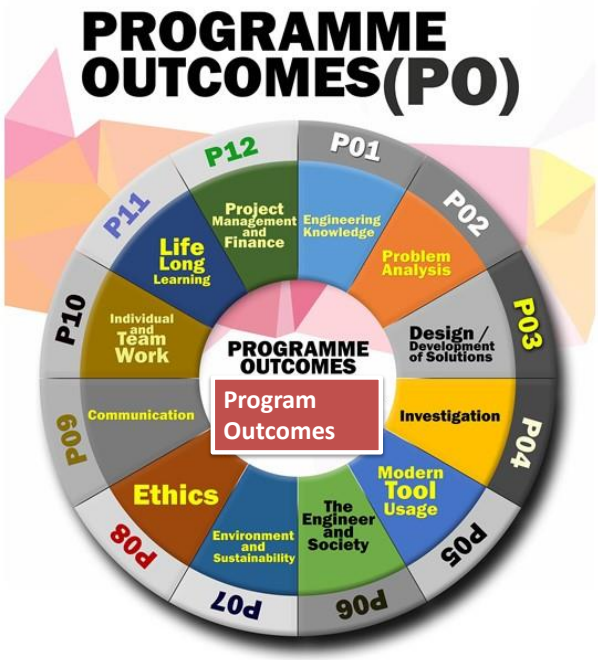
PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOMES AND COURSE OUTCOMES OF ALL DEPARTMENTS - 2018-19 (CRITERIA - 2)

Department of Aeronautical Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:



PO1 - Engineering Knowledge: Apply knowledge of mathematics and science, with fundamentals of Aeronautical Engineering to be able to solve complex engineering problems

related to Aeronautical Engineering.

PO2 - Problem Analysis: Identify, Formulate, review research literature and analyze complex engineering problems related to Aeronautical Engineering and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3 - Design/Development of solutions: Design solutions for complex aircraft problems related to Aeronautical Engineering 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

PO4 - Conduct Investigations of Complex problems: Use research–based knowledge and research methods including design of aircraft structure experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 - Modern Tool Usage: Create, Select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to Aeronautical Engineering related complex engineering activities with an understanding of the limitations.

PO6 - 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 Aeronautical professional engineering practice.

PO7 - Environment and Sustainability: Understand the impact of the Aeronautical professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development

PO8 - Ethics: Apply Ethical Principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary Settings.

PO10 -Communication: Communicate effectively on complex engineering activities with the engineering community and with High society and with write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO11 -Project Management and Finance: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.

PO12 -Life-Long Learning: Recognize the need for and have the preparation and ability to

engage in independent and life-long learning the broadest content of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

Engineering Graduates will be able to:

PSO-1: AEROMODELLING	Apply their Engineering knowledge of all the fundamental, Core subjects & the Hardware and Software skills in the development (design, fabrication, analysis, testing and flying) of Aero models(RC, UAV & DRONES).
PSO-2: AEROSPACE EXPOSURE	Students will be given additional exposure in advanced development in the fields like AEROSPACE and Helicopter designs.
PSO-3: Career Improvement through NETWORK	Graduates will get quality industrial exposures and career opportunities in the field of aeronautics and aerospace from eminent scientists of ISRO, NAL, and DRDO taking advantage from the department's Strong network.

Course Outcomes:

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Elements of Aeronautics – 17AE32	
CO1	Appreciate and apply the basic principle of aviation.
CO2	Apply the concepts of fundaments of flight, basics of aircraft structures, and aircraft propulsion and aircraft materials during the development of an aircraft.

CO3	Comprehend the complexities involved during development of flight vehicles.

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Aerothermodynamics– 17AE33	
CO1	Apply the concepts and definitions of thermodynamics.
CO2	Differentiate thermodynamic work and heat and apply I law and II law of thermodynamics to different process.
CO3	Apply the principles of various gas cycles.

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Mechanics of Materials– 17AE34	
CO1	Apply the basic concepts of strength of materials.
CO2	Compute stress, strain under different loadings.
CO3	Distinguish the different failure theories.

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Mechanics of Fluid– 17AE35	
CO1	Evaluate the effect of fluid properties.
CO2	Apply the governing laws of fluid flow.
CO3	Classify different types of fluid flows.

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Measurement and Metrology– 17AE36	
CO1	Apply the standards of measurement, system of limits, fits, tolerances and gauging.
CO2	Identify and use appropriate measuring instruments
CO3	Acquire the knowledge on measurement and measurement systems

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: Measurement and Metrology Lab– 17AEL37A	
CO1	Identify and classify different measuring tools related to experiments.
CO2	Identify, define, and explain accuracy, precision, and some additional terminology.
CO3	Conduct, Analyze, interpret, and present measurement data from measurements experiments.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: Machine Shop Lab– 17AEL38	
CO1	Demonstrate the operation of general purpose machine tools and manufacturing process.
CO2	Identify the special purpose machine tools for specific requirements
CO3	Develop physical models using different manufacturing processes.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Aerodynamics-I– 17AE42	
CO1	Evaluate typical airfoil characteristics and two-dimensional flows over airfoil
CO2	Compute and analyse the incompressible flow over finite wings
CO3	Apply finite wing theory and design high lift systems from the aerodynamics view point

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Aircraft Propulsion– 17AE43	
CO1	Apply the basic principle and theory of aircraft propulsion.
CO2	Explain the functions of centrifugal, axial compressors, axi.al and radial turbines.
CO3	Analyse the performance of nozzles & inlets and combustion chamber.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Mechanisms and Machine Theory – 17AE44	
CO1	Apply the theory of velocity, acceleration and static force analysis to design of mechanisms.
CO2	Design spur gears, gear train, balancing of rotating and reciprocating masses
CO3	Apply governors and gyroscope

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Aircraft Material Science – 17AE45	
CO1	Identify appropriate aircraft materials for a given application.
CO2	Explain the properties of super alloys, ablative materials and high energy material.
CO3	Understand material corrosion process and apply prevention technique.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Turbo machines – 17AE46	
CO1	Compute the energy transfer and energy transformation in turbo machines.
CO2	Analyse the design of turbo machine blades
CO3	Apply hydraulic pumps and turbines for specific requirements

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Material Testing Lab– 17AEL47A	
CO1	Apply the relations among materials and their properties.
CO2	Differentiate the formation, properties and significance of the alloys through different experiments
CO3	Understand the different types, advantages and applications of various NDT methods

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Computer Aided Aircraft Drawing Lab– 17AEL48	
CO1	Distinguish drawings of machine and aircraft components
CO2	Identify assembly drawings either manually or by using standard CAD packages
CO3	Practice with standard components and their assembly of an aircraft

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Management And Entrepreneurship– 15AE51	
CO1	Explain about the management and planning.
CO2	Apply the knowledge on planning, organizing, staffing, directing and controlling.
CO3	Describe the requirements towards the small-scale industries and project preparation

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Introduction To Composite Materials– 15AE52	
CO1	Explain the advantages of using composite materials as an alternative to conventional materials for specific applications
CO2	Describe the advanced fabrication and processing for producing composite parts.
CO3	Evaluate the micro- and macro-mechanical behavior of composite laminates

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Heat & Mass Transfer– 15AE53	
CO1	Describe the fundamental of heat and mass transfer.
CO2	Familiarize the student in the area of conduction, convection and radiation.
CO3	Analyze the problems due to heat transfer in several areas.

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Aircraft Structures - I – 15AE54	
CO1	Apply the basic concepts of stress and strain analysis.
CO2	Compute the impact stress.
CO3	Identify appropriate materials for suitable application based on properties

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Gas Dynamics– 15AE552	
CO1	Apply the equations of steady flow.
CO2	Explain the isentropic flow, adiabatic flow and wave phenomena.
CO3	Describe the flames and combustion

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Theory Of Vibrations – 15AE563	
CO1	Apply the principle of super position to Simple Harmonic Motions.
CO2	Determine the vibrations using vibration instruments.
CO3	Apply the numerical methods for multi-degree freedom systems

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Aerodynamics Lab– 15AEL57	
CO1	Apply the flow visualization techniques.
CO2	Estimate the pressure distribution over the bodies.
CO3	Calculate the lift and drag

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Energy Conversion And Fluid Mechanics Lab– 15AEL58	
CO1	Operate the instrument and measure the BP, FP, IP and AF ratio.
CO2	Find the efficiency of the engine and Estimate the calorific value of the given fuel
CO3	Verify the Bernoulli's equation
CO4	Evaluate the viscosity of fluid

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Aerodynamics - II– 15AE61	
CO1	Utilize the concepts of compressible flow and shock phenomenon
CO2	Apply knowledge of oblique shock and expansion wave formation.
CO3	Measure the parameters high speed flow.

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Gas Turbine Technology– 15AE62	
CO1	Select the suitable materials for engine manufacturing.
CO2	Evaluate the performance of the engine.
CO3	Test the engine using several types of engine testing methods

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Aircraft Performance -15AE63	
CO1	Apply the basic airplane performance parameters.
CO2	Differentiate the aircraft performance in steady unaccelerated and accelerated flight.
CO3	Explain the aircraft maneuver performance

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Aircraft Structures - II– 15AE64	
CO1	Utilize the concepts of thin walled beams.
CO2	Calculate the buckling of plates.
CO3	Analysis the stress in wings and fuselage frames

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Finite Element Method– 15AE651	
CO1	Apply discretisation technique for domain decomposition.
CO2	Evaluate the effects of different loading and boundary conditions
CO3	Analyze the governing equations of finite element analysis

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Space Mechanics – 15AE653	
CO1	Apply the basic concepts of space mechanics and the general N-body.
CO2	Explain satellite injection and satellite orbit perturbations.
CO3	Distinguish between interplanetary and ballistic missile trajectories.

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Unmanned Aerial Vehicles Basics & Applications– 15AE661	
CO1	Apply the basic concepts of UAV systems.
CO2	Explain the basic aerodynamics, performance, stability and control required for UAV.
CO3	Select the propulsion system and materials for structures.

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Maintenance, Overhaul &Repair Of Aircraft Systems– 15AE664	
CO1	Maintain the aircraft maintenance manual and logbook.
CO2	Do the quality control and calibration.
CO3	Incorporate the safety regulations and rules

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Aircraft Propulsion Lab– 15AEL67	
CO1	Analyze the cascade testing of axial compressor and axial turbine blade row.
CO2	Evaluate the performance of a jet engine.
CO3	Perform the measurement of a flame and nozzle flow

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Aircraft Structures Lab – 15AEL68	
CO1	Compute the deflection of simply supported beam and cantilever beam.
CO2	Verify the Maxwell's theorem.
CO3	Determine the buckling load, shear failure and shear centre

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: Control Engineering– 15AE71	
CO1	Apply the concepts of control systems.
CO2	Reduce the block diagrams and signal flow graphs
CO3	Determine the frequency response analysis by using various types of plots

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: Computational Fluid Dynamics – 15AE72	
CO1	Differentiate the FDM, FVM and FEM
CO2	Perform the flow, structural and thermal analysis.
CO3	Utilize the discretization methods according to the application

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: Aircraft Stability And Control – 15AE73	
CO1	Apply the basic concepts of aircraft stability and control.
CO2	Differentiate the static longitudinal and static directional stability.
CO3	Estimate the dynamic derivatives

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: Helicopter Dynamics– 15AE743	
CO1	Apply the basic concepts of helicopter dynamics.
CO2	Compute the critical speed by using various methods.
CO3	Distinguish the turbo rotor system stability by using transfer matrix and finite element formulation

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: Wind Tunnel Techniques– 15AE752	
CO1	Apply the principles and procedures for model testing in the wind tunnel.
CO2	Classify the types and functions of wind tunnel.
CO3	Distinguish the conventional measurement techniques and special wind tunnel techniques

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: Flight Simulation Lab– 15AEL76	
CO1	Apply the dynamics of aerospace vehicles for mathematically modelling.
CO2	Calculate the dynamics response of aircraft.
CO3	Use computational tools to model aircraft

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: Modeling & Analysis Lab – 15AEL77	
CO1	Draw the geometric models of symmetric, cambered aerofoil, nozzle, wing and other structures.
CO2	Apply different types of meshing.
CO3	Perform the flow and stress analysis

Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Avionics Systems– 15AE81	
CO1	Select the suitable data bus based on the application.
CO2	Identify the suitable navigation systems.
CO3	Distinguish the avionics system architecture

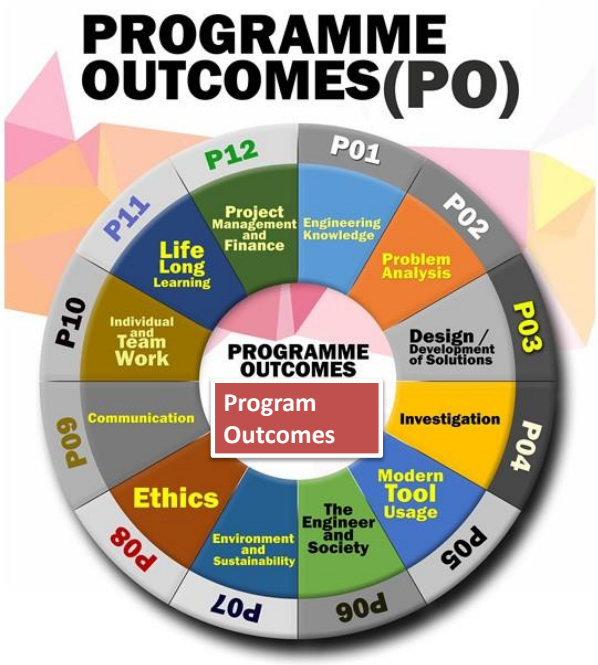
Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Flight Vehicle Design – 15AE82	
CO1	Calculate the thrust to weight ratio and wing loading.
CO2	Compute the flight vehicle performance.
CO3	Select the subsystems as per vehicle design

Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Flight Testing – 15AE831	
CO1	Measure The Flight Parameters.
CO2	Estimate The Performance Of Flight.
CO3	Apply The FAR Regulations

Department of Aerospace Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:



PO1 - Engineering Knowledge: Apply knowledge of mathematics and science, with fundamentals of Aerospace Engineering and able to solve complex engineering problems related to Aerospace Engineering.

PO2 - Problem Analysis: Identify, Formulate, review research literature and analyze complex engineering problems related to Aerospace Engineering and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3 - Design/Development of solutions: Design solutions for complex problems related to Aerospace Engineering 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

PO4 - Conduct Investigations of Complex problems: Use research–based knowledge and

research methods including design of space vehicle structure experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 - Modern Tool Usage: Create, Select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to Aerospace Engineering related complex engineering activities with an understanding of the limitations.

PO6 - 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 Aerospace professional engineering practice.

PO7 - Environment and Sustainability: Understand the impact of the Aerospace professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development

PO8 - Ethics: Apply Ethical Principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary Settings.

PO10 -Communication: Communicate effectively on complex engineering activities with the engineering community and with High society and with write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO11 -Project Management and Finance: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12 -Life-Long Learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning the broadest content of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

Engineering Graduates will be able to:

PSO-1: **Professional** **Knowledge**	Apply the knowledge of aerospace engineering in innovative, dynamic and challenging environment for design and development of flight or space vehicles through simulation, Programming skills and general purpose CAE packages.
PSO-2: **Leadership Skills**	Providing different types of in house training and industry practice to fabricate, test and develop the products with more innovative technologies.
PSO-3: **Attitude** **Development**	To prepare students to become technocrats with broad aerospace knowledge for design and development of systems and subsystems for aerospace and associated fields.

Course Outcomes:

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Engineering Mathematics - III– 17MAT31	
CO1	Apply knowledge of linear algebra for finding the solution of system of linear equations.
CO2	Analyze and interpret physical phenomena, which are periodic in nature by applying Fourier series.
CO3	Solve Algebraic and transcendental equations using effective numerical methods.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: INTRODUCTION TO AEROSPACE ENGINEERING– 17AS32	
CO1	Apply the basic knowledge & principles of aviation & spaceflight.
CO2	Apply the concepts of fundaments of flight, basics of aircraft structures, aircraft & rocket propulsion and aircraft materials during the development of an aircraft
CO3	Appreciate the complexities involved during development of flight vehicles.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: AERO-THERMODYNAMICS– 17AS33	
CO1	Apply the concepts and definitions of thermodynamics.
CO2	Differentiate thermodynamic work and heat and apply I law and II law of thermodynamics to different process.
CO3	Apply the principles of various gas cycles.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: Mechanics of Materials– 17AS34	
CO1	Apply the basic concepts of strength of materials.
CO2	Compute stress, strain under different loading.
CO3	Distinguish the different failure theories.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: Mechanics of Fluid– 17AS35	
CO1	Evaluate the effect of fluid properties.
CO2	Apply the governing laws of fluid flow.
CO3	Classify different types of fluid flows.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: AEROSPACE MATERIALS– 17AS36	
CO1	Apply the knowledge about the mechanical behaviour of different aircraft & aerospace materials.
CO2	Explain the applications of Aluminium alloys, Ceramics and Composites Materials.
CO3	Appreciate the importance of high temperature materials and their characterization.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: Material testing and Metrology Lab– 17ASL37	
CO1	Apply the relations among materials properties.
CO2	Identify and classify different measuring tools related to experiments and Identify, define, and explain accuracy, precision.
CO3	Conduct, Analyze, interpret, and present measurement data from measurements experiments.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: Fluid Mechanics LAB– 17ASL38	
CO1	Acquire knowledge of flow meters and flow visualization.
CO2	Give student insight into working of various fluid machines.
CO3	Compare performance of fluid machines under different working conditions.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: ENGINEERING MATHEMATICS - IV– 17MAT41	
CO1	Use appropriate numerical methods to solve first and second order ordinary differential equations.
CO2	Use Bessel's and Legendre's function which often arises when a problem possesses axial and spherical symmetry, such as in quantum mechanics, electromagnetic theory, hydrodynamics and heat conduction.
CO3	State and prove Cauchy’s theorem and its consequences including Cauchy's integral formula, compute residues and apply the residue theorem to evaluate integrals.

CO4	Analyze, interpret, and evaluate scientific hypotheses and theories using rigorous statistical methods.
Year / SEM : 2nd year / 4th sem	**Year of Study : 2018-19**
Course Name: Aerodynamics-I– 17AS42	
CO1	Evaluate typical airfoil characteristics and two-dimensional flows over airfoil
CO2	Compute and analyse the in-compressible flow over finite wings
CO3	Apply finite wing theory and design high lift systems from the aerodynamics view point

Year / SEM : 2nd year / 4th sem	**Year of Study : 2018-19**
Course Name: AEROSPACE STRUCTURES – I– 17AS43	
CO1	Apply the basic concepts of stress and strain analysis.
CO2	Compute the impact stress.
CO3	Identify appropriate materials for suitable application based on properties.

Year / SEM : 2nd year / 4th sem	**Year of Study : 2018-19**
Course Name: Mechanisms and Machine Theory – 17AS44	
CO1	Apply the theory of velocity, acceleration and static force analysis to design of mechanisms.
CO2	Design spur gears, gear train, balancing of rotating and reciprocating masses
CO3	Apply governors and gyroscope

Year / SEM : 2nd year / 4th sem	**Year of Study : 2018-19**
Course Name: HEAT & MASS TRANSFER – 17AS45	
CO1	Evaluate the effect of fluid properties.
CO2	Familiarize the student in the area of conduction, convection and radiation.
CO3	Analyze the problems due to heat transfer in several areas.

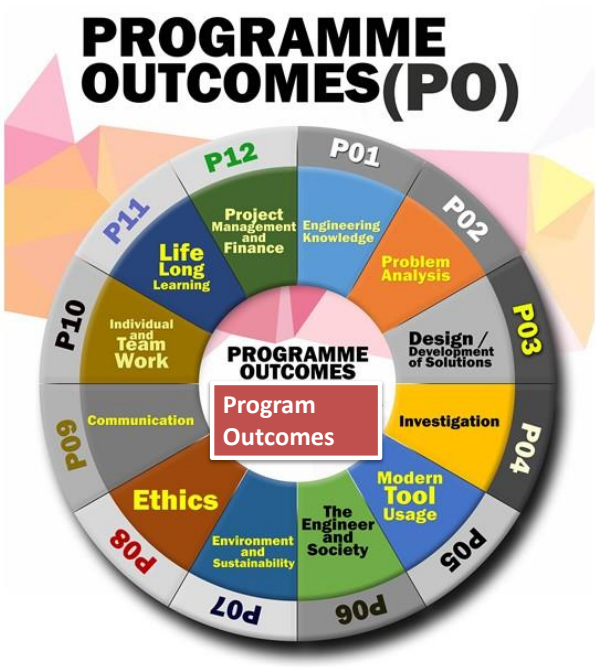
Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: COMPOSITE MATERIALS – 17AS46	
CO1	Explain the advantages of using composite materials as an alternative to conventional materials for specific applications.
CO2	Describe the advanced fabrication and processing for producing composite parts.
CO3	Evaluate the micro- and macro-mechanical behaviour of composite laminates.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: MANUFACTURING TECHNOLOGY LAB– 17ASL47	
CO1	Prepare the moulds.
CO2	Differentiate among different types of machining operations.
CO3	Manufacture a product using different machining process.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Computer Aided Aircraft Drawing Lab– 17ASL48	
CO1	Distinguish drawings of machine and aircraft components
CO2	Identify assembly drawings either manually or by using standard CAD packages
CO3	Practice with standard components and their assembly of an aircraft

Department of Biomedical Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes



Program Outcomes:

PO1 - Engineering Knowledge: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - 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.

PO3 - 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.

PO4. 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.

PO5 - 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.

PO6- 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.

PO7- 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.

PO8- Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9- Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10-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.

PO11- 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.

PO12-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 (PSOs):

Engineering Graduates will be able to:

PSO-1:	An ability to apply mathematical knowledge to design, develop, and analyze Bio-medical problems and applications

PSO-2:	Impart basic and advanced Bio-medical knowledge needed for the student relevant to excel as Bio-medical engineer

Course Outcomes:

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Electronic Instrumentation – 17BM32	
CO1	Analyze instrument characteristics, errors and generalized measurement system.
CO2	Analyze and use the circuit for the measurement of R, L, C, F, I, V etc
CO3	Use of Ammeters, Voltmeter and Multimeters and CRO for measurement
CO4	Analyze and interpret different signal generator circuits for the generation of various waveforms
CO5	Understand and use different display devices and recorders
Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Analog Electronics Circuits – 17BM33	
CO1	Explain the Working principles, characteristics and basic applications of BJT and FET.
CO2	Modeling of BJT/FET for analysis
CO3	Design Single stage, Multistage amplifier, with and without feedback
CO4	Analyze Frequency response of BJT and FET.
CO5	Acquire the knowledge of classifications of Power amplifier, operation, and able to design power amplifier

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Digital Design and HDL– 17BM34	
CO1	Simplify Boolean functions using K-map and Quine-McCluskey minimization technique

CO2	Analyze, design and write verilog code for combinational logic circuits. (MUX, De-MUX, adder and subtractor, and comparator circuits)
CO3	Analyze and design code converters, encoders and decoders.
CO4	Analyze and design of synchronous sequential circuits
CO5	Analyze sequential circuits, Moore/Mealy machines

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Human Anatomy and Physiology– 17BM35	
CO1	Describe internal environment of human body and explain the fundamental concept of Homeostasis
CO2	Explain the structure and functioning of various types of tissues.
CO3	Describe the structure and explain the functioning of various nervous system, cardiovascular system, respiratory system, digestive system and musculoskeletal system
CO4	Demonstrate and analyze various physiological parameters in normal and abnormal conditions

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Network Analysis– 17BM36	
CO1	Apply the basic concepts (Laws, theorems) of networks to obtain solution.
CO2	Choose the Appropriate/specific technique to analyze the networks.
CO3	Realize and Analyze the network behavior

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Analog Electronics Lab– 17BML37	
CO1	Acquire the Working principles, characteristics and basic applications of BJT and FET.
CO2	Modeling of BJT/FET for analysis
CO3	Able to design Single stage, Multistage amplifier, with and without feedback
CO4	Able to analyze Frequency response of BJT and FET.

CO5	Acquire the knowledge of Power amplifiers, operation, and able to design power amplifier.
CO6	Apply the knowledge gained in the design of BJT/FET circuits in Oscillators to generate different frequencies and their applications
CO7	Knowledge of UJT characteristics and its application.
CO8	Applications of theorems in various practical fields.

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: Digital Design and HDL Lab– 17BML38	
CO1	Realize Boolean expression using Universal gates / basic gates using ICs and Verilog
CO2	Demonstrate the function of adder/subtractor circuits using gates/ICs & Verilog.
CO3	Design and analyze the Comparator, Multiplexers Decoders, Encoders circuits using ICs and verilog
CO4	Design and analysis of different Flip-flops and counters using gates and FFs
CO5	Able to use FPGA/CPLD kits for down loading Verilog codes for shift registers and counters and check output

Year / SEM : 2nd year / 4th sem	**Year of Study : 2018-19**
Course Name: SC &DAC– 17BM42	
CO1	Understand the basic principles and operation of op-amp.
CO2	Design and develop circuits to meet the practical applications
CO3	Implement and integrate the op-amp circuits in electronic gadgets

Year / SEM : 2nd year / 4th sem	**Year of Study : 2018-19**
Course Name: Embedded Microcontrollers– 17BM43	
CO1	Learn architecture of 8051 and MSP 430.
CO2	Learn programming skills using Assembly language and C
CO3	Design and interfacing of microcontroller based embedded systems.
CO4	Build projects

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Control system– 17BM44	
CO1	Apply modeling knowledge in implementation physical systems.
CO2	Understand the reduction of block diagram &analyze using Signal flow graph.
CO3	Comment on performance of a system by evaluating various parameters.
CO4	Model a system by applying the concept of State Space analysis
CO5	Design and develop portable control systems

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Biomedical Transducers & Measurements– 17BM45	
CO1	Understand the working principle and construction details of Transducers.
CO2	Improve the measurement techniques through different approach.
CO3	Practically can implement the technology in measurement field.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Scientific Analytical Instrumentation– 17BM46	
CO1	The students get well versed with the principle, construction and working of various analytical Instrumentation
CO2	Students get detailed information about the application of analytical techniques in medicine, industry etc.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Embedded Controllers Lab– 17BML47	
CO1	Get hands-on exposure in 8051 and MSB 430 platform
CO2	Enhance programming skills using Assembly language and C.
CO3	Design and interfacing of microcontroller based embedded systems.
CO4	Build projects

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Biomedical Transducers & Measurements Lab– 17BML48	
CO1	Analyze the response and plot the characteristics of temperature measurement transducers such as RTD, Thermistor, and Thermocouple & AD590.
CO2	Analyze the response and plot the characteristics of displacement measuring transducers such as LVDT and Potentiometric transducer.
CO3	Analyze the response and plot the characteristics of strain gauge type load cell
CO4	Analyze the response and plot the characteristics of pressure transducer
CO5	Measure unknown values of resistance, capacitance and Inductance using different bridges
CO6	Design , build and test the circuits for practical applications using transducers
CO7	Measure BP, solution concentration, pH and conductivity for different biomedical applications.

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Management And Entrepreneurship– 15ES51	
CO1	Learn and explain basic is management and acquire basic managerial skills.
CO2	Analyze the nature, purpose & objectives of Planning, Organizing & Staffing.
CO3	Develop the factual leadership qualities for development of organizations
CO4	Learn and build the qualities and characteristics of business ethics and entrepreneurs.
CO5	Describe the importance of small scale industries in economic development and institutional support to start a small scale industry and implement.
CO6	Demonstrate the project management, product planning, project design and network analysis.

Year / SEM : 3rd year / 5thsem	Year of Study : 2018-19
Course Name: Fundamentals Signals &DSP– 15BM52	
CO1	Visualize, Classify and perform computation on discrete time signals, systems and properties
CO2	Perform the transformation techniques from time domain to other and vice versa, and analyze the system and properties (Z-Transform, DFT etc.)
CO3	Realize / implement the Direct/ cascade/ parallel/ lattice forms of the given digital system (IIR/ FIR)
CO4	Compute DFT by FFT algorithms
CO5	Develop transformation from analog system to digital system and design and implement IIR and FIR filters
CO6	Demonstrate the advanced concepts of signal processing (Multirate and Adaptive filtering) and architecture of DSP processor

Year / SEM : 3rd year / 5thsem	Year of Study : 2018-19
Course Name: Clinical Instrumentation-1– 15BM53	
CO1	Analyze and interpret the types of heart abnormalities.
CO2	Describe the constructional details of equipment's used in cardiology.
CO3	Explain the basic principles of ophthalmology instruments.

Year / SEM : 3rd year / 5thsem	Year of Study : 2018-19
Course Name: Biomedical Equipment's– 15BM54	
CO1	Define and analyze the ECG, EEG and BP signals.
CO2	Discuss the factors to be considered in the measurements of respiratory and audiometric signals.
CO3	Describe the principle and working of cardiac pacemakers, defibrillators and surgical devices.
CO4	Describe the principle and working of therapeutic instruments like Dialysis, heart-lung, ventilator, lithotripter and incubators.
CO5	Interpret the concepts involved with the measurement of man and instruments.
CO6	Discuss the physiological effects from electric shocks and maintenance of medical equipments as per standard.

Year / SEM : 3rd year / 5thsem	Year of Study : 2018-19
Course Name: Rehabilitation Engineering– 15BM552	
CO1	Define rehabilitation and explain the composition of rehabilitation team.
CO2	Discuss the engineering principles of rehabilitation engineering.
CO3	Apply engineering skills in the development of prosthetic and orthotic devices.
CO4	Evaluate the orthopedic design and applications. Approved
CO5	Apply the principles of engineering in the development of mobility aids for physically handicap

Year / SEM : 3rd year / 5thsem	Year of Study : 2018-19
Course Name: Virtual Bioinstrumentation– 15BM562	
CO1	Describe the Graphical System Design approach & basic features and techniques of LabVIEW.
CO2	Use the Modular Programming concepts for creation of VIs & employ DAQ assistant for configuration of hardware devices.
CO3	Discuss the basic concepts of DAQ Systems, LabVIEW, and BioBench software.
CO4	Describe the LabVIEW and BioBench software for EMG, ECG, and Cardiopulmonary system analysis.
CO5	Discuss the Medical Device Development Applications for Surgical Video Systems and IV Pumps.
CO6	Explain the Healthcare Information Management Systems using Information Science and Technology

Year / SEM : 3rd year / 5thsem	Year of Study : 2018-19
Course Name: Signal Conditioning Circuits and Data Acquisition Lab– 15BML57	
CO1	Sketch/draw circuit schematics, construct circuits on breadboards, analyze and troubleshoot circuits containing Op-amps, resistors, diodes, capacitors and independent sources. Approved
CO2	Memorize and reproduce the manufacturer's data sheets of IC 555 timer, IC µa741 op-amp and data converters like IC ADC 0800 and IC DAC 0809.
CO3	Design and evaluate analog integrated circuits like Amplifiers, Oscillators, Active filters, Precision Rectifiers and Voltage level detectors, and compare the experimental results with theoretical values.
CO4	Demonstrate and analyze the working of Sample-Hold, Programmable gain amplifier and Analog Multiplexer circuits in data acquisition system.
CO5	Design and evaluate different resolution data converters using discrete components and ICs.
CO6	Sketch/draw circuit schematics, construct circuits on breadboards, analyze and troubleshoot circuits containing Op-amps, resistors, diodes, capacitors and independent sources. Approved

Year / SEM : 3rd year / 5thsem	Year of Study : 2018-19
Course Name: Clinical Instrumentation Lab– 15BML58	
CO1	Measure the Op-amp parameters and design the circuits using opamp for various applications.
CO2	Design and verify the different bio amplifiers & filters.
CO3	Acquire and analyze the ECG, EEG and respiratory signals
CO4	Analyze the visual ability and audibility using appropriate instruments.
CO5	Demonstrate the working of different diagnostic and therapeutic hospital equipments.
CO6	Install and operate different types of hospital instruments.

Year / SEM : 3rd year / 6thsem	Year of Study : 2018-19
Course Name: Analog and digital Communication– 15BM61	
CO1	Explain the basics concepts of analog modulation techniques.
CO2	Discuss the basic concepts of digital modulation techniques.
CO3	Describe the basic concepts of digital data and pulse communication.
CO4	Explain and analyze different digital modulation techniques.
CO5	Describe different wireless area networks and their applications

Year / SEM : 3rd year / 6thsem	Year of Study : 2018-19
Course Name: Medical Image Processing– 15BM62	
CO1	Define the general terminology of digital image processing.
CO2	Identify the need for image transforms and their types both in spatial and frequency domain.
CO3	Identify different types of image degradation and apply restoration techniques.
CO4	Describe image compression models and learn image compression techniques.
CO5	Explain and apply various methodologies for image segmentation
CO6	Implement image processing and analysis algorithms

Year / SEM : 3rd year / 6thsem	Year of Study : 2018-19
Course Name: (OOPS with C++)-15BM63	
CO1	Explain the basic concepts of OOPS.
CO2	Apply the concept of OOPS to realize the existing algorithms.
CO3	Analyse the given program for debugging to obtain correct output
CO4	Create suitable application programs to solve real world problems

Year / SEM : 3rd year / 6thsem	Year of Study : 2018-19
Course Name: Clinical Instrumentation-II-15BM64	
CO1	Analyze the principles of clinical examinations in Neurology.
CO2	Explain the constructional details of Anesthetic machine and Anesthetic room.
CO3	Discuss electronic control of anesthetic gases and vapors with servo control.
CO4	Describe the non-invasive gas monitoring techniques.
CO5	Evaluate the type of fracture and its treatment in Orthopedics.

Year / SEM : 3rd year / 6thsem	Year of Study : 2018-19
Course Name: Biosensors and Smart Sensors -15BM651	
CO1	Describe the basics of biosensors used in biomedical engineering and their fabrication techniques.
CO2	Discuss the working principles enzyme sensors, enzyme electrodes and applications of biosensors in healthcare.
CO3	Discuss the basic concepts of smart sensors and principles of micromachining techniques.
CO4	Design the smart sensors with different controls, interfacing circuits and software tools.
CO5	Develop the smart sensor technology for automation and networking.

Year / SEM : 3rd year / 6thsem	Year of Study : 2018-19
Course Name: Embedded System Design and Programming -15BM663	
CO1	Explain different embedded systems and their design metrics.
CO2	Discuss the 8051 microcontroller architecture and instruction set
CO3	Write ALP for implementation of mathematical and logical operations.
CO4	Illustrate accessing I/O devices, direct memory access, buses, and interface circuits.
CO5	Evaluate interrupt latency, context switching and different interrupt handling mechanisms.

Year / SEM : 3rd year / 6thsem	Year of Study : 2018-19
Course Name: MIP Lab -15BML68	
CO1	Implement and analyze image enhancement techniques.
CO2	Implement and analyze Image segmentation and image compression techniques.
CO3	Develop and analyze Image processing algorithms in practical applications/case studies

Year / SEM : 3rd year / 6thsem	Year of Study : 2018-19
Course Name: OOPS with C++ Lab -15BML68	
CO1	Write C++ program to solve simple and complex problems
CO2	Apply and implement major object oriented concepts like message passing, function overloading, operator overloading and inheritance to solve real-world problems
CO3	Use major C++ features such as Templates for data type independent designs and File I/O to deal with large data set.
CO4	Analyze, design and develop solutions to real-world problems applying OOP concepts of C++
Year / SEM : 3rd year / 7thsem	**Year of Study : 2018-19**
Course Name: Biomedical Digital Signal Processing -15BM71	
CO1	Analyze the nature of Biomedical signals and related concepts
CO2	Apply filters to remove noise from biomedical signals.
CO3	Apply averaging technique on biomedical signals and extract the features of EEG signals.
CO4	Analyze event detection techniques for EEG and ECG signals.
CO5	Apply signal compression techniques on biomedical signals.

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: computer communication Networks in healthcare – 15BM72	
CO1	Explain the different formats of data generated in clinical field or Medical field.

CO2	Discriminate the functionality between the layers in OSI model and TCP/IP suite.
CO3	Discuss the concept of physical and data link layer.
CO4	Distinguish the IEEE standards designed to understand the interconnectivity between different LANs.
CO5	Apply different algorithms to route a packet to the destination for process to process delivery.
CO6	Discuss the concepts of Bluetooth technology, and transport & application layer.

Year / SEM : 4th year / 7th sem	**Year of Study : 2018-19**
Course Name: ARM Processor– 15BM73	
CO1	Depict the organization, architecture, bus technology, memory and operation of the ARM microprocessors
CO2	Employ the knowledge of Instruction set of ARM processors to develop basic Assembly Language Programs
CO3	Recognize the importance of the Thumb mode of operation of ARM processors and develop C programs for ARM processors
CO4	Describe the techniques involved in Exception and Interrupt handling in ARM Processors and understand the fundamental concepts of Embedded Operating Systems
CO5	Develop embedded C programs to interact with Built in Peripherals
CO6	Design, analyze and write programs using RTOS (Micro C/OS) on ARM based development boards.

Year / SEM : 4th year / 7th sem	**Year of Study : 2018-19**
Course Name: Biometric systems – 15BM744	
CO1	Explain the general principles of designing biometric-based systems.
CO2	Analyze various biometric systems, their characteristics and performance.
CO3	Discuss the online identification biometric techniques.
CO4	Recognize some of the personal privacy and security implications of biometrics based identification technology.
CO5	Analyze the privacy and security issues of biometrics.

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: Lasers & Optical fibers in medicine – 15BM752	
CO1	Explain the basics and principles of LASERS in Medicine.
CO2	Discuss the fundamentals and properties of optical fibers for UV, IR, power transmission and advancement.
CO3	Describe the working of optical fibre bundles for imaging devices applying the light guided fundamentals & principles.
CO4	Explain and demonstrate the working of endoscopic therapy, diagnostic & imaging principles.
CO5	Outline the clinical applications of fiber optic Lasers systems.

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: Biomedical DSP Lab –15BML76	
CO1	1. Apply the signal processing techniques on biomedical signals and evaluate their performance.
CO2	2. Develop/Write signal processing algorithms for the analysis of biomedical signals

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: ARM Processor Lab –15BML77	
CO1	Write ALP for implementation of specific arithmetic or logical operations.
CO2	Write programs to demonstrate functioning of various devices interfaced to ARM processor.
CO3	Develop programs for ARM processors to implement real world problems.
CO4	Design and develop mini projects.
Year / SEM : 4th year / 7th sem	**Year of Study : 2018-19**
Course Name: Project Work Phase- I + Project Work Seminar –15BMP78	
CO1	Collect the literature and materials in the proposed project work
CO2	Analyze the current state of art work in the proposed project work
CO3	Prepare synopsis with objectives and methodology
CO4	Justify the proposed project and its probable outcome in the seminar presentation.
CO5	Communicate the concepts by effective presentation 6. Participate effectively as an individual and member of project team.

Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Medical Imaging system – 15BM81	
CO1	Describe the fundamentals of x-ray radiography and computed tomography, and analyze the system requirements.
CO2	Explain principles of ultrasound imaging and diagnostic methods and analyze the system requirements.
CO3	Discuss the fundamentals of radionuclide imaging, MRI, thermal imaging and analyze the system requirements.
CO4	Describe the concepts of image Guided Intervention and image guided surgery.
CO5	Design and develop prototype of simple medical imaging system.

Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Biomaterials and artificial organs– 15BM82	
CO1	Explain the principle and biology underlying the design of implants and artificial organs.
CO2	Differentiate classes of materials used in medicine.
CO3	Discuss the application of biomaterials in medicine.
CO4	Discuss concept of biocompatibility and the methods of biomaterial testing.
CO5	Discuss the design process in some of the prominent artificial organs.

Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Flight Testing – 15BM831	
CO1	Discuss MEMS with current and potential markets for types of Microsystems.
CO2	Identify the suitable material to develop a micro system.
CO3	Explain the principles of emerging Bio-MEMS technology.
CO4	Apply the principles of micro sensors and micro actuators to design micro system.

Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Internship– 15BM84	
CO1	Acquire practical experience within industry in which the internship is done.
CO2	Apply knowledge and skills learned to classroom work.
CO3	Experience the activities and functions of professionals.
CO4	Develop and refine oral and written communication skills.
CO5	Recognize the areas for future knowledge and skill development.

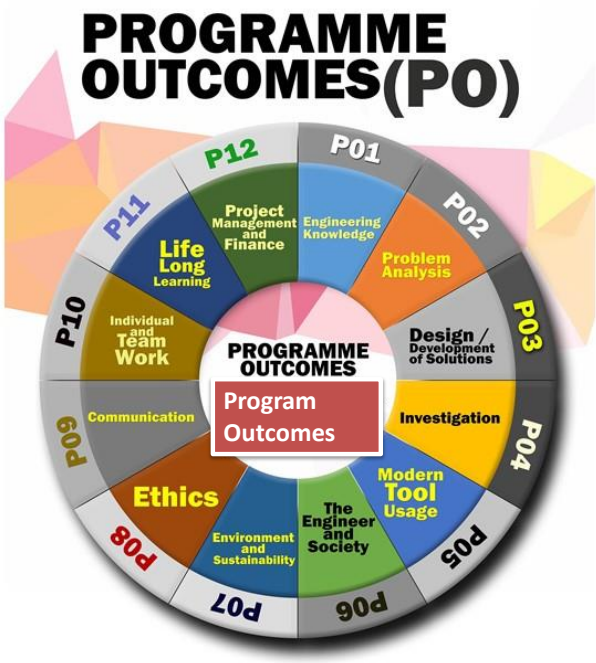
Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Technical Seminar– 15BMS86	
CO1	Develop knowledge in the field of Biomedical Engineering and other disciplines through independent learning and collaborative study.
CO2	Identify and discuss the current, real-time issues and challenges in engineering & technology.
CO3	Develop written and oral communication skills.
CO4	Explore concepts in larger diverse social and academic contexts.
CO5	Apply principles of ethics and respect in interaction with others.
CO6	Develop the skills to enable life-long learning.

Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Project – 15BMP85	
CO1	Describe the project and be able to defend it.
CO2	Develop critical thinking and problem solving skills.
CO3	Learn to use modern tools and techniques.
CO4	Communicate effectively and to present ideas clearly and coherently both in written and oral forms.
CO5	Develop skills to work in a team to achieve common goal.
CO6	Develop skills of project management and finance.
CO7	Develop skills of self learning, evaluate their learning and take appropriate actions to improve it.
CO8	Prepare themselves for life-long learning to face the challenges and support the technological changes to meet the societal needs.

Department of Civil Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:



3rd Semester BE-CBCS SYLLABUS 2017-18 Scheme
Program Outcomes (POs)
At the end of the B.E program, students are expected to have developed the following outcomes.
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, 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 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 (PSOs)
At the end of the B.E Civil Engineering program, the students are expected to have developed the following program specific outcomes.
PSO1 The graduates will have the ability to plan, analyze, design, execute and maintain cost effective civil engineering structures without overexploitation of natural resources.
PSO2 The graduates of civil engineering program will have the ability to take up employment, entrepreneurship, research and development for sustainable civil society.
PSO3 The graduates will be able to pursue opportunities for personal and professional growth, higher studies, demonstrate leadership skills and engage in lifelong learning by active participation in the civil engineering profession.
PSO4 The graduates will be able to demonstrate professional integrity and an appreciation of ethical, environmental, regulatory and issues related to civil engineering projects.

Course outcomes (COs)	
Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: STRENGTH OF MATERIALS – 17CV32	
CO1	To evaluate the strength of various structural elements internal forces such as compression, tension, shear, bending and torsion.
CO2	To suggest suitable material from among the available in the field of construction and manufacturing.
CO3	To evaluate the behavior and strength of structural elements under the action of compound stresses and thus understand failure concepts.
CO4	To understand the basic concept of analysis and design of members subjected to torsion.
CO5	To understand the basic concept of analysis and design of structural elements such as columns and struts.

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: – FLUIDS MECHANICS - 17CV33	
CO1	Possess a sound knowledge of fundamental properties of fluids and fluid Continuum
CO2	Compute and solve problems on hydrostatics, including practical applications
CO3	Apply principles of mathematics to represent kinematic concepts related to fluid flow
CO4	Apply fundamental laws of fluid mechanics and the Bernoulli's principle for practical applications
CO5	Compute the discharge through pipes and over notches and weirs

Year / SEM : 2nd year / 3rd sem	**Year of Study : 2018-19**
Course Name: – BASIC SURVEYING – 17CV34	
CO1	Posses a sound knowledge of fundamental principles Geodetics
CO2	Measurement of vertical and horizontal plane, linear and angular dimensions to arrive at solutions to basic surveying problems.
CO3	Capture geodetic data to process and perform analysis for survey problems
CO4	Analyze the obtained spatial data and compute areas and volumes. Represent 3D data on plane figures as contours

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: ENGINEERING GEOLOGY – 17CV35	
CO1	Students will able to apply the knowledge of geology and its role in Civil Engineering
CO2	Students will effectively utilize earth's materials such as mineral, rocks and water in civil engineering practices.
CO3	Analyze the natural disasters and their mitigation.
CO4	Assess various structural features and geological tools in ground water exploration, Natural resource estimation and solving civil engineering problems.
CO5	Apply and asses use of building materials in construction and asses their properties

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: Building Materials and Construction – 17CV36	
CO1	Select suitable materials for buildings and adopt suitable construction techniques.
CO2	Adopt suitable repair and maintenance work to enhance durability of buildings.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: BUILDING MATERIALS T ESTING LABORATORY – 17CVL37	
CO1	Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear and torsion.
CO2	Identify, formulate and solve engineering problems of structural elements subjected to flexure.
CO3	Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to unsuitable materials.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: BASIC SURVEYING PRACTICE – 17CVL38	
CO1	Apply the basic principles of engineering surveying for linear and angular measurements.
CO2	Comprehend effectively field procedures required for a professional surveyor.
CO3	Use techniques, skills and conventional surveying instruments necessary for engineering practice.

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Design of RC Structural Elements – 15CV51	
CO1	understand the design philosophy and principles
CO2	solve engineering problems of RC elements subjected to flexure, shear and torsion
CO3	demonstrate the procedural knowledge in designs of RC structural elements such as slabs, columns and footings
CO4	owns professional and ethical responsibility

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Analysis of Indeterminate Structures – 15CV52	
CO1	Determine the moment in indeterminate beams and frames having variable moment of inertia and subsidence using slope defection method
CO2	Determine the moment in indeterminate beams and frames of no sway and sway using moment distribution method.
CO3	Construct the bending moment diagram for beams and frames by Kani's method.
CO4	Construct the bending moment diagram for beams and frames using flexibility method
CO5	Analyze the beams and indeterminate frames by system stiffness method.

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Applied Geotechnical Engineering – 15CV53	
CO1	Ability to plan and execute geotechnical site investigation program for different civil engineering projects
CO2	Understanding of stress distribution and resulting settlement beneath the loaded footings on sand and clayey soils
CO3	Ability to estimate factor of safety against failure of slopes and to compute lateral pressure distribution behind earth retaining structures
CO4	Ability to determine bearing capacity of soil and achieve proficiency in proportioning shallow isolated and combined footings for uniform bearing pressure
CO5	Capable of estimating load carrying capacity of single and group of piles

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Computer Aided Building Planning and Drawing – 15CV54	
CO1	Gain a broad understanding of planning and designing of buildings
CO2	Prepare, read and interpret the drawings in a professional set up.
CO3	Know the procedures of submission of drawings and Develop working and submission drawings for building
CO4	Plan and design a residential or public building as per the given requirements

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Air Pollution and Control – 15CV551	
CO1	Identify the major sources of air pollution and understand their effects on health and environment.
CO2	Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models.
CO3	Ascertain and evaluate sampling techniques for atmospheric and stack pollutants.
CO4	Choose and design control techniques for particulate and gaseous emissions.

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Remote Sensing and GIS – 15CV563	
CO1	Collect data and delineate various elements from the satellite imagery using their spectral signature.
CO2	Analyze different features of ground information to create raster or vector data.
CO3	Perform digital classification and create different thematic maps for solving specific problems
CO4	Make decision based on the GIS analysis on thematic maps.

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: Geotechnical Engineering Lab – 15CVL57	
CO1	Physical and index properties of the soil
CO2	Classify based on index properties and field identification
CO3	To determine OMC and MDD, plan and assess field compaction program

CO4	Shear strength and consolidation parameters to assess strength and deformation characteristics
CO5	In-situ shear strength characteristics (SPT- Demonstration)

Year / SEM : 3rd year / 5th sem	**Year of Study : 2018-19**
Course Name: Concrete and Highway Materials Laboratory – 15CVL58	
CO1	Conduct appropriate laboratory experiments and interpret the results
CO2	Determine the quality and suitability of cement
CO3	Design appropriate concrete mix
CO4	Determine strength and quality of concrete
CO5	Test the road aggregates and bitumen for their suitability as road material.
CO6	Test the soil for its suitability as sub grade soil for pavements.

Year / SEM : 3rd year / 7th sem	**Year of Study : 2018-19**
Course Name: Municipal and Industrial Waste Water Engineering – 15CV71	
CO1	Acquires capability to design sewer and Sewerage treatment plant.
CO2	Evaluate degree of treatment and type of treatment for disposal, reuse and recycle.
CO3	Identify waste streams and design the industrial waste water treatment plant.
CO4	Manage sewage and industrial effluent issues.

Year / SEM : 3rd year / 7th sem	**Year of Study : 2018-19**
Course Name: Design of RCC and Steel Structures – 15CV72	
CO1	Students will acquire the basic knowledge in design of RCC and Steel Structures.
CO2	Students will have the ability to follow design procedures as per codal provisions and skills to arrive at structurally safe RC and Steel members.

Year / SEM : 3rd year / 5th sem	**Year of Study : 2018-19**
Course Name: Hydrology and Irrigation Engineering – 15CV73	
CO1	Understand the importance of hydrology and its components.

CO2	Measure precipitation and analyze the data and analyze the losses in precipitation.
CO3	Estimate runoff and develop unit hydrographs.
CO4	Find the benefits and ill-effects of irrigation.
CO5	Find the quantity of irrigation water and frequency of irrigation for various crops.
CO6	Find the canal capacity, design the canal and compute the reservoir capacity.

Year / SEM : 3rd year / 7th sem	**Year of Study : 2018-19**
Course Name: Ground Water & Hydraulics – 15CV742	
CO1	Find the characteristics of aquifers.
CO2	Estimate the quantity of ground water by various methods.
CO3	Locate the zones of ground water resources.
CO4	Select particular type of well and augment the ground water storage.

Year / SEM : 3rd year / 7th sem	**Year of Study : 2018-19**
Course Name: Rehabilitation and Retrofitting of Structures – 15CV753	
CO1	Understand the cause of deterioration of concrete structures.
CO2	Able to assess the damage for different type of structures
CO3	Summarize the principles of repair and rehabilitation of structures
CO4	Recognize ideal material for different repair and retrofitting technique

Year / SEM : 3rd year / 7th sem	**Year of Study : 2018-19**
Course Name: Environmental Engineering Laboratory – 15CVL76	
CO1	Acquire capability to conduct experiments and estimate the concentration of different parameters.
CO2	Compare the result with standards and discuss based on the purpose of analysis.
CO3	Determine type of treatment, degree of treatment for water and waste water.
CO4	Identify the parameter to be analyzed for the student project work in environmental stream

Year / SEM : 3rd year / 7th sem	Year of Study : 2018-19
Course Name: Computer Aided Detailing of Structures – 15CVL77	
CO1	Prepare detailed working drawings

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Analysis of Determinate Structures – 17CV42	
CO1	Evaluate the forces in determinate trusses by method of joints and sections.
CO2	Evaluate the deflection of cantilever, simply supported and overhanging beams by different methods
CO3	Understand the energy principles and energy theorems and its applications to determine the deflections of trusses and bent frames.
CO4	Determine the stress resultants in arches and cables.
CO5	Understand the concept of influence lines and construct the ILD diagram for the moving loads.

Year / SEM : 2ndyear / 4th sem	Year of Study : 2018-19
Course Name: Applied Hydraulics - 17CV43	
CO1	Apply dimensional analysis to develop mathematical modeling and compute the parametric values in prototype by analyzing the corresponding model parameters
CO2	Design the open channels of various cross sections including economical channel sections
CO3	Apply Energy concepts to flow in open channel sections, Calculate Energy dissipation
CO4	Compute water surface profiles at different conditions
CO5	Design turbines for the given data, and to know their operation characteristics under different operating conditions

Year / SEM : 2ndyear / 4th sem	Year of Study : 2018-19
Course Name: Concrete Technology - 17CV44	
CO1	Relate material characteristics and their influence on microstructure of concrete.
CO2	Distinguish concrete behavior based on its fresh and hardened properties.
CO3	Illustrate proportioning of different types of concrete mixes for required fresh and hardened properties using professional codes.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Basic Geotechnical Engineering - 17CV45	
CO1	Will acquire an understanding of the procedures to determine index properties of any type of soil, classify the soil based on its index properties
CO2	Will be able to determine compaction characteristics of soil and apply that knowledge to assess field compaction procedures
CO3	Will be able to determine permeability property of soils and acquires conceptual knowledge about stresses due to seepage and effective stress; Also acquire ability to estimate seepage losses across hydraulic structure
CO4	Will be able to estimate shear strength parameters of different types of soils using the data of different shear tests and comprehend Mohr-Coulomb failure theory.
CO5	Ability to solve practical problems related to estimation of consolidation settlement of soil deposits also time required for the same.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Advanced Surveying - 17CV46	
CO1	Apply the knowledge of geometric principles to arrive at surveying problems
CO2	Use modern instruments to obtain geo-spatial data and analyze the same to appropriate engineering problems.
CO3	Capture geodetic data to process and perform analysis for survey problems with the use of electronic instruments
CO4	Design and implement the different types of curves for deviating type of alignments.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Fluid Mechanics and Hydraulic Machines Laboratory - 17CVL47	
CO1	Properties of fluids and the use of various instruments for fluid flow measurement.
CO2	Working of hydraulic machines under various conditions of working and their characteristics.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: Engineering Geology Laboratory - 17CVL48	
CO1	Identifying the minerals and rocks and utilize them effectively in civil engineering practices.

CO2	Understanding and interpreting the geological conditions of the area for the implementation o f civil engineering projects.
CO3	Interpreting subsurface information such as thickness of soil, weathered zone, depth of hard rock and saturated zone by using geophysical methods.
CO4	The techniques of drawing the curves of electrical resistivity data and its interpretation for geotechnical and aquifer boundaries

Year / SEM : 3rd year / 6th sem	**Year of Study : 2018-19**
Course Name: Construction Management and Entrepreneurship – 15CV61	
CO1	Understand the construction management process.
CO2	Understand and solve variety of issues that are encountered by every professional in discharging professional duties.
CO3	Fulfill the professional obligations effectively with global outlook

Year / SEM : 3rd year / 6th sem	**Year of Study : 2018-19**
Course Name: Design of Steel Structural Elements – 15CV62	
CO1	Possess a knowledge of Steel Structures Advantages and Disadvantages of Steel structures, steel code provisions and plastic behavior of structural steel
CO2	Understand the Concept of Bolted and Welded connections.
CO3	Understand the Concept of Design of compression members, built-up columns and columns splices.
CO4	Understand the Concept of Design of tension members, simple slab base and gusseted base.
CO5	Understand the Concept of Design of laterally supported and un-supported steel beams.

Year / SEM : 3rd year / 6th sem	**Year of Study : 2018-19**
Course Name: Highway Engineering - 15CV63	
CO1	Acquire the capability of proposing a new alignment or re-alignment of existing roads, conduct necessary field investigation for generation of required data.
CO2	Evaluate the engineering properties of the materials and suggest the suitability of the same for pavement construction.
CO3	Design road geometrics, structural components of pavement and drainage.
CO4	Evaluate the highway economics by few select methods and also will have a basic knowledge of various highway financing concepts.

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Water Supply and Treatment Engineering - 15CV64	
CO1	Estimate average and peak water demand for a community.
CO2	Evaluate available sources of water, quantitatively and qualitatively and make appropriate choice for a community.
CO3	Evaluate water quality and environmental significance of various parameters and plan suitable treatment system.
CO4	Design a comprehensive water treatment and distribution system to purify and distribute water to the required quality standards.

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Solid Waste Management - 15CV651	
CO1	Analyze existing solid waste management system and to identify their drawbacks
CO2	Evaluate different elements of solid waste management system
CO3	Suggest suitable scientific methods for solid waste management elements
CO4	Design suitable processing system and evaluate disposal sites.

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Water Resources Management - 15CV661	
CO1	Assess the potential of groundwater and surface water resources
CO2	Address the issues related to planning and management of water resources
CO3	Know how to implement IWRM in different regions
CO4	Understand the legal issues of water policy.
CO5	Select the method for water harvesting based on the area

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Software Application Lab - 15CVL67	
CO1	use software skills in a professional set up to automate the work and thereby reduce cycle time for completion of the work

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Extensive Survey Project /Camp – 15CVP68	
CO1	Apply Surveying knowledge and tools effectively for the projects
CO2	Understanding Task environment, Goals, responsibilities, Task focus, working in Teams towards common goals, Organizational performance expectations, technical and behavioral competencies.
CO3	Application of individual effectiveness skills in team and organizational context, goal setting, time management, communication and presentation skills.
CO4	Professional etiquettes at workplace, meeting and general
CO5	Establishing trust based relationships in teams & organizational environment
CO6	Orientation towards conflicts in team and organizational environment, Understanding sources of conflicts, Conflict resolution styles and techniques

Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Quantity Surveying and Contracts Management – 15CV81	
CO1	Prepare detailed and abstract estimates for roads and building
CO2	Prepare valuation reports of buildings
CO3	Interpret Contract document's of domestic and international construction works

Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Design of Pre Stressed Concrete Elements – 15CV82	
CO1	Understand the requirement of PSC members for present scenario
CO2	Analyze the stresses encountered in PSC element during transfer and at working
CO3	Understand the effectiveness of the design of PSC after studying losses
CO4	Capable of analyzing the PSC element and finding its efficiency
CO5	Design PSC beam for different requirements

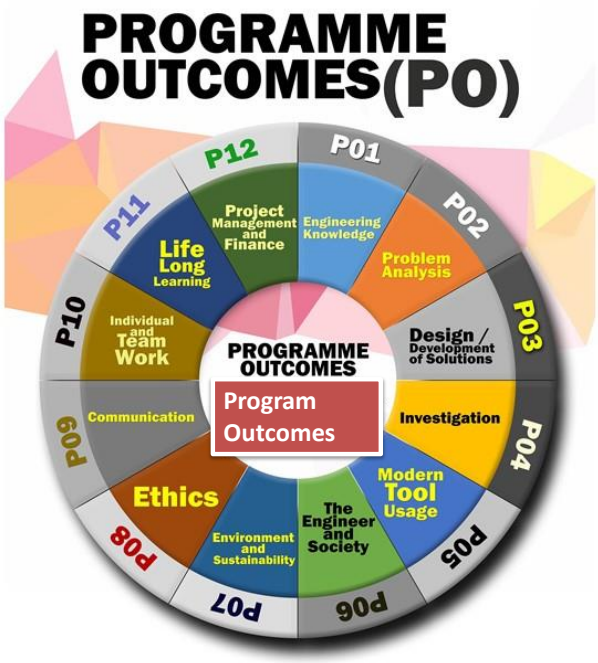
Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: Hydraulic Structures – 15CV832	
CO1	Check the stability of gravity dams and design the dam.

CO2	Estimate the quantity of seepage through earth dams
CO3	Design spillways and aprons for various diversion works
CO4	Select particular type of canal regulation work for canal network

Department of Computer Science and Engineering

Program outcomes, program specific outcomes and course outcomes

Program Outcomes:



PO1. Apply knowledge of mathematics and science, with fundamentals of Computer Science & Engineering to be able to solve complex engineering problems related to CSE.

PO2. Apply mathematical foundations, algorithmic principles, and computer Science theory in the modelling and design of computer based systems in a way that demonstrates comprehension of tradeoffs involved in design choices.

PO3. Analyze a problem, and identify and define the computing requirements appropriate to its solution

PO4. Design and development principles in the construction of software systems of varying complexity

PO5. Design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as

well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations;

PO6. Use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional;

PO7. Work effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary environment

PO8. Demonstrate knowledge of contemporary issues and understand professional, ethical, legal, security and social issues and responsibilities

PO9. Analyze the local and global impact of computing on individuals, organizations, and society;

PO10. Demonstrate knowledge and understanding of the engineering and management principles including financial implications and apply these to his/her work, as a member and leader in a team, and to manage project work as part of a multidisciplinary team

PO11. Communicate effectively in both verbal and written forms;

PO12. Recognize the need for, and be motivated to engage in life-long learning and continuing professional development

PROGRAM SPECIFIC OUTCOMES (PSOs):

Engineering Graduates will be able to:

PSO-1:	Foundation of mathematical concepts: To use mathematical methodologies to crack problem using suitable mathematical analysis, data structure and suitable algorithm.
PSO-2:	Foundation of Computer System: the ability to interpret the fundamental concepts and methodology of computer systems. Students can understand the functionality of hardware and software aspects of computer systems.
PSO-3:	Foundations of Software development: the ability to grasp the software development lifecycle and methodologies of software systems. Possess competent skills and knowledge of software design process. Familiarity and practical proficiency with a broad area of programming concepts and provide new ideas and innovations towards research

COURSE OUTCOMES

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: --ANALOG AND DIGITAL ELECTRONICS-17CS32	
CO1	Explain the operation of JFETs and MOSFETs , Operational Amplifier circuits and their application
CO2	Explain Combinational Logic, Simplification Techniques using Karnaugh Maps, Quine McClusky technique.
CO3	Demonstrate Operation of Decoders, Encoders, Multiplexers, Adders and Subtractor, working of Latches,
CO4	Flip-Flops, Designing Registers, Counters, A/D and D/A Converters
CO5	Design of Counters, Registers and A/D & D/A converters

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: DATA STRUCTURES AND APPLICATIONS – 17CS33	
CO1	Explain different types of data structures, operations and algorithms
CO2	Apply searching and sorting operations on files
CO3	Make use of stack, Queue, Lists, Trees and Graphs in problem solving.
CO4	Develop all data structures in a high-level language for problem solving

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: COMPUTER ORGANIZATION – 17CS34	
CO1	Explain the basic organization of a computer system.
CO2	Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.
CO3	Illustrate hardwired control and micro programmed control. pipelining, embedded and other computing systems.
CO4	Build simple arithmetic and logical units.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: UNIX AND SHELL PROGRAMMING – 17CS35	
CO1	Explain UNIX system and use different commands.
CO2	Compile Shell scripts for certain functions on different subsystems.
CO3	Demonstrate use of editors and Perl script writing

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: DISCRETE MATHEMATICAL STRUCTURES – 17CS36	
CO1	Make use of propositional and predicate logic in knowledge representation and truth verification.
CO2	Demonstrate the application of discrete structures in different fields of computer science.
CO3	Solve problems using recurrence relations and generating functions.
CO4	Apply different mathematical proofs, techniques in proving theorems.
CO5	Compare graphs, trees and their applications.

Year / SEM : 2nd year / 3rd sem	Year of Study : 2018-19
Course Name: ANALOG AND DIGITAL ELECTRONICS LABORATORY – 17CSL37	
CO1	Demonstrate various Electronic Devices like Cathode ray Oscilloscope, Signal generators, Digital Trainer Kit, Multimeters and components like Resistors, Capacitors, Op amp and Integrated Circuit.
CO2	Design and demonstrate various combinational logic circuits.
CO3	Design and demonstrate various types of counters and Registers using Flip-flops
CO4	Make use of simulation package to design circuits.
CO5	Infer the working and implementation of ALU.

Year / SEM : 2nd year / 3rd sem		Year of Study : 2018-19
Course Name: DATA STRUCTURES LABORATORY – 17CSL38		
CO1	Analyze and Compare various linear and non-linear data structures	
CO2	Demonstrate the working nature of different types of data structures and their applications	
CO3	Develop, analyze and evaluate the searching and sorting algorithms	
CO4	Choose the appropriate data structure for solving real world problems	
Year / SEM : 2nd year / 4th sem		**Year of Study : 2018-19**
Course Name: OBJECT ORIENTED CONCEPTS – 17CS42		
CO1	Explain the object-oriented concepts and JAVA.	
CO2	Develop computer programs to solve real world problems in Java.	
CO3	Develop simple GUI interfaces for a computer program to interact with users, and to comprehend the event-based GUI handling principles using Applets and swings.	

Year / SEM : 2nd year / 4th sem		Year of Study : 2018-19
Course Name: DESIGN AND ANALYSIS OF ALGORITHMS – 17CS43		
CO1	Describe computational solution to well known problems like searching, sorting etc.	
CO2	Estimate the computational complexity of different algorithms.	
CO3	Develop an algorithm using appropriate design strategies for problem solving.	

Year / SEM : 2nd year / 4th sem		Year of Study : 2018-19
Course Name: MICROPROCESSORS AND MICROCONTROLLERS– 17CS44		
CO1	Differentiate between microprocessors and microcontrollers	
CO2	Develop assembly language code to solve problems	
CO3	Explain interfacing of various devices to x86 family and ARM processor	
CO4	Demonstrate interrupt routines for interfacing devices	

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: SOFTWARE ENGINEERING – 17CS45	
CO1	Design a software system, component, or process to meet desired needs within realistic constraints.
CO2	Assess professional and ethical responsibility
CO3	Function on multi-disciplinary teams
CO4	Make use of techniques, skills, and modern engineering tools necessary for engineering practice
CO5	Comprehend software systems or parts of software systems.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: DATA COMMUNICATION – 17CS46	
CO1	Illustrate basic computer network technology.
CO2	Identify the different types of network topologies and protocols.
CO3	List and explain the layers of the OSI model and TCP/IP model.
CO4	Comprehend the different types of network devices and their functions within a network
CO5	Demonstrate subnetting and routing mechanisms.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: DESIGN AND ANALYSIS OF ALGORITHM LABORATORY– 17CSL47	
CO1	Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
CO2	Develop variety of algorithms such as sorting, graph related, combinatorial, etc., in a high level language.
CO3	Analyze and compare the performance of algorithms using language features.
CO4	Apply and implement learned algorithm design techniques and data structures to solve real-world problems.

Year / SEM : 2nd year / 4th sem	Year of Study : 2018-19
Course Name: MICROPROCESSOR AND MICROCONTROLLER LABORATORY– 17CSL48	
CO1	Summarize 80x86 instruction sets and comprehend the knowledge of how

	assembly language works.
CO2	Design and develop assembly programs using 80x86 assembly language instructions
CO3	Infer functioning of hardware devices and interfacing them to x86 family
CO4	Choose processors for various kinds of applications.

Year / SEM : 3rd year / 5th sem	**Year of Study : 2018-19**
Course Name: MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY – 15CS51	
CO1	Define management, organization, entrepreneur, planning, staffing, ERP and outline their importance in entrepreneurship
CO2	Utilize the resources available effectively through ERP
CO3	Make use of IPRs and institutional support in entrepreneurship

Year / SEM : 3rd year / 5th sem	**Year of Study : 2018-19**
Course Name: COMPUTER NETWORKS – 15CS52	
CO1	Explain principles of application layer protocols
CO2	Recognize transport layer services and infer UDP and TCP protocols
CO3	Classify routers, IP and Routing Algorithms in network layer
CO4	Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard
CO5	Describe Multimedia Networking and Network Management

Year / SEM : 3rd year / 5th sem	**Year of Study : 2018-19**
Course Name: DATABASE MANAGEMENT SYSTEM – 15CS53	
CO1	Identify, analyze and define database objects, enforce integrity constraints on a
CO2	database using RDBMS.
CO3	Use Structured Query Language (SQL) for database manipulation.

CO4	Design and build simple database systems
CO5	Develop application to interact with databases.

Year / SEM : 3rd year / 5th sem	**Year of Study : 2018-19**
Course Name: AUTOMATA THEORY AND COMPUTABILITY – 15CS54	
CO1	Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation
CO2	Learn how to translate between different models of Computation (e.g., Deterministic and Non-deterministic and Software models).
CO3	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.
CO4	Develop skills in formal reasoning and reduction of a problem to a formal model, with an emphasis on semantic precision and conciseness.
CO5	Classify a problem with respect to different models of Computation.

Year / SEM : 3rd year / 5th sem	**Year of Study : 2018-19**
Course Name: ADVANCED JAVA AND J2EE– 15CS553	
CO1	Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs
CO2	Build client-server applications and TCP/IP socket programs
CO3	Illustrate database access and details for managing information using the JDBC API
CO4	Describe how servlets fit into Java-based web application architecture
CO5	Develop reusable software components using Java Beans

Year / SEM : 3rd year / 5th sem	**Year of Study : 2018-19**
Course Name: Theory Of Vibrations – 15AE563	
CO1	Apply the principle of super position to Simple Harmonic Motions.
CO2	Determine the vibrations using vibration instruments.
CO3	Apply the numerical methods for multi-degree freedom systems

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: COMPUTER NETWORK LABORATORY– 15CSL57	
CO1	Analyze and Compare various networking protocols.
CO2	Demonstrate the working of different concepts of networking.
CO3	Implement, analyze and evaluate networking protocols in NS2 / NS3

Year / SEM : 3rd year / 5th sem	Year of Study : 2018-19
Course Name: DBMS LABORATORY WITH MINI PROJECT – 15CSL58	
CO1	Create, Update and query on the database.
CO2	Demonstrate the working of different concepts of DBMS
CO3	Implement, analyze and evaluate the project developed for an application.

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: CRYPTOGRAPHY, NETWORK SECURITY AND CYBER LAW – 15CS61	
CO1	Discuss cryptography and its need to various applications
CO2	Design and develop simple cryptography algorithms
CO3	Understand cyber security and need cyber Law

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: COMPUTER GRAPHICS AND VISUALIZATION – 15CS62	
CO1	Design and implement algorithms for 2D graphics primitives and attributes.
CO2	Illustrate Geometric transformations on both 2D and 3D objects.
CO3	Apply concepts of clipping and visible surface detection in 2D and 3D viewing, and Illumination Models.
CO4	Decide suitable hardware and software for developing graphics packages using OpenGL

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: SYSTEM SOFTWARE AND COMPILER DESIGN-15CS63	
CO1	Explain system software such as assemblers, loaders, linkers and macro processors
CO2	Design and develop lexical analyzers, parsers and code generators
CO3	Utilize LEX and YACC tools for implementing different concepts of system software

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: OPERATING SYSTEMS – 15CS64	
CO1	Demonstrate need for OS and different types of OS
CO2	Apply suitable techniques for management of different resources
CO3	Use processor, memory, storage and file system commands
CO4	Realize the different concepts of OS in platform of usage through case studies

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: OPERATION RESEARCH– 15CS653	
CO1	Select and apply optimization techniques for various problems.
CO2	Model the given problem as transportation and assignment problem and solve.
CO3	Apply game theory for decision support system.

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: Maintenance, Overhaul &Repair Of Aircraft Systems– 15CS664	
CO1	Maintain the aircraft maintenance manual and logbook.
CO2	Do the quality control and calibration.
CO3	Incorporate the safety regulations and rules

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: SYSTEM SOFTWARE AND OPERATING SYSTEM LABORATORY – 15CSL67	
CO1	Implement and demonstrate Lexer's and Parser's
CO2	Evaluate different algorithms required for management, scheduling, allocation and communication used in operating system.

Year / SEM : 3rd year / 6th sem	Year of Study : 2018-19
Course Name: COMPUTER GRAPHICS LABORATORY WITH MINI PROJECT – 15CSL68	
CO1	Apply the concepts of computer graphics
CO2	Implement computer graphics applications using OpenGL
CO3	Animate real world problems using OpenGL

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: TECHNOLOGY AND ITS APPLICATIONS – 15CS71	
CO1	Adapt HTML and CSS syntax and semantics to build web pages.
CO2	Construct and visually format tables and forms using HTML and CSS
CO3	Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
CO4	Appraise the principles of object oriented development using PHP
CO5	Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: ADVANCED COMPUTER ARCHITECTURES– 15CS72	
CO1	Explain the concepts of parallel computing and hardware technologies
CO2	Compare and contrast the parallel architectures
CO3	Illustrate parallel programming concepts

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: MACHINE LEARNING– 15CS73	
CO1	Analyze the natural language text.
CO2	Generate the natural language.
CO3	Do Text mining.
CO4	Apply information retrieval techniques.

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: UNIX SYSTEM PROGRAMMING– 15CS744	
CO1	Ability to understand and reason out the working of Unix Systems
CO2	Build an application/service over a Unix system.

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: STORAGE AREA NETWORKS– 15CS754	
CO1	Identify key challenges in managing information and analyze different storage networking technologies and virtualization
CO2	Explain components and the implementation of NAS
CO3	Describe CAS architecture and types of archives and forms of virtualization
CO4	Illustrate the storage infrastructure and management activities

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: MACHINE LEARNING LABORATORY– 15CSL76	
CO1	Understand the implementation procedures for the machine learning algorithms.
CO2	Design Java/Python programs for various Learning algorithms.
CO3	Apply appropriate data sets to the Machine Learning algorithms.
CO4	Identify and apply Machine Learning algorithms to solve real world problems.

Year / SEM : 4th year / 7th sem	Year of Study : 2018-19
Course Name: WEB TECHNOLOGY LABORATORY WITH MINI PROJECT– 15CSL77	
CO1	Design and develop dynamic web pages with good aesthetic sense of designing and latest technical know-how's.
CO2	Have a good understanding of Web Application Terminologies, Internet Tools other web services.
CO3	Learn how to link and publish web sites

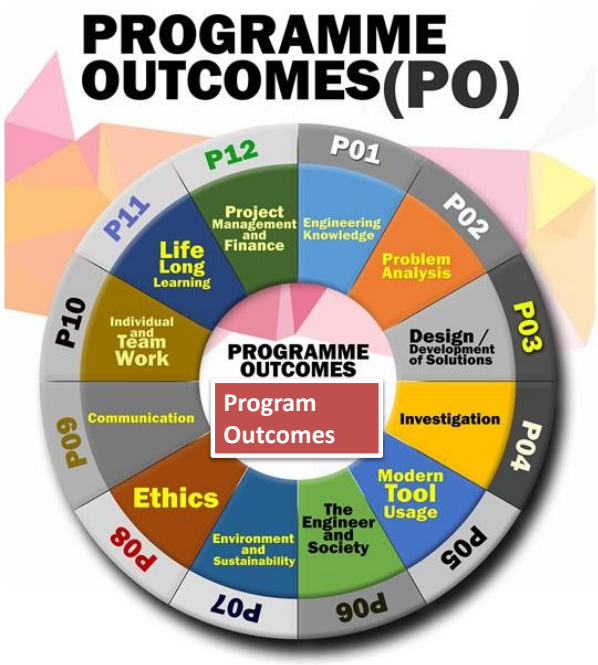
Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: IOT TECHNOLOGY– 15CS81	
CO1	Explain what IoT is, its framework along with examples
CO2	Summarize the design standardization of IoT/M2M architectural layers and domains
CO3	Illustrate the usage of message protocols between connected devices and the web
CO4	Identify the functions and usage of data analytics and data visualizations for IoT applications
CO5	Discuss WSN IoT applications

Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: BIG DATA ANALYTICS– 15CS82	
CO1	Master the concepts of HDFS and Map Reduce framework
CO2	Investigate Hadoop related tools for Big Data Analytics and perform basic Hadoop Administration
CO3	Recognize the role of Business Intelligence, Data warehousing and Visualization in decision making
CO4	Infer the importance of core data mining techniques for data analytics
CO5	Compare and contrast different Text Mining Techniques

Year / SEM : 4th year / 8th sem	Year of Study : 2018-19
Course Name: USER INTERFACE DESIGN– 15CS832	
CO1	Design the user interface, design, menu creation and windows creation and connection between menu and windows

Department of Electronics & Communication Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes



B.E: Electronics & Communication Engineering

Program Outcomes (POs)

At the end of the B.E program, students are expected to have developed the following outcomes.

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, 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 modelling 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 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 Teamwork:** 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 ones 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 (PSOs)

At the end of the B.E Electronics & Communication Engineering program, students are expected to have developed the following program specific outcomes.

PSO1: Specify, design, build and test analog, digital and embedded systems for signal processing.

PSO2: Understand and architect wired and wireless analog and digital communication systems as per specifications and determine their performance.

B.E E&C THIRD SEMESTER COURSE OUTCOMES

Subject Name with Code	Engineering Mathematics---III-17MAT31	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	Know the use of periodic signals and Fourier series to analyse circuits and system communications.	
2	Explain the general linear system theory for continuous-time signals and digital signal processing using the Fourier Transform and z-transform.	
3	Employ appropriate numerical methods to solve algebraic and transcendental equations.	
4	Apply Green's Theorem, Divergence Theorem and Stokes' theorem in various	
5	Applications in the field of electro-magnetic and gravitational fields and fluid flow problems.	
6	Determine the externals of functional and solve the simple problems of the calculus of variations.	

Subject Name with Code	ELECTRONIC INSTRUMENTATION-17EC32	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	Describe instrument measurement errors and calculate them.	
2	Describe the operation of Ammeters, Voltmeters, Multimeters and develop circuits for multirange Ammeters and Voltmeters.	
3	Describe functional concepts and operation of Digital voltmeters and instruments to measure voltage, frequency, time period, phase difference of signals, rotation speed, capacitance and pH of solutions.	
4	Describe functional concepts and operation of various Analog measuring instruments to measure field Strength, impedance, stroboscopic speed, in/out of phase, Q of coils, insulation resistance.	
5	Describe and discuss functioning and types of Oscilloscopes, Signal generators and Transducers.	
6	Utilize AC and DC bridges for passive component and frequency measurements.	

Subject Name with Code	ANALOG ELECTRONICS-17EC33	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	Describe the working principle and characteristics of BJT, FET, Single stage, cascaded and feedback amplifiers.	
2	Describe the Phase shift, Wien bridge, tuned and crystal oscillators using BJT/FET/UJT.	
3	Calculate the AC gain and impedance for BJT using re and h parameters models for CE and CC configuration.	
4	Determine the performance characteristics and parameters of BJT and FET amplifier using small signal model.	
5	Determine the parameters which affect the low frequency and high frequency responses of BJT and FET amplifiers and draw the characteristics.	
6	Evaluate the efficiency of Class A and Class B power amplifiers and voltage Regulators.	

Subject Name with Code	DIGITAL ELECTRONICS-17EC34	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	Develop simplified switching equation using Karnaugh Maps and Quine-McClusky techniques.	
2	Explain the operation of decoders, encoders, multiplexers, demultiplexers, adders, subractors and comparators.	
3	Explain the working of Latches and Flip Flops (SR,D,T and JK).	
4	Design Synchronous/Asynchronous Counters and Shift registers using Flip Flops.	
5	Develop Mealy/Moore Models and state diagrams for the given clocked sequential circuits.	
6	Apply the knowledge gained in the design of Counters and Registers.	

Subject Name with Code	NETWORK ANALYSIS—17EC35	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	After studying this course, students will be able to: Determine currents and voltages using source transformation/ source shifting/mesh/ nodal analysis and reduce given network using star-delta transformation/source transformation/source shifting	
2	Solve network problems by applying Superposition/ Reciprocity/ Thevenin‘s/Norton‘s/ Maximum Power Transfer/ Millman‘s Network Theorems and electrical laws to reduce circuit complexities and to arrive at feasible solutions	
3	Calculate current and voltages for the given circuit under transient conditions.	
4	Apply Laplace transform to solve the given network.	
5	Evaluate for RLC elements/ frequency response related parameters like resonant frequency, quality factor, half power frequencies, voltage across inductor and capacitor, current through the RLC elements, in resonant circuits	

Subject Name with Code	ENGINEERING ELECTROMAGNETICS—17EC36	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	After studying this course, students will be able to: Evaluate problems on electric field due to point, linear, volume charges by applying conventional methods or by Gauss law.	
2	Determine potential and energy with respect to point charge and capacitance using Laplace equation.	
3	Calculate magnetic field, force, and potential energy with respect to magnetic materials.	
4	Apply Maxwell‘s equation for time varying fields, EM waves in free space	

	and conductors
5	Evaluate power associated with EM waves using Poynting theorem.

Subject Name with Code	**ANALOG ELECTRONICS LABORATORY—17ECL37**	**2017-18**
Sl.No.	**COURSE OUTCOMES**	
1	On the completion of this laboratory course, the students will be able to: Test circuits of rectifiers, clipping circuits, clamping circuits and voltage regulators.	
2	Determine the characteristics of BJT and FET amplifiers and plot its frequency response	
3	Compute the performance parameters of amplifiers and voltage regulators.	
4	Design and test the basic BJT/FET amplifiers, BJT Power amplifier and oscillators.	

Subject Name with Code	**DIGITAL ELECTRONICS LAB—17ECL38**	**2017-18**
Sl.No.	**COURSE OUTCOMES**	
1	On the completion of this laboratory course, the students will be able to:	
2	Demonstrate the truth table of various expressions and combinational circuit using logic gates.	
3	Design and test various combinational circuits such as adders, subtractors, comparators, multiplexers.	
4	Realize Boolean expression using decoders.	
5	Construct and test flips-flops, counters and shift registers.	
6	Simulate full adder and up/down counters	

B.E E&C FIFTH SEMESTER

Subject Name with Code	MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT—17ES51	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	After studying this course, students will be able to: Understand the fundamental concepts of Management and Entrepreneurship.	
2	Select a best Entrepreneurship model for the required domain of establishment.	
3	Describe the functions of Managers, Entrepreneurs and their social responsibilities.	
4	Compare various types of Entrepreneurs.	
5	Construct and test flips-flops, counters and shift registers.	
6	Analyse the Institutional support by various state and central government agencies.	

Subject Name with Code	DIGITAL SIGNAL PROCESSING—17EC52	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	After studying this course, students will be able to: Determine response of LTI systems using time domain and DFT techniques.	
2	Compute DFT of real and complex discrete time signals.	
3	Computation of DFT using FFT algorithms and linear filtering approach	
4	Solve problems on digital filter design and realize using digital computations.	

Subject Name with Code	VERILOG HDL—17EC53	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	At the end of this course, students should be able to Write Verilog programs in gate, dataflow (RTL), behavioral and switch modelling levels of Abstraction.	
2	Write simple programs in VHDL in different styles.	
3	Design and verify the functionality of digital circuit/system using test benches.	
4	Identify the suitable Abstraction level for a particular digital design.	
5	Write the programs more effectively using Verilog tasks and directives. Perform timing and delay Simulation.	

Subject Name with Code	INFORMATION THEORY AND CODING—17EC54	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	At the end of the course the students will be able to: Explain concept of Dependent & Independent Source, measure of information, Entropy, Rate of Information and Order of a source.	
2	Represent the information using Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithms.	
3	Model the continuous and discrete communication channels using input, output and joint probabilities.	
4	Determine a codeword comprising of the check bits computed using Linear	
5	Block codes, cyclic codes & convolutional codes.	
6	Design the encoding and decoding circuits for Linear Block codes, cyclic codes, convolutional codes, BCH and Golay codes.	

Subject Name with Code	OPERATING SYSTEM—17EC553	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	After studying this course, students will be able to: Explain the goals, structure, operation and types of operating systems.	
2	Apply scheduling techniques to find performance factors. Explain organization of file systems and IOCS	
3	Apply suitable techniques for contiguous and non-contiguous memory allocation.	
4	Describe message passing, deadlock detection and prevention methods.	

Subject Name with Code	8051 MICROCONTROLLERS—17EC563	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	At the end of the course, students will be able to: Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 Microcontroller, and Interfacing of 8051 to external memory and Instruction set of 8051.	
2	Write 8051 Assembly level programs using 8051 instruction set. Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051.	
3	Write 8051 Assembly language program to generate timings and waveforms using 8051 timers, to send & receive serial data using 8051 serial port and to generate an external interrupt using a switch.	
4	Write 8051 C programs to generate square wave on 8051 I/O port pin using interrupt and to send & receive serial data using 8051 serial port	
5	Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 using 8051 I/O ports	

Subject Name with Code	DSP LAB---17ECL57	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	Understand the concepts of analog to digital conversion of signals and frequency domain sampling of signals.	
2	Modelling of discrete time signals and systems and verification of its properties and results.	
3	Implementation of discrete computations using DSP processor and verify the results.	
4	Realize the digital filters using a simulation tool and a DSP processor and verify the frequency and phase response.	

Subject Name with Code	HDL LAB—17ECL58	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	Write the Verilog/VHDL programs to simulate Combinational circuits in	
2	Dataflow, Behavioral and Gate level Abstractions.	
3	Describe sequential circuits like flip flops and counters in Behavioral description and obtain simulation waveforms.	
4	Synthesize Combinational and Sequential circuits on programmable ICs and test the hardware.	

B.E E&C SEVENTH SEMESTER

Subject Name with Code	MICROWAVES AND ANTENNAS—15EC71	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	Describe the use and advantages of microwave transmission	

2	Analyse various parameters related to microwave transmission lines and waveguides
3	Identify microwave devices for several applications
4	Analyze various antenna parameters necessary for building an RF system
5	Recommend various antenna configurations according to the applications

Subject Name with Code	**DIGITAL IMAGE PROCESSING—15EC72**	**2017-18**
Sl.No.	**COURSE OUTCOMES**	
1	Understand image formation and the role human visual system plays in	
2	Perception of gray and colour image data.	
3	Apply image processing techniques in both the spatial and frequency (Fourier) domains.	
4	Design image analysis techniques in the form of image segmentation and to	
5	Conduct independent study and analysis of Image Enhancement techniques.	

Subject Name with Code	**POWER ELECTRONICS—15EC73**	**2017-18**
Sl.No.	**COURSE OUTCOMES**	
1	Describe the characteristics of different power devices and identify the various applications associated with it.	
2	Illustrate the working of power circuit as DC-DC converter.	
3	Illustrate the operation of inverter circuit and static switches.	
4	Determine the output response of a thyristor circuit with various triggering options.	
5	Determine the response of controlled rectifier with resistive and inductive loads.	

Subject Name with Code	MULTIMEDIA COMMUNICATION—15EC741	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	Understand basics of different multimedia networks and applications.	
2	Understand different compression techniques to compress audio and video.	
3	Describe multimedia Communication across Networks.	
4	Analyse different media types to represent them in digital form.	
5	Compress different types of text and images using different compression	

Subject Name with Code	DSP ALGORITHMS and ARCHITECTURE-15EC751	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	Comprehend the knowledge and concepts of digital signal processing techniques.	
2	Apply the knowledge of DSP computational building blocks to achieve speed in DSP architecture or processor.	
3	Apply knowledge of various types of addressing modes, interrupts, peripherals and pipelining structure of TMS320C54xx processor	
4	Develop basic DSP algorithms using DSP processors	
5	Discuss about synchronous serial interface and multichannel buffered serial port (McBSP) of DSP device.	
6	Demonstrate the programming of CODEC interfacing.	

Subject Name with Code	ADVANCED COMMUNICATION LAB—15ECL76	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	Determine the characteristics and response of microwave devices and optical waveguide.	
2	Determine the characteristics of microstrip antennas and devices and compute the parameters associated with it.	
3	Simulate the digital modulation schemes with the display of waveforms and computation of performance parameters	
4	Design and test the digital modulation circuits/systems and display the waveforms.	

Subject Name with Code	VLSI LAB—15ECL77	2017-18
Sl.No.	**COURSE OUTCOMES**	
1	Write test bench to simulate various digital circuits.	
2	Interpret concepts of DC Analysis, AC Analysis and Transient Analysis in analog circuits.	
3	Design and simulate basic CMOS circuits like inverter, common source amplifier and differential amplifiers.	
4	Use basic amplifiers and further design higher level circuits like operational amplifier and analog/digital converters to meet desired parameters.	
5	Use transistors to design gates and further using gates realize shift registers and adders to meet desired parameters.	

B.E E&C FOURTH SEMESTER

Subject Name with Code	ENGINEERING MATHS-17EC41	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	Solve first and second order ordinary differential equations arising in flow problems using single step and multistep numerical methods.	
2	Understand the analyticity, potential fields, residues and poles of complex potentials in field theory and electromagnetic theory.	
3	Describe conformal and bilinear transformation arising in aerofoil theory, fluid flow visualization and image processing	
4	Solve problems of quantum mechanics, hydrodynamics and heat conduction by employing Bessel‘s function relating to cylindrical polar coordinate systems and Legendre‘s polynomials relating to spherical polar coordinate systems.	
5	Solve problems on probability distributions relating to digital signal processing, information theory and optimization concepts of stability of design and structural engineering.	
6	Draw the validity of the hypothesis proposed for the given sampling distribution in accepting or rejecting the hypothesis.	
7	Determine joint probability distributions and stochastic matrix connected with the multivariable correlation problems for feasible random events.	
8	Define transition probability matrix of a Markov chain and solve problems related to discrete parameter random process.	

Subject Name with Code	SIGNALS AND SYSTEMS—17EC42	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	Classify the signals as continuous/discrete, periodic/aperiodic, even/odd, energy/power and deterministic/random signals.	
2	Determine the linearity, causality, time-invariance and stability properties of continuous and discrete time systems.	
3	Compute the response of a Continuous and Discrete LTI system using convolution integral and convolution sum.	
4	Determine the spectral characteristics of continuous and discrete time signal using Fourier analysis.	
5	Compute Z-transforms, inverse Z- transforms and transfer functions of complex LTI systems.	

Subject Name with Code	CONTROL SYSTEMS—17EC43	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	Develop the mathematical model of mechanical and electrical systems	
2	Develop transfer function for a given control system using block diagram	
3	reduction techniques and signal flow graph method	
4	Determine the time domain specifications for first and second order systems	
5	Determine the stability of a system in the time domain using Routh-Hurwitz	

Subject Name with Code	PRINCIPLES OF COMMUNICATION SYSTEMS—17EC44	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	Determine the performance of analog modulation schemes in time and frequency domains.	
2	Determine the performance of systems for generation and detection of modulated analog signals.	
3	Characterize analog signals in time domain as random processes and in frequency domain using Fourier transforms.	
4	Characterize the influence of channel on analog modulated signals	
5	Determine the performance of analog communication systems.	

Subject Name with Code	LINEAR INTEGRATED CIRCUITS—17EC45	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	Explain Op-Amp circuit and parameters including CMRR, PSRR, Input & Output Impedances and Slew Rate.	
2	Design Op-Amp based Inverting, Non-inverting, Summing & Difference	
3	Amplifier, and AC Amplifiers including Voltage Follower.	
4	Test circuits of Op-Amp based Voltage/ Current Sources & Sinks, Current, Instrumentation and Precision Amplifiers.	

Subject Name with Code	MICROPROCESSORS—17EC46	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	Explain the History of evaluation of Microprocessors, Architecture and instruction	
2	set of 8086, CISC & RISC, Von-Neumann & Harvard CPU Architecture,	
3	Configuration & Timing diagrams of 8086 and Instruction set of 8086.	
4	Write 8086 Assembly level programs using the 8086-instruction set	
5	Write modular programs using procedures.	
6	Write 8086 Stack and Interrupts programming.	

Subject Name with Code	MICROPROCESSOR LAB—17ECL47	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	Write and execute 8086 assembly level programs to perform data transfer, arithmetic and logical operations.	
2	Understand assembler directives, branch, loop operations and DOS 21H Interrupts.	
3	Write and execute 8086 assembly level programs to sort and search elements in a given array.	
4	Perform string transfer, string reversing, searching a character in a string with string manipulation instructions of 8086.	
5	Utilize procedures and macros in programming 8086.	
6	Demonstrate the interfacing of 8086 with 7 segment display, matrix keyboard, logical controller, stepper motor, ADC, DAC, and LDR for simple applications.	

Subject Name with Code	LINEAR ICS AND COMMUNICATION LAB—17ECL48	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	This laboratory course enables students to: Illustrate the pulse and flat top sampling techniques using basic circuits.	
2	Demonstrate addition and integration using linear ICs, and 555 timer operations to generate signals/pulses.	
3	Demonstrate AM and FM operations and frequency synthesis.	
4	Design and illustrate the operation of instrumentation amplifier, LPF, HPF, DAC and oscillators using linear IC.	

B.E E&C SIXTH SEMESTER

Subject Name with Code	DIGITAL COMMUNICATION—17EC61	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	At the end of the course, the students will be able to: Associate and apply the concepts of Bandpass sampling to well specified signals and channels.	
2	Analyze and compute performance parameters and transfer rates for low pass and band pass symbol under ideal and corrupted non band limited channels.	
3	Test and validate symbol processing and performance parameters at the receiver under ideal and corrupted band limited channels.	
4	Demonstrate by simulation and emulation that band pass signals subjected to corrupted and distorted symbols in a band limited channel, can be demodulated and estimated at receiver to meet specified performance criteria.	

Subject Name with Code	ARM MICROCONTROLLER & EMBEDDED SYSTEMS—17EC62	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	After studying this course, students will be able to: Describe the architectural features and instructions of 32 bit microcontroller ARMCortex M3.	
2	Apply the knowledge gained for Programming ARM Cortex M3 for different applications.	
3	Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.	
4	Develop the hardware /software co-design and firmware design approaches.	
5	Explain the need of real time operating system for embedded system applications.	

Subject Name with Code	VLSI DESIGN—17EC63	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	At the end of the course, the students will be able to: Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling.	
2	Draw the basic gates using the stick and layout diagrams with the knowledge of physical design aspects.	
3	Interpret Memory elements along with timing considerations	
4	Demonstrate knowledge of FPGA based system design	
5	Interpret testing and testability issues in VLSI Design	
6	Analyse CMOS subsystems and architectural issues with the design constraints.	

Subject Name with Code	COMPUTER COMMUNICATION NETWORKS—17EC64	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	At the end of the course, the students will be able to: Identify the protocols and services of Data link layer.	
2	Identify the protocols and functions associated with the transport layer services.	
3	Describe the layering architecture of computer networks and distinguish between the OSI reference model and TCP/IP protocol suite.	
4	Distinguish the basic network configurations and standards associated with each network.	
5	Construct a network model and determine the routing of packets using different routing algorithms	

Subject Name with Code	CELLULAR MOBILE COMMUNICATIONS—17EC651	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	At the end of the course, the students will be able to: Apply the understanding of statistical characterization of urban mobile channels to compute the performance for simple modulation schemes	
2	Demonstrate the limitations of GSM, GPRS and CDMA to meet high data rate requirements and limited improvements that are needed.	
3	Analyse the call process procedure between a calling number and called number for all scenarios in GSM or CDMA based systems.	
4	Test and validate voice and data call handling for various scenarios in GSM and CDMA systems for national and international interworking situations.	

Subject Name with Code	EMBEDDED CONTROLLER LAB—17ECL67	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	After studying this course, students will be able to: Understand the instruction set of 32 bit microcontroller ARM Cortex M3, and the software tool required for programming in Assembly and C language.	
2	Develop assembly language programs using ARM Cortex M3 for different applications.	
3	Interface external devices and I/O with ARM Cortex M3.	
4	Develop C language programs and library functions for embedded system applications.	

Subject Name with Code	COMPUTER NETWORKS LAB—17ECL68	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	On the completion of this laboratory course, the students will be able to: Use the network simulator for learning and practice of networking algorithms.	
2	Illustrate the operations of network protocols and algorithms using C programming.	
3	Simulate the network with different configurations to measure the performance parameters.	
4	Implement the data link and routing protocols using C programming.	

Subject Name with Code	DIGITAL SYSTEM DESIGN USING VERILOG—17EC663	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	After studying this course, students will be able to: Construct the combinational circuits, using discrete gates and programmable logic devices.	
2	Describe Verilog model for sequential circuits and test pattern generation.	
3	Design a semiconductor memory for specific chip design.	
4	Design embedded systems using small microcontrollers, larger CPUs/DSPs, or hard or soft processor cores.	
5	Synthesize different types of processor and I/O controllers that are used in embedded system.	

B.E E&C EIGTH SEMESTER

Subject Name with Code	WIRELESS CELLULAR and LTE 4G BROADBAND—15EC81	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	At the end of the course, students will be able to: Understand the system architecture and the functional standard specified in LTE 4G.	
2	Analyse the role of LTE radio interface protocols and EPS Data convergence protocols to set up, reconfigure and release data and voice from users.	
3	Demonstrate the UTRAN and EPS handling processes from set up to release including mobility management for a variety of data call scenarios.	
4	Test and Evaluate the Performance of resource management and packet data processing and transport algorithms.	

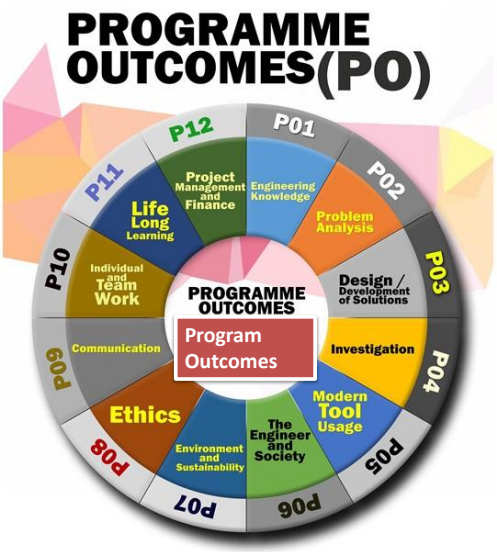
Subject Name with Code	FIBER OPTICS and NETWORKS—15EC82	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	At the end of the course, students will be able to: Classification and working of optical fiber with different modes of signal propagation.	
2	Describe the transmission characteristics and losses in optical fiber communication.	
3	Describe the construction and working principle of optical connectors, multiplexers and amplifiers.	
4	Describe the constructional features and the characteristics of optical sources and detectors.	
5	Illustrate the networking aspects of optical fiber and describe various standards associated with it.	

Subject Name with Code	RADAR ENGINEERING—15EC833	2018-19
Sl.No.	**COURSE OUTCOMES**	
1	At the end of the course, students will be able to: Understand the radar fundamentals and radar signals.	
2	Explain the working principle of pulse Doppler radars, their applications and limitations	
3	Describe the working of various radar transmitters and receivers	
4	Analyze the range parameters of pulse radar system which affect the system Performance.	

Mechanical Engineering

2.6.1 Program outcomes, program specific outcomes and course outcomes

Program Outcomes:



PO1 - Engineering Knowledge: Apply knowledge of mathematics and science, with fundamentals of Mechanical Engineering to be able to solve complex engineering problems related to Mechanical Engineering.

PO2 - Problem Analysis: Identify, Formulate, review research literature and analyze complex engineering problems related to Mechanical Engineering and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3 - Design/Development of solutions: Design solutions for complex aircraft problems related to Mechanical Engineering 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

PO4 - Conduct Investigations of Complex problems: Use research–based knowledge and research methods including design of aircraft structure experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 - Modern Tool Usage: Create, Select and apply appropriate techniques, resources and

modern engineering and IT tools including prediction and modeling to Mechanical Engineering related complex engineering activities with an understanding of the limitations.

PO6 - 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 Mechanical professional engineering practice.

PO7 - Environment and Sustainability: Understand the impact of the Mechanical professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development

PO8 - Ethics: Apply Ethical Principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary Settings.

PO10 -Communication: Communicate effectively on complex engineering activities with the engineering community and with High society and with write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO11 -Project Management and Finance: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.

PO12 -Life-Long Learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning the broadest content of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

Engineering Graduates will be able to:

PSO-1: Knowledge:	Mechanical Graduates will have strong fundamental technical knowledge and are capable to develop core competency in diversified areas such as Production, Design, Thermal, Industrial and allied fields with the use of software tools to expand their knowledge horizon and inculcate lifelong learning.
PSO-2:	Graduates will have effective communication, leadership, team building, problem solving, decision making skills, and software and creative skills by

Skill:	understanding contemporary issues there by contributing to their overall personality and career development.
PSO-3: **Attitude**	Graduates will practice ethical responsibilities and service towards their peers, employers, society and follow these percepts in their daily life.

Course Outcomes:

1st Year CO Details

ENGINEERING MATHEMATICS-I : Sub Code: 17MAT11	
CO1	Use partial derivatives to calculate rates of change of multivariate functions.
CO2	Analyze position, velocity, and acceleration in two or three dimensions using the calculus of vector valued functions
CO3	Recognize and solve first-order ordinary differential equations, Newton's law of cooling
CO4	Use matrices techniques for solving systems of linear equations in the different areas of Linear Algebra

ENGINEERING CHEMISTRY Sub Code: 17CHE12/17CHE22	
CO1	Electrochemical and concentration cells. Classical & modern batteries and fuel cells
CO2	Causes & effects of corrosion of metals and control of corrosion. Modification of surface properties of metals to develop resistance to corrosion, wear, tear, impact etc. by electroplating and electro less plating.
CO3	Production & consumption of energy for industrialization of country and living standards of people. Utilization of solar energy for different useful forms of energy
CO4	Replacement of conventional materials by polymers for various applications
CO5	Boiler troubles; sewage treatment and desalination of sea water
CO6	Over viewing of synthesis, properties and applications of nanomaterials

ELEMENTS OF MECHANICAL ENGINEERING Sub Code: 17EME14/17EME24	
CO1	Various Energy sources, Boilers, Prime movers such as turbines and IC engines, refrigeration and air-conditioning systems
CO2	Metal removal process using Lathe, drilling, Milling Robotics and Automation
CO3	Fair understanding of application and usage of various engineering materials

COMPUTER AIDED ENGINEERING DRAWING Sub Code: 17CED14/17CED24	
CO1	Students will be able to demonstrate the usage of CAD software

CO2	Students will be able to visualize and draw Orthographic projections, Sections of solids and Isometric views of solids
CO3	Students are evaluated for their ability in applying various concepts to solve practical problems related to engineering drawing

WORKSHOP PRACTICE Sub Code: 17WSL16/17WSL26	
CO1	Demonstrate and produce different types of fitting models
CO2	Gain knowledge of development of sheet metal models with an understanding of their applications
CO3	Perform soldering and welding of different sheet metal & welded joints
CO4	Understand the Basics of Workshop practices

3rd Semester CO Details

Material Science	**Sub Code: 15ME32**
CO1	Describe the mechanical properties of metals, their alloys and various modes of failure
CO2	Understand the microstructures of ferrous and non-ferrous materials to mechanical properties
CO3	Explain the processes of heat treatment of various alloys
CO4	Understand the properties and potentialities of various materials available and material selection procedures
CO5	Know about composite materials and their processing as well as applications

Basic Thermodynamics	**Sub Code: 15ME33**
CO1	Explain thermodynamic systems, properties, Zeroth law of thermodynamics, temperature scales and energy interactions
CO2	Determine heat, work, internal energy, enthalpy for flow &non flow process using First and Second Law of Thermodynamics
CO3	Interpret behavior of pure substances and its applications to practical problems
CO4	Determine change in internal energy, change in enthalpy and change in entropy using TD relations for ideal gases
CO5	Calculate Thermodynamics properties of real gases at all ranges of pressure, temperatures using modified equation of state including Vander Waals equation, Redlich Wong equation and Beattie Bridgeman equation

Mechanics of Materials	**Sub Code: 15ME34**
CO1	Understand simple, compound, thermal stresses and strains their relations, Poisson's ratio, Hooke's law, mechanical properties including elastic constants and their relations
CO2	Determine stresses, strains and deformations in bars with varying circular and rectangular cross-sections subjected to normal and temperature loads
CO3	Determine plane stress, principal stress, maximum shear stress and their orientations using analytical method and Mohr's circle
CO4	Determine the dimensions of structural members including beams, bars and rods using Energy methods and also stress distribution in thick and thin cylinders

CO5	Draw SFD and BMD for different beams including cantilever beams, simply supported beams and overhanging beams subjected to UDL, UVL, Point loads and couples
CO6	Determine dimensions, bending stress, shear stress and its distribution in beams of circular, rectangular, symmetrical I and T sections subjected to point loads and UDL
CO7	Determine slopes and deflections at various points on beams subjected to UDL, UVL, Point loads and couples
CO8	Determine the dimensions of shafts based on torsional strength, rigidity and flexibility and also elastic stability of columns using Rankin's and Euler's theory

Metal Casting and Welding	**Sub Code: 15ME35A**
CO1	Describe the casting process, preparation of Green, Core, dry sand molds and Sweep, Shell, Investment and plaster molds
CO2	Explain the Pattern, Core, Gating, Riser system and Jolt, Squeeze, Sand Slinger Molding Machines
CO3	Compare the Gas fired pit, Resistance, Coreless, Electrical and Cupola Metal Furnaces
CO4	Compare the Gravity, Pressure die, Centrifugal, Squeeze, slush and Continuous Metal mold castings
CO5	Explain the Solidification process and Casting of Non-Ferrous Metals
CO6	Describe the Metal Arc, TIG, MIG, Submerged and Atomic Hydrogen Welding processes used in manufacturing
CO7	Explain the Resistance spot, Seam, Butt , Projection, Friction, Explosive, Thermit, Laser and Electron Beam Special type of welding process used in manufacturing
CO8	Describe the Metallurgical aspects in Welding and inspection methods for the quality assurance of components made of casting and joining process

Computer Aided Machine Drawing	**Sub Code: 15ME36A**
CO1	Sections of pyramids, prisms, cubes, cones and cylinders resting on their bases in 2D
CO2	Orthographic views of machine parts with and without sectioning in 2D
CO3	Sectional views for threads with terminologies of ISO Metric, BSW, square and acme, sellers and American standard threads in 2D
CO4	Hexagonal and square headed bolt and nut with washer, stud bolts with nut and lock nut, flanged nut, slotted nut, taper and split pin for locking counter sunk head screw, grub screw, Allen screw assemblies in 2D
CO5	Parallel key, Taper key, and Woodruff Key as per the ISO standards in 2D
CO6	single and double riveted lap joints, butt joints with single/double cover straps, cotter and knuckle joint for two rods in 2D
CO7	Sketch split muff, protected type flanged, pin type flexible, Oldham's and universal couplings in 2D
CO8	assemblies from the part drawings with limits ,fits and tolerance given for Plummer block, Ram bottom safety valve, I.C. Engine connecting rod, Screw Jack, Tailstock of lathe, Machine Vice and Lathe square tool post in 2D and 3D

Materials Testing Lab	**Sub Code: 15MEL37 A**
CO1	Acquire experimentation skills in the field of material testing

CO2	Develop theoretical understanding of the mechanical properties of materials by performing experiments
CO3	Apply the knowledge to analyze a material failure and determine the failure inducing agent/S
CO4	Apply the knowledge of testing methods in related areas
CO5	Know how to improve structure/behavior of materials for various industrial applications

Foundry and Forging LabSub Code: 15MEL38 A	
CO1	Demonstrate various skills of sand preparation, molding
CO2	Demonstrate various skills of forging operations
CO3	**Work as a team keeping up ethical principles**

4th Semester CO Details

Kinematics of Machines	**Sub Code: 15ME42**
CO1	Identify mechanisms with basic understanding of motion
CO2	Comprehend motion analysis of planar mechanisms, gears, gear trains and cams
CO3	Carry out motion analysis of planar mechanisms, gears, gear trains and cams

Applied Thermodynamics	**Sub Code: 15ME43**
CO1	Apply thermodynamic concepts to analyze the performance of gas power cycles including propulsion system
CO2	Evaluate the performance of steam turbine components
CO3	Understand combustion of fuels and combustion processes in I C engines including alternate fuels and pollution effect on environment
CO4	Apply thermodynamic concepts to analyze turbo machines
CO5	Determine performance parameters of refrigeration and air-conditioning systems
CO6	Understand the principles and applications of refrigeration systems
CO7	Analyze air-conditioning processes using the principles of psychometric and Evaluate cooling and heating loads in an air-conditioning system
CO8	Understand the working, applications, relevance of air and identify methods for performance improvement

Fluid Mechanics	**Sub Code: 15ME43**
CO1	Identify and calculate the key fluid properties used in the analysis of fluid behavior
CO2	Understand and apply the principles of pressure, buoyancy and floatation
CO3	Apply the knowledge of fluid statics, kinematics and dynamics while addressing problems of mechanical and chemical engineering
CO4	Understand and apply the principles of fluid kinematics and dynamics
CO5	Understand the concept of boundary layer in fluid flow and apply dimensional analysis to form dimensionless numbers in terms of input output variables
CO6	Understand the basic concept of compressible flow and CFD

Machine Tools and Operations	**Sub Code: 15ME45B**
CO1	Explain the construction & specification of various machine tools
CO2	Describe various machining processes pertaining to relative motions between tool & work piece
CO3	Discuss different cutting tool materials, tool nomenclature & surface finish
CO4	Apply mechanics of machining process to evaluate machining time
CO5	Analyze tool wear mechanisms and equations to enhance tool life and minimize machining cost

Mechanical Measurements and Metrology	**Sub Code: 15ME46B**
CO1	Understand the objectives of metrology, methods of measurement, selection of measuring instruments, standards of measurement and calibration of end bars
CO2	Describe slip gauges, wringing of slip gauges and building of slip gauges, angle measurement using sine bar, sine center, angle gauges, optical instruments and straightness measurement using Autocollimator
CO3	Explain tolerance, limits of size, fits, geometric and position tolerances, gauges and their design
CO4	Understand the principle of Johnson Mikrokator, sigma comparator, dial indicator, LVDT, back pressure gauges, Solex comparators and Zeiss Ultra Optimeter
CO5	Describe measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2 – wire, 3 – wire methods, screw thread gauges and tool maker's microscope
CO6	Explain measurement of tooth thickness using constant chord method, addendum comparator methods and base tangent method, composite error using gear roll tester and measurement of pitch, concentricity, run out and involute profile
CO7	Understand laser interferometers and Coordinate measuring machines
CO8	Explain measurement systems, transducers, intermediate modifying devices and terminating devices
CO9	Describe functioning of force, torque, pressure, strain and temperature measuring devices

Mechanical Measurements and Metrology Lab	**Sub Code: 15ME47B**
CO1	To calibrate pressure gauge, thermocouple, LVDT, load cell, micrometer
CO2	To measure angle using Sine Center/ Sine Bar/ Bevel Protractor, alignment using Autocollimator/ Roller set
CO3	To demonstrate measurements using Optical Projector/Tool maker microscope, Optical flats
CO4	To measure cutting tool forces using Lathe/Drill tool dynamometer
CO5	To measure Screw thread parameters using 2-Wire or 3-Wire method, gear tooth profile using gear tooth Vernier/Gear tooth micrometer
CO6	To measure surface roughness using Tally Surf/ Mechanical Comparator

Machine Shop	Sub Code: 15ME48B
CO1	Perform turning , facing , knurling , thread cutting, tapering , eccentric turning and allied operations
CO2	Perform keyways / slots , grooves etc., using shaper
CO3	Perform gear tooth cutting using milling machine
CO4	Understand the formation of cutting tool parameters of single point cutting tool using bench grinder / tool and cutter grinder
CO5	Understand Surface Milling/Slot Milling
CO6	Demonstrate precautions and safety norms followed in Machine Shop
CO7	Exhibit interpersonal skills towards working in a team

5th Semester CO Details

Management And Engineering Economics	Sub Code: 15ME51
CO1	Understand needs, functions, roles, scope and evolution of Management
CO2	Understand importance, purpose of Planning and hierarchy of planning and also analyze its types
CO3	Discuss Decision making, Organizing, Staffing, Directing and Controlling
CO4	Select the best economic model from various available alternatives
CO5	Understand various interest rate methods and implement the suitable one
CO6	Estimate various depreciation values of commodities
CO7	Prepare the project reports effectively

Dynamics of Machinery	Sub Code: 15ME52
CO1	Determine the forces and couples for static and dynamic conditions of four bar and slider crank mechanisms to keep the system in equilibrium
CO2	Determine magnitude and angular position of balancing masses under static and dynamic condition of rotating masses in same and different planes
CO3	Determine unbalanced primary, secondary forces and couples in single and multi-cylinder engine
CO4	Determine sensitiveness, isochronism, effort and power of porter and hartnell governors
CO5	Determine gyroscopic couple and effects related to 2, 4 wheeler, plane disc, ship and aero planes
CO6	Understand types of vibration, SHM and methods of finding natural frequencies of simple mechanical systems
CO7	Determine equation of motion, natural frequency, damping factor, logarithmic decrement of damped free vibration (SDOF) systems
CO8	Determine the natural frequency, force and motion transmissibility of single degree freedom systems
CO9	Determine equation of motion of rotating and reciprocating unbalance systems, magnification factor, and transmissibility of forced vibration (SDOF) systems

Turbo Machines	**Sub Code: 15ME53**
CO1	Able to give precise definition of turbo machinery
CO2	Identify various types of turbo machinery
CO3	Apply the Euler's equation for turbo machinery to analyses energy transfer in turbo machines
CO4	Understand the principle of operation of pumps, fans, compressors and turbines
CO5	Perform the preliminary design of turbo machines (pumps, rotary compressors and turbines)
CO6	Analyze the performance of turbo machinery

Design of Machine Elements-I	**Sub Code: 15ME54**
CO1	Describe the design process, choose materials
CO2	Apply the codes and standards in design process
CO3	Analyze the behavior of machine components under static, impact, fatigue loading using failure theories
CO4	Design shafts, joints, couplings
CO5	Design of riveted and welded joints
CO6	Design of threaded fasteners and power screws

Non Traditional Machining	**Sub Code: 15ME554**
CO1	Understand the compare traditional and non-traditional machining process and recognize the need for Non-traditional machining process.
CO2	Understand the constructional features, performance parameters, process characteristics, applications, advantages and limitations of USM, AJM and WJM.
CO3	Identify the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages and limitations
CO4	Understand the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM &PAM
CO5	Understand the LBM equipment, LBM parameters, and characteristics. EBM equipment and mechanism of metal removal, applications, advantages and limitations LBM & EBM

Energy And Environment	**Sub Code: 15ME562**
CO1	Summarize the basic concepts of energy, its distribution and general Scenario
CO2	Explain different energy storage systems, energy management, audit and economic analysis
CO3	Summarize the environment eco system and its need for awareness
CO4	Identify the various types of environment pollution and their effects
CO5	Discuss the social issues of the environment with associated acts

Fluid Mechanics & Machinery Lab	**Sub Code: 15MEL57**
CO1	Perform experiments to determine the coefficient of discharge of flow measuring devices
CO2	Conduct experiments on hydraulic turbines and pumps to draw characteristics
CO3	Test basic performance parameters of hydraulic turbines and pumps and execute the

	knowledge in real life situations
CO4	Determine the energy flow pattern through the hydraulic turbines and pumps
CO5	Exhibit his competency towards preventive maintenance of hydraulic machines

Energy Conversion Lab	**Sub Code: 15MEL58**
CO1	Perform experiments to determine the properties of fuels and oils
CO2	Conduct experiments on engines and draw characteristics
CO3	Test basic performance parameters of I.C. Engine and implement the knowledge in industry
CO4	Identify exhaust emission, factors affecting them and report the remedies
CO5	Determine the energy flow pattern through the I C Engine
CO6	Exhibit his competency towards preventive maintenance of IC engines

6th Semester CO Details

Finite Element Analysis	**Sub Code: 15ME61**
CO1	Understand the concepts behind formulation methods in FEM
CO2	Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements
CO3	Develop element characteristic equation and generation of global equation
CO4	Able to apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi symmetric and dynamic problems and solve them displacements, stress and strains induced

Computer Integrated Manufacturing	**Sub Code: 15ME62**
CO1	Able to define Automation, CIM, CAD, CAM and explain the differences between these concepts. Solve simple problems of transformations of entities on computer screen
CO2	Explain the basics of automated manufacturing industries through mathematical models and analyze different types of automated flow lines
CO3	Analyze the automated flow lines to reduce down time and enhance productivity
CO4	Explain the use of different computer applications in manufacturing, and able to prepare part programs for simple jobs on CNC machine tools and robot programming
CO5	Visualize and appreciate the modern trends in Manufacturing like additive manufacturing, Industry 4.0 and applications of Internet of Things leading to Smart Manufacturing

Heat Transfer	**Sub Code: 15ME63**
CO1	Understand the basic modes of heat transfer
CO2	Compute temperature distribution in steady-state and unsteady-state heat conduction
CO3	Understand and interpret heat transfer through extended surfaces
CO4	Interpret and compute forced and free convective heat transfer
CO5	Explain the principles of radiation heat transfer and understand the numerical formula for heat conduction problems
CO6	Design heat exchangers using LMTD and NTU methods

Design of Machine Elements II	**Sub Code: 15ME64**
CO1	Apply engineering design tools to product design
CO2	Design mechanical systems involving springs,belts and pulleys
CO3	Design different types of gears and simple gear boxes for different applications
CO4	Design brakes and clutches
CO5	Design hydrodynamic bearings for different applications.
CO6	Select Anti friction bearings for different applications using the manufacturers, catalogue.
CO7	Develop proficiency to generate production drawings using CAD software
CO8	Become good design engineers through learning the art of working in a team with morality and ethics

Metal Forming	**Sub Code: 15ME653**
CO1	Able to understand the concept of different metal forming process
CO2	Able to approach metal forming processes both analytically and numerically
CO3	Able to design metal forming processes
CO4	Able to develop approaches and solutions to analyze metal forming processes and the associated problems and flaws

Automobile Engineering	**Sub Code: 15ME655**
CO1	To identify the different parts of an automobile and it's working
CO2	To understand the working of transmission and braking systems
CO3	To comprehend the working of steering and suspension systems
CO4	To learn various types of fuels and injection systems
CO5	To know the cause of automobile emissions ,its effects on environment and methods to reduce the emissions

INDUSTRIAL SAFETY	**Sub Code: 15ME662**
CO1	Understand the basic safety terms
CO2	Identify the hazards around the work environment and industries
CO3	Use the safe measures while performing work in and around the work area of the available laboratories
CO4	Able to recognize the sign boards and its application
CO5	Able to demonstrate the portable extinguishers used for different class of fires
CO6	Able to write the case studies by sharing experience of the employees working in housekeeping, laboratories like workshops, electrical labs, machine shops, electronics and computer laboratories
CO7	Able to understand and report the case studies from various references (text books, news report, journals, visiting industries like power stations,manufacturing and maintenance)

Total Quality Management	**Sub Code: 15ME664**
CO1	Explain the various approaches of TQM
CO2	Infer the customer perception of quality
CO3	Analyze customer needs and perceptions to design feedback systems
CO4	Apply statistical tools for continuous improvement of systems
CO5	Apply the tools and technique for effective implementation of TQM

Heat Transfer Lab	Sub Code: 15MEL67
CO1	Perform experiments to determine the thermal conductivity of a metal rod
CO2	Conduct experiments to determine convective heat transfer coefficient for free and forced convection and correlate with theoretical values
CO3	Estimate the effective thermal resistance in composite slabs and efficiency in pin-fin
CO4	Determine surface emissivity of a test plate
CO5	Estimate performance of a refrigerator and effectiveness of fin
CO6	Calculate temperature distribution of study and transient heat conduction through plane wall, cylinder and fin using numerical approach

Modeling and Analysis Lab	Sub Code: 15ME664
CO1	Demonstrate the basic features of an analysis package
CO2	Use the modern tools to formulate the problem, and able to create geometry, discretize, apply boundary condition to solve problems of bars, truss, beams, plate to find stress with different loading conditions
CO3	Demonstrate the deflection of beams subjected to point, uniformly distributed and varying loads further to use the available results to draw shear force and bending moment diagrams
CO4	Analyze the given problem by applying basic principle to solve and demonstrate 1D and 2D heat transfer with conduction and convection boundary conditions
CO5	Carry out dynamic analysis and finding natural frequencies for various boundary conditions and also analyze with forcing function

7th Semester CO Details

Engineering Economics	Sub Code: 10ME71
CO1	Identify the type of interest simple compound preset worth comparison equivalent annual worth comparison shrinking fund application concepts using formulas compound interest tables
CO2	Knowledge of obtaining annual payment monthly payment cash flow diagram depreciation
CO3	To acquire skills regarding direct costs components of costs financial statement profit and loss account, Determine the stability of profit planning balance sheet scope of finance functions

MECHANICAL VIBRATIONS	Sub Code: 10ME72
CO1	Understand types, of vibrations, SDOF system, Fourier series
CO2	Undammed, Damped & Forced vibrations for SDOF Systems
CO3	Measuring Instruments & critical speed of shafts
CO4	Natural frequencies of Two DOF & Multi degree of freedom systems

HYDRAULICS & PNEUMATICS	SUB Code: 10ME73
CO1	Describe the construction, structure & working Principle of various Hydraulic pumps, motors and Actuators and their Performance Characteristics
CO2	Comprehend &Analyze Single& Double Acting Hydraulic Cylinder circuits and their

	Control Components and Maintenance of Hydraulic Systems
CO3	Describe the construction, structure & working Principle of various Pneumatic Actuators, Pneumatic Control Valves Applications
CO4	Recall the Signal Processing Elements such as OR & AND gates in pneumatic applications and Multi cylinder applications and Electro-Pneumatic Control

OPERATION RESEARCH	**SUB Code: 10ME74**
CO1	Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively. Will have the knowledge of formulating mathematical models for quantitative analysis
CO2	Students will have the knowledge of optimizing the transportation models and Integer Programming models.
CO3	Students will have the knowledge of Project management techniques: PERT-CPM and Queuing Theory
CO4	Students will have the knowledge of Game Theory problems and Sequencing of Job's

NON CONVENSIONAL ENERGY SOURCES	**SUB Code: 10ME754**
CO1	Ability to understand the availability of energy, consumption and conservations and alternative energy sources.
CO2	Ability to understand the alternate sources of energy like solar, wind, geothermal, tidal, OTEC, etc.,
CO3	Ability to understand global warming by adopting green and clean technologies like solar collectors, solar pond, wind generators, wind machines, solar water still etc.,
CO4	Ability to understand the alternate sources of energy like Energy from tidal system, geothermal, Biomass, bio digestion and Hydrogen energy

EXPERIMENTAL STRESS ANALYSIS	**SUB Code: 10ME761**
CO1	Ability to understand fundamentals of strain gauges and types, potentiometer circuits, Wheatstone bridge with constant voltage, different types of strain rosettes
CO2	The student is aware of the overall concepts of stress/strain analysis by experimental means, photo elasticity for two dimensional and three dimensional, scattered light polar scopes, brittle coating, birefringence coating
CO3	The student is familiar with the theory and practice of common experimental stress analysis methods including grid methods, photo elasticity, moiré analysis, interferometer and strain gauges.
CO4	Ability to understand the problems on strain analysis, two element rosette, three element rosette, delta rosette, crack patterns in brittle coating techniques, holography

DESIGN LAB	**SUB Code: 10MEL77**
CO1	Understand the concept of natural frequency and damping coefficient in a single DOF vibrating system
CO2	Students are able analyze the balancing of rotating and reciprocating masses by using static and dynamic balance

CO3	Ability to demonstrate the concept of stress concentration for different photo- elastic materials
CO4	Students are able to determine pressure distribution in journal bearings

CIM & AUTOMOTAION LAB	**SUB Code: 10MEL78**
CO1	Ability to identify the type of machining center for the geometry given (cylindrical or prismatic), write the part program, explain the instructions, examine for the error in the program and choose right G and M codes to optimize the program and construct the final geometry by running the simulation using the software
CO2	To practically relate to concepts discussed in Computer Integrated Manufacturing course to write CNC part programs using SWAN SOFT CNC simulation package for simulation of machining operations such as Turning, Drilling & Milling. To understand & write programs for Flexible Manufacturing Systems &Robotics

8th Semester CO Details

OPERATION MANAGEMENT	**Sub Code: 10ME81**
CO1	Identify the Properties of forecasting productivity characteristics of operation decisions
CO2	Knowledge of obtaining techniques of aggregate planning mathematical techniques of scheduling process determining capacity requirement concept of tenders
CO3	To acquire skills to charting techniques and Determine the stability of production effective capacity material requirement planning procurement process
CO4	To acquire knowledge about the supply chain management, and importance of purchasing in the organization. To take the decision by the Break Even analysis

CONTROL ENGINEERING	**Sub Code: 10ME82**
CO1	Identify the type of control system, their applications, limitations, Concepts of feedback, Types of controllers and also arrive at the transfer functions of the given physical system (i.e. Mechanical , Electrical , Thermal, Hydraulic) models by writing Differential Equations using Laplace Transformation
CO2	Produce the Transfer Function by Block Reduction Technique and also using Mason's Formula for Signal Flow Graph and also Interpret the S-plane with the terms like settling time, rise-time and overshoot to step-response. Apply Routh-Hurwitz criterion to determine the stability of time- invariant systems
CO3	Apply frequency domain analysis techniques, and design control systems to achieve specific dynamic characteristics, Possess knowledge of stability and controls, Determine the stability of control systems using Nyquist methods and also by using Bode Attenuation diagrams
CO4	Determine the stability of control systems using Root-Locus Technique and feedback control systems using frequency domain and state-variable methods. Possess knowledge of stability and controls

POWER PLANT ENGINEERING	**Sub Code: 10ME833**
CO1	Understand types of fuels, types of stokers, types of circulation, Advantages and disadvantages of pulverised coal, Equipment for preparation and burning of pulverised coal ,working of unit system and bin system, Construction and Working of LaMount, Benson, Velox, Schmidt, Loeffer and Ramson steam generators. Natural and forced circulation in power plants
CO2	Understand different draught systems, different cooling towers, boiler mountings and accessories, height of chimney, different cooling towers, methods of starting diesel engine, methods of cooling diesel power plants, hydrographs, flow duration curve , mass curve, Penstock, water hammer, surge tanks, gates and valves, power house and knowledge of the important Hydel Installations in India
CO3	Understand the components and working of nuclear power plant, nuclear fission and fusion reactions, disposal of nuclear waste and have the knowledge about the reactors of the following types - Pressurized water reactor, Boiling water reactor, Sodium graphite reactor(liquid metal reactor), and Nuclear fuels. Define connected load, maximum demand, demand factor, investigations to be done during site selection for power plants. Have the knowledge about selection of plant and generating equipment's, performance and operating characteristics of power plants, tariffs for electrical energy

AUTOMOTIVE ENGINEERING	**Sub Code: 10ME844**
CO1	Students are able to understand an automobile engine components and fuel supply system of construction, operation, application
CO2	Students are able to understand improving of performance of IC engine by supercharger, turbocharger & ignition system
CO3	Students are able understand different gear system and power transmission system to rear wheel and of the I C engine
CO4	Students are able to understand and suspension system of the I C engine & automotive emission control system and standard of the emission controlled

1st year – Basic Engineering

CALCULUS AND LINEAR ALGEBRA Sub Code: 18MAT11	
Course Outcomes: On completion of this course, students are able to:	
CO1	Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.
CO2	Learn the notion of partial differentiation to calculate rates of change of multivariate functions and solve problems related to composite functions and Jacobians.
CO3	Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.
CO4	Solve first order linear/nonlinear differential equation analytically using standard methods
CO5	Make use of matrix theory for solving system of linear equations and compute eigenvalues and eigenvectors required for matrix diagonalization process.

ENGINEERING PHYSICS Course Code : 18PHY12/22	
Course Outcomes: On completion of this course, students are able to:	
CO1	Understand various types of oscillations and their implications, the role of Shock waves in various fields and Recognize the elastic properties of materials for engineering applications.
CO2	Realize the interrelation between time varying electric field and magnetic field, the transverse nature of the EM waves and their role in optical fiber communication.
CO3	Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent 1-D Schrodinger's wave equation.
CO4	Apprehend theoretical background of laser, construction and working of different types of laser and its applications in different fields
CO5	Understand various electrical and thermal properties of materials like conductors, semiconductors and dielectrics using different theoretical models.

BASIC ELECTRICAL ENGINEERING	Course Code : I8ELE13/23
Course Outcomes: On completion of this course, students are able to:	
CO1	Explain the principle of operation and construction of single phase transformers.
CO2	Explain the principle of operation and construction of DC machines and synchronous machines.
CO3	Explain the principle of operation and construction of three phase induction motors.
CO4	Discuss concepts of electrical wiring, circuit protecting devices and earthing.
CO5	Explain the principle of operation and construction of single phase transformers.

ELEMENTS OF CIVIL NEGINEERING AND MECHANICS Course Code : 18CIV14/24	
Course Outcomes: On completion of this course, students are able to:	
CO1	Mention the applications of various fields of Civil Engineering.
CO2	Compute the resultant of given force system subjected to various loads.
CO3	Comprehend the action of Forces, Moments and other loads on systems of rigid bodies and compute the reactive forces that develop as a result of the external loads.
CO4	Locate the Centroid and compute the Moment of Inertia of regular and built-up sections.
CO5	Express the relationship between the motion of bodies and analyze the bodies in motion. Question paper pattern:

ENGINEERING GRAPHICS	Course Code : 18EGDL15/25
Course Outcomes: On completion of this course, students are able to:	
CO1	Prepare engineering drawings as per BIS conventions mentioned in the relevant codes.
CO2	Produce computer generated drawings using CAD software.
CO3	Use the knowledge of orthographic projections to represent engineering information / concepts and present the same in the form of drawings.
CO4	Develop isometric drawings of simple objects reading the orthographic projections of those objects.

CO5	Convert pictorial and isometric views of simple objects to orthographic views. Question paper pattern:

ENGINEERING PHYSICS LABORATORY Course Code : I8PHYL16/26	
Course Outcomes: On completion of this course, students are able to:	
CO1	Identify the common electrical components and measuring instruments used for conducting experiments in the electrical laboratory.
CO2	Compare power factor of lamps.
CO3	Determine impedance of an electrical circuit and power consumed in a 3 phase load.
CO4	Determine earth resistance and understand two way and three way control of lamps.

Course Code : I8ELEL17/27 Basic Electrical Engineering Laboratory	
Course Outcomes: On completion of this course, students are able to:	
CO1	Identify the common electrical components and measuring instruments used for conducting experiments in the electrical laboratory.
CO2	Compare power factor of lamps.
CO3	Determine impedance of an electrical circuit and power consumed in a 3 phase load.
CO4	Determine earth resistance and understand two way and three way control of lamps.

TECHNICAL ENGLISH 1 Course Code : I8EGH18	
Course Outcomes: On completion of this course, students are able to:	
CO1	Use grammatical English and essentials of language skills and identify the nuances of phonetics, intonation and flawless pronunciation
CO2	Implement English vocabulary at command and language proficiency
CO3	Identify common errors in spoken and written communication
CO4	Understand and improve the non verbal communication and kinesics
CO5	Perform well in campus recruitment, engineering and all other general competitive examinations

Course Code : 18MAT21 , ADVANCE CALCULAS AND NUMERICAL METHODS	
Course Outcomes: On completion of this course, students are able to:	
CO1	Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.
CO2	Demonstrate various physical models through higher order differential equations and solve such linear ordinary differential equations.
CO3	Construct a variety of partial differential equations and solution by exact methods/method of separation of variables.
CO4	Explain the applications of infinite series and obtain series solution of ordinary differential equations.
CO5	Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.

Course Code : ISCHE12/22 , ENGINEERING CHEMISTRY	
Course Outcomes: On completion of this course, students are able to:	
CO1	Use of free energy in equilibria, rationalize bulk properties and processes using thermodynamic considerations, electrochemical energy systems.
CO2	Causes & effects of corrosion of metals and control of corrosion. Modification of surface properties of metals to develop resistance to corrosion, wear, tear, impact etc. by electroplating and electroless plating.
CO3	Production & consumption of energy for industrialization of country and living standards of people. Electrochemical and concentration cells. Classical, modern batteries and fuel cells. Utilization of solar energy for different useful forms of energy.
CO4	Environmental pollution, waste management and water chemistry.
CO5	Different techniques of instrumental methods of analysis. Fundamental principles of nano materials.

Course Code : 18CPS13/23 C PROGRAMMING FOR PROBLEM SOLVING	
Course Outcomes: On completion of this course, students are able to:	
CO1	Illustrate simple algorithms from the different domains such as mathematics, physics, etc.
CO2	Construct a programming solution to the given problem using C.
CO3	Identify and correct the syntax and logical errors in C programs.
CO4	Modularize the given problem using functions and structures.

Course Code : I8SELN14/24 , BASIC ELECTRONICS	
Course Outcomes: On completion of this course, students are able to:	
CO1	Describe the operation of diodes, BJT, FET and Operational Amplifiers.
CO2	Design and explain the construction of rectifiers, regulators, amplifiers and oscillators.
CO3	Describe general operating principles of SCRs and its application.
CO4	Explain the working and design of Fixed voltage IC regulator using 7805 and Astable oscillator using Timer IC 555.
CO5	Explain the different number system and their conversions and construct simple combinational and sequential logic circuits using Flip-Flops.

Course Code :18ME15/25 ELEMENTS OF MECHANICAL ENGINEERING	
Course Outcomes: On completion of this course, students are able to:	
CO1	Identify different sources of energy and their conversion process.
CO2	Explain the working principle of hydraulic turbines, pumps, IC engines and refrigeration.
CO3	Recognize various metal joining processes and power transmission elements.
CO4	Understand the properties of common engineering materials and their applications in engineering industry.
CO5	Discuss the working of conventional machine tools, machining processes, tools and accessories.
CO6	Describe the advanced manufacturing systems.

Course Code : 18CHEL16/26 , ENGINEERING CHEMISTRY LABORATORY	
Course Outcomes: On completion of this course, students are able to:	
CO1	Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.
CO2	Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results. Conduction of Practical Examination :
CO3	Examination shall be conducted for 100 marks, later reduced to 60 marks. All experiments are to be included for practical examination.
CO4	One instrumental and another volumetric experiment shall be set. Different experiments shall be set under instrumental and a common experiment under volumetric.

Course Code : 18CPL17/27 , C PROGRAMMING LABORATORY	
Course Outcomes: On completion of this course, students are able to:	
CO1	Identify common errors in spoken and written communication
CO2	Get familiarized with English vocabulary and language proficiency
CO3	Improve nature and style of sensible writing and acquire employment and workplace communication skills
CO4	Improve their Technical Communication Skills through Technical Reading and Writing practices
CO5	Perform well in campus recruitment, engineering and all other general competitive examinations
Course Code : 18SEGH28	**Technical English -II**
Course Outcomes: On completion of this course, students are able to:	
CO1	Identify common errors in spoken and written communication
CO2	Get familiarized with English vocabulary and language proficiency
CO3	Improve nature and style of sensible writing and acquire employment and workplace communication skills
CO4	Improve their Technical Communication Skills through Technical Reading and Writing practices
CO5	Perform well in campus recruitment, engineering and all other general competitive examinations