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 analyse 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 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

3rd SEM

ELECTRONIC INSTRUMENTATION

Course Code	17EC32

- Describe instrument measurement errors and calculate them.
- Describe the operation of Ammeters, Voltmeters, Multimeters and develop circuits for multirange Ammeters and Voltmeters.
- 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.
- 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.
- Describe and discuss functioning and types of Oscilloscopes, Signal generators and Transducers.
- Utilize AC and DC bridges for passive component and frequency measurements

ANALOG ELECTRONICS

Course Code	17EC33

Course Outcomes: After studying this course, students will be able to:

- Describe the working principle and characteristics of BJT, FET, Single stage, cascaded and feedback amplifiers.
- Describe the Phase shift, Wien bridge, tuned and crystal oscillators using BJT/FET/UJT.
- Calculate the AC gain and impedance for BJT using re and h parameters models for CE and CC configuration.
- Determine the performance characteristics and parameters of BJT and FET amplifier using small signal model.
- Determine the parameters which affect the low frequency and high frequency responses of BJT and FET amplifiers and draw the characteristics.
- Evaluate the efficiency of Class A and Class B power amplifiers and voltage regulators.

DIGITAL ELECTRONICS

Course Code	17EC34

Course Outcomes: After studying this course, students will be able to:

- Develop simplified switching equation using Karnaugh Maps and Quine- McClusky techniques.
- Explain the operation of decoders, encoders, multiplexers, demultiplexers, adders, subtractors and comparators.
- Explain the working of Latches and Flip Flops (SR,D,T and JK).
- Design Synchronous/Asynchronous Counters and Shift registers using Flip Flops.
- Develop Mealy/Moore Models and state diagrams for the given clocked sequential circuits.
- Apply the knowledge gained in the design of Counters and Registers.

NETWORK ANALYSIS

Course Code	17EC35

Course Outcomes: 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.
- 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.
- Calculate current and voltages for the given circuit under transient conditions. Apply Laplace transform to solve the given network.
- 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
- Solve the given network using specified two port network parameter like Z or Y or T or h.

ENGINEERING ELECTROMAGNETICS

Course Code	17EC36

- **Course Outcomes:** 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.
- Determine potential and energy with respect to point charge and capacitance using Laplace equation.
- Calculate magnetic field, force, and potential energy with respect to magnetic materials.
- Apply Maxwell‘s equation for time varying fields, EM waves in free space and conductors.
- Evaluate power associated with EM waves using Poynting theorem

B.E E&C FOURTH SEMESTER

SIGNALS AND SYSTEMS

Course Code	17EC42

Course Outcomes: At the end of the course, students will be able to:

- Classify the signals as continuous/discrete, periodic/aperiodic, even/odd, energy/power and deterministic/random signals.
- Determine the linearity, causality, time-invariance and stability properties of continuous and discrete time systems.
- Compute the response of a Continuous and Discrete LTI system using convolution integral and convolution sum.
- Determine the spectral characteristics of continuous and discrete time signal using Fourier analysis.
- Compute Z-transforms, inverse Z- transforms and transfer functions of complex LTI systems.

CONTROL SYSTEMS

Course Code	17EC43

Course Outcomes: At the end of the course, the students will be able to

- Develop the mathematical model of mechanical and electrical systems Develop transfer function for a given control system using block diagram reduction techniques and signal flow graph method

- Determine the time domain specifications for first and second order systems Determine the stability of a system in the time domain using Routh-Hurwitz criterion and Root-locus technique.
- Determine the stability of a system in the frequency domain using Nyquist and bode plots
- Develop a control system model in continuous and discrete time using state variable techniques

PRINCIPLES OF COMMUNICATION SYSTEMS

Course Code	**17EC44**

Course Outcomes: At the end of the course, students will be able to:

- Determine the performance of analog modulation schemes in time and frequency domains.
- Determine the performance of systems for generation and detection of modulated analog signals.
- Characterize analog signals in time domain as random processes and in frequency domain using Fourier transforms.
- Characterize the influence of channel on analog modulated signals Determine the performance of analog communication systems.
- Understand the characteristics of pulse amplitude modulation, pulse position modulation and pulse code modulation systems.

LINEAR INTEGRATED CIRCUITS

Course Code	**17EC45**

Course Outcomes: After studying this course, students will be able to:

- Explain Op-Amp circuit and parameters including CMRR, PSRR, Input & Output Impedances and Slew Rate.
- Design Op-Amp based Inverting, Non-inverting, Summing & Difference Amplifier, and AC Amplifiers including Voltage Follower.
- Test circuits of Op-Amp based Voltage/ Current Sources & Sinks, Current, Instrumentation and Precision Amplifiers.
- Test circuits of Op-Amp based linear and non-linear circuits comprising of limiting, clamping, Sample & Hold, Differentiator/ Integrator Circuits, Peak Detectors, Oscillators and Multiplier & Divider.
- Design first & second order Low Pass, High Pass, Band Pass, Band Stop Filters and Voltage Regulators using Op-Amps.
- Explain applications of linear ICs in phase detector, VCO, DAC, ADC and Timer

MICROPROCESSORS

Course Code	**17EC46**

Course Outcomes: At the end of the course students will be able to:

- Explain the History of evaluation of Microprocessors, Architecture and instruction set of 8086, CISC & RISC, Von-Neumann & Harvard CPU Architecture, Configuration & Timing diagrams of 8086 and Instruction set of 8086.
- Write 8086 Assembly level programs using the 8086 instruction set
- Write modular programs using procedures.
- Write 8086 Stack and Interrupts programming.
- Interface 8086 to Static memory chips and 8255, 8254, 0808 ADC, 0800 DAC, Keyboard, Display and Stepper motors.

- Use INT 21 DOS interrupt function calls to handle Keyboard and Display.

MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

Course Code	15ES51

Course Outcomes: After studying this course, students will be able to:

- Understand the fundamental concepts of Management and Entrepreneurship Select a best Entrepreneurship model for the required domain of establishment Describe the functions of Managers, Entrepreneurs and their social responsibilities
  - Compare various types of Entrepreneurs
  - Analyze the Institutional support by various state and central government agencies

DIGITAL SIGNAL PROCESSING

Course Code	17EC52

Course Outcomes: After studying this course, students will be able to:

- Determine response of LTI systems using time domain and DFT techniques. Compute DFT of real and complex discrete time signals.
- Computation of DFT using FFT algorithms and linear filtering approach.
- Solve problems on digital filter design and realize using digital computations.

VERILOG HDL

Course Code	17EC53

Course Outcomes: At the end of this course, students should be able to

- Write Verilog programs in gate, dataflow (RTL), behavioral and switch modeling levels of Abstraction.
- Write simple programs in VHDL in different styles.
- Design and verify the functionality of digital circuit/system using test benches. Identify the suitable Abstraction level for a particular digital design.
- Write the programs more effectively using Verilog tasks and directives. Perform timing and delay Simulation.

INFORMATION THEORY AND CODING

Course Code	17EC54

Course Outcomes: 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
- Represent the information using Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithms
- Model the continuous and discrete communication channels using input, output and joint probabilities
- Determine a codeword comprising of the check bits computed using Linear Block codes, cyclic codes & convolutional codes

- Design the encoding and decoding circuits for Linear Block codes, cyclic codes, convolutional codes, BCH and Golay codes.

OPERATING SYSTEM

Course Code	17EC553

Course outcomes: After studying this course, students will be able to:

- Explain the goals, structure, operation and types of operating systems. Apply scheduling techniques to find performance factors.
- Explain organization of file systems and IOCS.
- Apply suitable techniques for contiguous and non-contiguous memory allocation. Describe message passing, deadlock detection and prevention methods.

AUTOMOTIVE ELECTRONICS

Course Code	17EC561

Course Outcomes: At the end of the course, students will be able to:

- Acquire an overview of automotive components, subsystems, and basics of Electronic Engine Control in today‘s automotive industry.
- Use available automotive sensors and actuators while interfacing with microcontrollers / microprocessors during automotive system design.
- Understand the networking of various modules in automotive systems, communication protocols and diagnostics of the sub systems.
- Design and implement the electronics that attribute the reliability, safety, and smartness to the automobiles, providing add-on comforts and get fair idea on future Automotive Electronic Systems.

B.E E&C SIXTH SEMESTER

DIGITAL COMMUNICATION

Course Code	17EC61

Course Outcomes: 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.
- Analyze and compute performance parameters and transfer rates for low pas and bandpass symbol under ideal and corrupted non band limited channels.
- Test and validate symbol processing and performance parameters at the receiver under ideal and corrupted bandlimited channels.
- Demonstrate by simulation and emulation that bandpass signals subjected to corrupted and distorted symbols in a bandlimited channel, can be demodulated and estimated at receiver to meet specified performance criteria

ARM MICROCONTROLLER & EMBEDDED SYSTEMS

Course Code	17EC62

- **Course outcomes:** After studying this course, students will be able to:
- Describe the architectural features and instructions of 32 bit microcontroller ARM Cortex M3.
- Apply the knowledge gained for Programming ARM Cortex M3 for different applications.
- Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
- Develop the hardware /software co-design and firmware design approaches. Explain the need of real time operating system for embedded system applications

VLSI DESIGN

Course Code	17EC63

Course outcomes: At the end of the course, the students will be able to:

- Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling.
- Draw the basic gates using the stick and layout diagrams with the knowledge of physical design aspects.
- Interpret Memory elements along with timing considerations Demonstrate knowledge of FPGA based system design Interpret testing and testability issues in VLSI Design
- Analyze CMOS subsystems and architectural issues with the design constraints.

COMPUTER COMMUNICATION NETWORKS

Course Code	17EC64

Course Outcomes: At the end of the course, the students will be able to:

Identify the protocols and services of Data link layer.
Identify the protocols and functions associated with the transport layer services. Describe the layering architecture of computer networks and distinguish between the OSI reference model and TCP/IP protocol suite.

- Distinguish the basic network configurations and standards associated with each network.
- Construct a network model and determine the routing of packets using different routing algorithms.

- **DIGITAL SWITCHING SYSTEMS**

Course Code	17EC654

Course Outcomes: At the end of the course, students should be able to:

- Describe the electromechanical switching systems and its comparison with the digital switching. Determine the telecommunication traffic and its measurements. Define the technologies associated with the data switching operations.

Describe the software aspects of switching systems and its maintenance

DIGITAL SYSTEM DESIGN USING VERILOG

Course Code:	17EC663

Course outcomes: After studying this course, students will be able to:

- Construct the combinational circuits, using discrete gates and programmable logic devices.
- Describe Verilog model for sequential circuits and test pattern generation. • Design a semiconductor memory for specific chip design.
- Design embedded systems using small microcontrollers, larger CPUs/DSPs, or hard or soft processor cores.
- Synthesize different types of processor and I/O controllers that are used in embedded system.

B.E E&C SEVENTH SEMESTER

MICROWAVES AND ANTENNAS

Course Code	17EC71

Course Outcomes: At the end of the course, students will be able to:

- Describe the use and advantages of microwave transmission
- Analyze various parameters related to microwave transmission lines and waveguides
- Identify microwave devices for several applications
- Analyze various antenna parameters necessary for building an RF system Recommend various antenna configurations according to the applications

DIGITAL IMAGE PROCESSING

Course Code	17EC72

Course Outcomes: At the end of the course students should be able to:

Understand image formation and the role human visual system plays in perception of gray and color image data.

- Apply image processing techniques in both the spatial and frequency (Fourier) domains.
- Design image analysis techniques in the form of image segmentation and to evaluate the Methodologies for segmentation.
- Conduct independent study and analysis of Image Enhancement techniques

POWER ELECTRONICS

Course Code	17EC73
Course Outcomes: At the end of the course students should be able to:	

- Describe the characteristics of different power devices and identify the various applications associated with it.
- Illustrate the working of power circuit as DC-DC converter. Illustrate the operation of inverter circuit and static switches.
- Determine the output response of a thyristor circuit with various triggering options. Determine the response of controlled rectifier with resistive and inductive loads.

- **MULTIMEDIA COMMUNICATION**

Course Code	17EC741

Course Outcomes: After studying this course, students will be able to:

- Understand basics of different multimedia networks and applications.
- Understand different compression techniques to compress audio and video.
- Describe multimedia Communication across Networks.
- Analyse different media types to represent them in digital form.
- Compress different types of text and images using different compression techniques and analyse DMS

DSP ALGORITHMS and ARCHITECTURE

Course Code	17EC751

Course Outcomes: At the end of this course, students would be able to

- Comprehend the knowledge and concepts of digital signal processing techniques. Apply the knowledge of DSP computational building blocks to achieve speed in DSP architecture or processor.
- Apply knowledge of various types of addressing modes, interrupts, peripherals and pipelining structure of TMS320C54xx processor.
- Develop basic DSP algorithms using DSP processors.
- Discuss about synchronous serial interface and multichannel buffered serial port (McBSP) of DSP device.
- Demonstrate the programming of CODEC interfacing

B.E E&C EIGTH SEMESTER

WIRELESS CELLULAR and LTE 4G BROADBAND

Course Code	17EC81

Course Outcomes: At the end of the course, students will be able to:

- Understand the system architecture and the functional standard specified in LTE 4G.
- Analyze the role of LTE radio interface protocols and EPS Data convergence protocols to set up, reconfigure and release data and voice from users.
- Demonstrate the UTRAN and EPS handling processes from set up to release including mobility management for a variety of data call scenarios.
- Test and Evaluate the Performance of resource management and packet data processing and transport algorithms.

FIBER OPTICS and NETWORKS

Course Code	17EC82

Course Outcomes: At the end of the course, students will be able to:

1. 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.

Illustrate the networking aspects of optical fiber and describe various standards associated with it.

RADAR ENGINEERING

Course Code	17EC833

Course outcomes: At the end of the course, students will be able to:

- Understand the radar fundamentals and radar signals.
- Explain the working principle of pulse Doppler radars, their applications and limitations
- Describe the working of various radar transmitters and receivers.
- Analyze the range parameters of pulse radar system which affect the system performance