflection of beams
	C05	Evaluate the stresses and strains of cylindrical and spherical thin cylinders due to bursting forces
FLUID MECHANICS AND HYDRAULIC MACHINERY(A2ME09)	C01	Explain the effects of fluid properties on a flow system
	C02	Identify type of fluid flow patterns and describe continuity equation
	C03	Analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design.
	C04	Demonstrate boundary layer concepts and performance of turbines.
	C05	Select and analyze an appropriate turbine with reference to given situation in power plants
	C06	Estimate performance parameters of a given centrifugal and reciprocating pump.
THERMODYNAMICS(A2M E10)	C01	Understand concepts of thermodynamics and conversion of heat into work in various flow & non-flow processes
	C02	Apply the knowledge about second law of thermodynamics and determine the change in entropy, availability in various processes
	C03	Interpret various phases of pure substance and calculate its properties
	C04	Analyze the concepts of mixture of gases and their property values during any process
	C05	Understand the working of different types of air standard cycles and their performance
METALLURGY AND MATERIAL SCIENCE(A2ME11)	C01	Describe different crystal structures and classification of materials.
	C02	Identify the phases and their interrelationship in different alloy systems.
	C03	Determine microstructures, properties and applications of different materials.
	C04	Select suitable heat treatment process to achieve desired properties of metals and alloys
MACHINE DRAWING	C01	Define and create knowledge about the various practices with regard to the

LAB(A2ME12)		convention, dimensioning, sectioning and rules to be followed by engineers for making accurate drawings.
	C02	Demonstrate the essential drafting methodologies that can be ascertained and it forms a base for learning design of machine elements
	C03	Develop a set of working drawings of a machine assembly
	C04	The student can analyze the visualization of assembly and sub assembly of various machine elements.
	C05	Skilfully use modern engineering tools and techniques and justify cad-cam softwares for mechanical engineering design, analysis, and application.
ELECTRICAL & ELECTRONICS ENGINEERING LAB (A2EC04)	C01	Find the differences between generator & motor performances characteristics
	C02	Find the applications of electrical machines with the experimental determination of the performance of the machines
	C03	Find the applications of the transformers with the experimental determination of the performance of the transformers
	C04	Apply the basic components to real time applications
	C05	Analyze the concepts for designing 3-phase induction motor
	C06	Find the regulation of 3-phase alternator by using synchronous impedance method
MECHANICS OF SOLIDS LAB(A2ME13)	C01	To describe the ductile behavior of mild steel, estimate percentage of elongation and plot the graph between stress and strain.
	C02	To determine modulus of rigidity and evaluate maximum torque that can be transmitted through a shaft.
	C03	To calculate the toughness and energy absorption of machine members against impact loads
	C04	To evaluate deflection of cantilever and simply supported beams.
	C05	To analyze behavior of tension and compression springs
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS(A2HS14)	C01	Demonstrate basic concepts of economics and demand analysis.
	C02	Describe about production function, laws of returns and cost analysis
	C03	Discuss about types of competition and markets, methods of pricing and features of business organization.
	C04	Explain concepts of capital budgeting.
	C05	Describe accounting concepts and conventions.
DESIGN OF MACHINE MEMBERS - I (A2ME14)	C01	Describe general design procedure and selection of materials based up on the strength and its properties.
	C02	Evaluate endurance strength of machine components subjected to fluctuating stresses.
	C03	Apply various techniques to join the machine components and evaluate the strength of joints
	C04	Design power transmission elements like keys, cotters and shafts in machines .
	C05	Evaluate deflection, strain energy in a various types of mechanical springs.
THERMAL ENGINEERING - I(A2ME15)	C01	Discuss main idea and importance behind the 2 - S and 4 - S IC engines.
	C02	Explain the combustion process and also how it does affect the performance of the ic engines
	C03	Apply the thermodynamic principles in the design of an ic engines, compressors and refrigeration system.
	C04	Formulate and perform the procedures required for the maintenance and operation of IC engines, compressors and refrigeration systems

	C05	Compare different ic engines, compressors and refrigeration systems and develop a system which meets the requirements.
PRODUCTION TECHNOLOGY(A2ME16)	C01	Demonstrate different manufacturing processes and their classification.
	C02	Design core, core print and gating system in metal casting processes
	C03	Explain different methods of joining and cutting of metals through various welding techniques.
	C04	Develop process-maps for metal forming processes using plasticity principles
	C05	Identify and predict the causes of various defects in different manufacturing methods suitable remedy for them
KINEMATICS OF MACHINERY (A2ME17)	C01	Discriminate between machine, mechanism and their components intended for motion transmission.
	C02	Analyze the mechanisms for displacement, velocity and acceleration.
	C03	Analyze lower paired mechanisms for desired path generation
	C04	Design and analyze higher paired mechanisms for desired path generation using cams and followers
	C05	Select and analyze gears and gear trains with an intent to design power transmission in machines and automobiles.
PRODUCTION TECHNOLOGY LAB (A2ME18)	C01	Able to design and manufacture simple patterns
	C02	Able to determine sand properties.
	C03	Able to operate arc welding, gas welding and resistance welding equipment
	C04	Able to use pipe bending and injection moulding equipment
	C05	Able to use hydraulic press for deep drawing operation
METALLURGY & MATERIAL SCIENCE LAB(A2ME19)	C01	Prepare sample for the study of micro structure.
	C02	Find micro structure of various metals and alloys.
	C03	Determine the micro structure of heat treated steel.
	C04	Analyze significance of cooling rate in the formation of fine grains using jominy and quench test.
	C05	Find hardness of various treated and untreated steels
FLUID MECHANICS AND HYDRAULIC MACHINERY LAB(A2ME20)	C01	Evaluate major and minor energy losses occur in flow through pipes experimentally. Demonstrate construction, working of flow measuring devices and to calibrate them experimentally.
	C02	Demonstrate continuity equation and Bernoulli's equation experimentally
	C03	Apply impulse-momentum equation and evaluate impinging force by a fluid-jet experimentally.
	C04	Demonstrate construction, working and to evaluate performance of impulse turbines experimentally
	C05	Demonstrate construction, working and to evaluate performance of reaction turbines experimentally.
	C06	Demonstrate construction, working and to evaluate performance of centrifugal pumps experimentally.
	C07	Demonstrate construction, working and to evaluate performance of reciprocating pumps experimentally
ENVIRONMENTAL STUDIES(A2HS16)	C01	Able to identify the environmental conditions
	C02	Able to solve various ecosystem and biodiversity problems
	C03	Able to know the environmental pollution, global issues and control measures
	C04	Able to know the green environmental issues.

	C05	Able to know the environmental ethics, assessment and role of NGOs.
DYNAMICS OF MACHINERY(A2ME21)	C01	Calculate and analyze the effect of gyroscopic and centrifugal couples on aeroplane, naval ship and automobiles moving in a curved path.
	C02	Determine and analyze the frictional forces and frictional torque transmitted by various components such as clutches, brakes and dynamometers.
	C03	Design and analyze various components of i.c. engines such as flywheels and governors.
	C04	. Estimate the amount of unbalanced forces in various rotating and reciprocating parts of the engine.
	C05	Determine the frequency of free and torsional vibrations in various machine members.
MACHINE TOOLS(A2ME22)	C01	Describe the working of different machine tools and their operations
	C02	Identify suitable work and tool holding devices for various machine tools
	C03	Illustrate cutting tool nomenclature, geometry and its mechanics
	C04	Calculate various cutting forces and other parameters involved in machining operations
	C05	Explain the working of various surface finishing machines
	C06	Select tool materials which suitable for different machining operations
THERMAL ENGINEERING - II(A2ME23)	C01	Evaluate the performance of rankine cycle and analyze the combustion process
	C02	Evaluate, calculate, understand ,classify various types of boilers and nozzles
	C03	Classify, understand and analyze different types of condensers, steam turbines. Calculate the performance of steam turbine
	C04	Analyze the degree of reaction thermodynamically, the performance of gas turbine. Calculate and evaluate the performance of reaction and gas turbines.
	C05	Understand , analyze the operation of jet engines and rockets. Classify different types of jet engines and rockets.
DESIGN OF MACHINE MEMBERS - II(A2ME24)	C01	Ability to identify design variables and performance factors in the study of journal bearings
	C02	Apply the basic principles for design of piston, connecting rod and crankshaft based on maximum bending and twisting moments
	C03	Design of screws that are applied in hosting of heavy weights like screw jack etc
	C04	Knowledge on power transmission elements like belts, chains and ropes and able to design on stress criteria
	C05	Apply the design concepts to evaluate the strength of the gear
THERMAL ENGINEERING LAB(A2ME28)	C01	To demonstrate the working and conduct the performance test on reciprocating air compressors. study various types of boilers.
	C02	To demonstrate the working and conduct the performance test on single cylinder 4 stroke c i engine. assemble and disassemble of engines
	C03	To demonstrate the working and conduct the performance test on single cylinder 4 stroke s i engine.
	C04	To demonstrate the working and conduct the performance test on single cylinder 2 stroke s i engine
	C05	To conduct the performance test on 4 cylinder 4 stroke s i engine and demonstrate the morse test.
MACHINE TOOLS LAB(A2ME29)	C01	To make students to identify various cutting tools and its uses
	C02	To make students to understand the working of various machine tools.
	C03	To make students familiar with various operations on various machines
	C04	To make students to create prototype models by machining.

DYNAMICS OF MACHINERY LAB (A2ME30)	C01	To evaluate the natural frequency of vibration systems
	C02	To analyze the balancing of rotating masses and field balancing
	C03	To determine the gyroscopic couple and can explain its effects.
	C04	To analyze the data through FFT analyzer both in frequency domain and time domain
	C05	To develop the program for articulate robot for palletizing and other operations
ENGINEERING METROLOGY(A2ME31)	C01	Describe the basics of measurement standards, limits, fits and tolerances
	C02	Design go and no go gauges for hole and shaft assembly
	C03	Explain the working of various measuring instruments like linear, angular, optical, coordinate measuring machines etc
	C04	Determine the surface roughness values by using various methods
	C05	Evaluate various parameters of screw thread and gears.
	C06	Inspect the quality and control of various components in industrial applications
HEAT TRANSFER(A2ME32)	C01	Demonstrate the basic modes of heat transfer and compute temperature distribution in steady state and unsteady state heat conduction
	C02	Analyze the heat transfer through variable thermal conductivity, system with heat generation and extended surfaces.
	C03	Interpret the free and forced convection heat transfer.
	C04	Comprehend the phenomena and flow regimes of boiling and condensation and able to apply LMTD and NTU methods to design heat exchangers
	C05	Describe the principles of radiation heat transfer.
COMPOSITE MATERIALS(A2ME38)	C01	Identify and explain the types of composite materials and their characteristic features
	C02	Explain the differences in the strengthening mechanism of composite and its corresponding
	C03	Effect on performance and application;
	C04	Understand and explain the methods employed in composite fabrication;
	C05	Learn simple micromechanics and failure modes of composites.
HEAT TRANSFER LAB(A2ME41)	C01	Demonstrate the steady state conduction heat transfer fundamentals and apply them to composite systems and extended surfaces
	C02	Apply the transient conduction heat transfer fundamentals to engineering equipments
	C03	Calculate the convection heat transfer parameters through various apparatus.
	C04	Evaluate the radiation characteristics of different components.
	C05	Analyze the phase change heat transfer phenomena
METROLOGY LAB(A2ME42)	C01	Apply familiarity with the different instruments those are available for linear, angular, roundness and roughness measurements
	C02	To be able to demonstrate and use the appropriate measuring instrument according to a specific requirement.
	C03	Describe students with practical skills associated with measuring techniques
	C04	Interpret activities include precision measurement of component features, form and geometry utilizing specialized measuring instruments and equipment
	C05	Design effectively in product processing methods
ADVANCED ENGLISH COMMUNICATION SKILLS LAB(A2HS13)	C01	identify the vocabulary
	C02	To describe the writing skills
	C03	To adapt the speaking and listening skills
	C04	to explain the topic in a proper manner

	C05	to develop his communication skills
CAD/CAM (A2ME43)	C01	Able to identify the role of computers in industrial manufacturing
	C02	Able to describe the various geometric constructions, models, curve representation methods, surface representation methods
	C03	Able to demonstrate drafting and modeling methods
	C04	Able to describe about numerical control, structure of CNC machine tools, manual part programming methods, computer aided part programming
	C05	Able to demonstrate knowledge of computer aided processes planning, production flow analysis.
INSTRUMENTATION AND CONTROL SYSTEMS(A2ME44)	C01	Ability to understand and analyze the instruments and their applications to various industries
	C02	Ability to generalized measurement system and able to model and analyze the transducers
	C03	Knowledge in measuring techniques and to apply in field of engineering to monitor the operational systems
	C04	Ability to formulate certain empirical relations where adequate theory does not exit
	C05	Ability to apply control theory to practical engineering problem to describe the defective components that need to be out right rejected at the earliest stage.
FINITE ELEMENT METHODS (A2AE26)	C01	Understand, formulate and solve finite element equations for 1-d elements
	C02	Derive stiffness matrices, analyze trusses and beams subjected to different load conditions
	C03	Solve 2-d problems using constant strain triangular elements and explain convergence requirements
	C04	Understand, formulate and solve finite element equations of heat transfer problems
	C05	Analyze axial bar and beam elements subjected to dynamic loads
CAD/CAM LAB (A2ME53)	C01	insert, manipulate, constrain and modify components in an assembly
	C02	work with the links of the assembly and create parts within the assembly structure
	C03	perform static and dynamic analysis to solve various engineering field problems.
	C04	solve heat transfer analysis problems.
	C05	perform different operations on CNC lathe and CNC milling machines.
PRODUCTION DRAWING LAB (A2ME54)	C01	Able to memorize and represent the conventional drawings
	C02	Able to compare and select different types of fits.
	C03	Able to identify and indicate the form and position tolerances on drawings
	C04	Able to prepare drawings indicating surface roughness on machine components based on heat treatment , manufacturing processes and surface treatment
	C05	Able to develop detailed and part drawings indicating the size, tolerances, roughness, form and position errors etc.
INSTRUMENTATION AND CONTROL SYSTEMS LAB (A2ME54)	C01	Ability to calibrate and analyze the measuring system for the measurement of displacement and pressure
	C02	Ability to calibrate and analyze the measurement systems for the measurement of temperature
	C03	Ability to calibrate and analyze the measuring system for the measurement of speed
	C04	Ability to calibrate and analyze the measurement systems of fluid flow
	C05	Ability to calibrate and analyze the measuring system for the measurement of seismic pickup
COMPOSITE MATERIALS	C01	Fabricate metal matrix and polymer matrix composites using different fabrication

LAB (A2ME55)		process
	C02	Evaluate properties of laminated composites.
	C03	Prepare metal matrix composites using stir casting machine.
	C04	Determine properties of metal matrix composites.
	C05	Detect void and flaws in metal matrix composites.
AUTOMOBILE ENGINEERING (A2ME38)	C01	Identify and differentiate the various components of an automobile vehicle, types of engines with the better understanding of the lubrication system and maintenance.
	C02	Critically assess the fuel supply system for si and ci engines, bearing in mind pollution control norms.
	C03	Evaluate the cooling and ignitions systems used for an automobile.
	C04	Analyze the acquired knowledge, applied on transmission system and braking system.
	C05	Analyze the various steering geometries, evaluate and create a suitable suspension system, and able design a complete automobile system.
OPERATIONS RESEARCH (PROFESSIONAL ELECTIVE – I)(A2ME37)	C01	Understand linear programming problem techniques and calculate the maximum profit or minimizing the total cost
	C02	Analyze the optimal solution for the problem by determining the appropriate method
	C03	Evaluate the waiting time of the customer by identifying the behavior of the system
	C04	Determine the best (optimum) decision relative to largest possible portion of the total organization.
	C05	Create a model and apply systematic approach in problem analysis to get a feasible solution. modeling and evaluation of solutions for the problems
POWER PLANT ENGINEERING (PROFESSIONAL ELECTIVE – I)(A2ME57)	C01	Describe the various types of power plants used in Jordan.
	C02	Discuss about various types of conventional and non-conventional power plants
	C03	Demonstrate the knowledge of the operation, construction and design of various components of power plants.
	C04	Calculate the performance parameters of various power plants.
	C05	Define and calculate the various factors of plant load and economy.
MECHATRONICS (PROFESSIONAL ELECTIVE – I)(A2ME39)	C01	Demonstrate basic concepts of mechatronics.
	C02	Explain about data presentation systems, analog and digital indicators, liquid crystal display units and data acquisition systems.
	C03	Explain about pneumatic controllers.
	C04	Describe controls in NC machines.
	C05	Discuss about basic fluidic devices.
PRODUCT LIFE CYCLE MANAGEMENT (PROFESSIONAL ELECTIVE – I)(A2ME40)	C01	List, justify and interpret productivity models in Manufacturing and service organization.
	C02	Judge product development and industrial process design.
	C03	Predict facility location and network models.
	C04	Interpret and solve data from aggregate output planning models
	C05	Select and analyze an inventory control model based upon given data.
	C06	Predict and control the quality of an end product.
	C07	Design and model industrial systems using linear and non-linear programming approaches
PRODUCTION PLANNING & CONTROL (PROFESSIONAL ELECTIVE – II)(A2ME49)	C01	Demonstrate basic concepts of production planning and control and forecasting methods
	C02	Explain inventory management
	C03	Explain routing procedure and bill of materials
	C04	Discuss scheduling and scheduling policies

	C05	Describe dispatching procedure and activities of a dispatcher.
REFRIGERATION AND AIR CONDITIONING (PROFESSIONAL ELECTIVE – II)(A2ME50)	C01	Able to analyze air refrigeration and steam jet refrigeration cycles
	C02	Able to apply the principles of psychrometry and to perform load calculations.
	C03	An ability to derive chemical formulae for refrigerants; identify, formulate and solve problems on vapour compression and vapour absorption refrigeration systems.
	C04	Able to design a component to meet desired need of refrigeration.
	C05	Able to demonstrate various heat pump circuits.
RENEWABLE ENERGY SOURCES (PROFESSIONAL ELECTIVE – II)(A2ME51)	C01	Identify various renewable energy sources and their utilization.
	C02	Demonstrate the basic concepts of solar radiation and analyze the working of solar PV cell and thermal systems.
	C03	Discuss principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas and hydrogen.
	C04	Describe the concepts and applications of fuel cells, thermoelectric convertor and MHD generator.
	C05	Identify methods of energy storage for specific applications.
	C06	Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.
UNCONVENTIONAL MACHINING PROCESSES (PROFESSIONAL ELECTIVE – II)(A2ME52)	C01	Demonstrate knowledge about the modern manufacturing processes and their applications in various industries.
	C02	Explain the need for unconventional machining processes in comparison with conventional manufacturing processes.
	C03	Classify of unconventional machining processes
	C04	Describe the principle, mechanism of metal removal rate of various unconventional machining processes.
	C05	Identify the selection of processes.
INDUSTRIAL ROBOTICS (PROFESSIONAL ELECTIVE – III) (A2ME58)	C01	Able to identify robot anatomy and solve kinematic equations and robot arm dynamics
	C02	Able to evaluate design control system models
	C03	Able to identify and design actuation motions, taking into considerations grippers and end effectors.
	C04	Able to design robot for material transfer process and operations of manufacturing
	C05	Able to evaluate assembly, work cell control.
ADDITIVE MANUFACTURING (PROFESSIONAL ELECTIVE – IV)(A2ME65)	C01	Demonstrate fundamental concepts of additive manufacturing.
	C02	Classify and explain liquid based additive manufacturing systems.
	C03	Explain fusion decomposition modeling
	C04	Describe principle and working of thermal jet printer, 3-D printer, Genisys Xs printer HP system.
	C05	Explain about rapid manufacturing process optimization.
FUNDAMENTALS OF ENGINEERING MATERIALS (OPEN ELECTIVE-I) (A2ME27)	C01	.Explain basic concepts of crystal structure such as unit cells, crystal systems of metals etc
	C02	Demonstrate the concept of alloying and formation of different types of phases in alloys
	C03	.Differentiate ferrous and non ferrous alloys.
	C04	Explain various heat treatment processes.
	C05	.Classify and explain polymers, ceramics and composites.
BASICS OF ROBOTICS (OPEN ELECTIVE-II)(A2ME36)	C01	Demonstrate different types of robots, specifications of robots and different end effectors used in robots.
	C02	Explain various types of end effectors
	C03	Evaluate rotation matrices, forward kinematics of RR, RP and 3R Manipulators.
	C04	Explain inverse kinematics of RR manipulator, RP manipulator and trajectory

		planning techniques.
	C05	Explain feedback components used in robots and industrial applications.
NON-CONVENTIONAL ENERGY SOURCES (OPEN ELECTIVE - III) (A2ME47)	C01	Demonstrate various energy sources and their availability.
	C02	Explain concepts and applications of solar energy
	C03	Discuss elaboratively the principles of wind energy conversion
	C04	Explain Biomass conversion techniques and Geothermal Sources and resources
	C05	Explain about tidal energy and Ocean Thermal Energy
INTRODUCTION TO JETS AND ROCKETS (OPEN ELECTIVE -I)(A2AE19)	C01	Explain basic concepts of aerospace propulsion.
	C02	Describe principles of jet propulsion.
	C03	Discuss about the aspects of ramjet engines, scream jet engines and nozzles.
	C04	Formulate Equations of rocket motion in free space, Tsiokovsky's equation.
	C05	Describe about types, applications of rockets and the types of fuel in aviation and aerospace engineering.
NON DESTRUCTIVE TESTING METHODS (OPEN ELECTIVE -II) (A2AE28)	C01	Describe the various types of NDT tests carried out on components
	C02	Explain liquid penetrate testing and magnetic particle testing
	C03	Explain ultrasonic method of testing the materials
	C04	Discuss about radiography uses in engineering.
	C05	Demonstrate principles of special NDT methods such as acoustic emission testing, infrared thermography, laser shearography etc.