## PEOs(Program Educational Objectives)

After three to four years of graduation our engineers will

**PEO1:** Lead a successful career by providing solutions to the problems in the field of Electronics and Communication Engineering and for sustainable environmental development.

**PEO2:** Exhibits professional and Team building attitude along with effective Communication.

**PEO3:** Pursue higher education for continuous learning.

## PROGRAMME OUTCOMES

Graduation students of  Bachelor of Electronics and Communication Engineering program
at Sapthagiri College of Engineering will attain the following program outcomes in the field
of  Electronics and communication Engineering

**PO1.Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals 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 and engineering sciences.

**PO3. Design/development of solutions:** Design solutions for complex engineering problems - design system components or processes that meet the specified needs of society.

**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.

**PO6. The engineer and society:** Apply reasoning 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 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.

**PO11. Project management and finance:** Demonstrate the engineering and management principles and apply these as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12. Life-long learning:** ability to engage in independent and life-long learning in the broadest context of technological change.

## PROGRAMME SPECIFIC OUTCOMES

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

| | PROGRAM SPECIFIC OUTCOMES |
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| **PSO1** | Specify, design, build and test analog, digital and embedded systems for signal processing. |
| **PSO2** | Design wired, wireless analog and digital communication systems as per specifications, and determine their performance. |

**Course Outcomes (Cos)**

**ECE 2015 scheme**

| | 2015 Batch II Year | |
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| **Engineering Mathematics –III /15MAT31/ C201** | C201.1 | Find the Fourier series, half range Fourier series and Fourier coefficients of periodic functions. |
| | C201.2 | Find the Fourier and inverse Fourier transforms of periodic functions. |
| | C201.3 | Solve the finite difference equations using Z-transforms |
| | C201.4 | Apply the concept of statics for curve fitting, correlation and regression. |
| | C201.5 | Analyze and apply proper numerical techniques to solve the algebraic/transcendental equation, to find polynomials, intermediatevalues and evaluation of integrals |
| | C201.6 | Find the integrals using Green's, Stokes and Gauss divergence theorem and external of a functional |
| **Analog Electronics/15EC32/ C202** | C202.1 | Analyse the working and characteristics of BJT, FET, Single stage, cascaded and feedback amplifiers. |
| | C202.2 | Analyse and design different oscillators using BJT/FET and explain UJT relaxation oscillator. |
| | C202.3 | Calculate the AC gain and impedance for BJT using re and h parameters models for CE and CC configuration. |
| | C202.4 | Analyse and determine the performance characteristics and parameters of BJT and FET amplifier using small signal model. |
| | C202.5 | Design and Evaluate the efficiency of Class A and Class B power amplifiers and explain the operation of voltage regulators |
| **Digital Electronics/15EC33 / C203** | C203.1 | Develop simplified switching equations using Karnaugh Maps |
| | C203.2 | Define, Analyse and Design various combinational circuits. |
| | C203.3 | Define, analyse and design various sequential circuits, counters Registers, mealy and Moore model. |

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| **Network Analysis/15EC34/ C204** | C204.1 | Solve problems related to series and parallel combination of Passive Components, Source transformation and Source Shifting. |
| | C204.2 | Solve problems related to Network Theorems and Electrical laws to reduce circuit complexities and to arrive at feasible solutions. |
| | C204.3 | Solve problems related to various Two port Parameters and their Relationship for finding Network Solutions. |
| | C204.4 | Analyse the Performance of various Types of Networks Using different concepts and principles. |
| **Electronic Instrumentation/15EC35/ C205** | C205.1 | Distinguish between various types of errors and calculate the same, and describe the operation of ammeters, voltmeters and multimeters and develop circuits for multi range Ammeters and Voltmeters |
| | C205.2 | Describe functional concepts and operation of Digital voltmeters and instruments to measure frequency, time period, phase difference of signals, rotation speed, capacitance and pH of solutions and microprocessor-based instrumentation |
| | C205.3 | Describe the operation of analog oscilloscope, digital storage oscilloscope and different types of signal generators |
| | C205.4 | Describe functional concepts of various Analog measuring instruments to measure field Strength, impedance, stroboscopic speed, Q of coils, insulation resistance and analyse AC and DC bridges for passive component and frequency measurements. |
| | C205.5 | Classify different types of transducers for different applications |
| **Engineering Electromagnetics/15EC36/ C206** | C206.1 | Evaluate the problems on Electric Fields due to different charge distributions by applying conventional methods and gauss law |
| | C206.2 | Solve problems related to Poisson's and Laplace's Equations, Uniqueness theorem, and solution of Laplace's equation and steady magnetic field. |
| | C206.3 | Analyse and solve problems related to Magnetic Forces, Time-varying fields using Maxwell's equations |
| | C206.4 | Evaluate power associated with electromagnetic waves waves using Poynting theorem |

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| **Analog Electronics Lab/15ECL37/ C207** | C207.1 | Design and Test rectifiers, clipping circuits, clamping circuits and voltage regulators |
| | C207.2 | Determine the parameters from the characteristics of JFET and MOSFET devices |
| | C207.3 | Evaluate BJT amplifiers in CE configuration as well as JFET/MOSFET amplifiers |
| | C207.4 | Test a power amplifier and compute its conversion efficiency |
| | C207.5 | Design and test various types of oscillators |
| **Digital Electronics Lab/15ECL38/C208** | C208.1 | Examine the functionality of logic gates. |
| | C208.2 | Design and test various combinational circuits such as adders, subtractors, comparators, multiplexers, demultiplexers and decoders. |
| | C208.3 | Construct and test flips-flops, counters and shift registers. |
| | C208.4 | Simulate full adder and up/down counters. |
| **Engineering Mathematics – IV/15MAT41/ C209** | C209.1 | Apply appropriate numerical methods to solve ordinary differential equations |
| | C209.2 | Derive and Apply Bessel's function, Legendre's polynomials & Rodrigue's formula, and its properties.. |
| | C209.3 | Solve problems on analytic functions using Cauchy–Riemann equations, complex line integrals, conformal and bilinear transformations.. |
| | C209.4 | Analyse and solve the probability distribution problems. |
| | C209.5 | Analyze and interpret the hypothesis for the given sampling distribution and to solve stochastic process problems. |
| **Microprocessor/15EC42 / C210** | C210.1 | Explain basic architecture of 8086 microprocessor and its addressing modes. |
| | C210.2 | Develop assembly level language program using 8086 microprocessors. |
| | C210.3 | Develop 8086 based assembly level language programs using procedures, interrupts and macros. |
| | C210.4 | Design physical memory organization, minimum mode and maximum mode operations of 8086. |
| | C210.5 | Explain interfacing of stepper motor, static RAM, ADC and DAC using 8255 and 8087/8088 architecture. |

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| **Control Systems/15EC43/ C211** | C211.1 | Develop the mathematical model of mechanical and electrical signals. |
| | C211.2 | Develop transfer function for a given control system using block diagram reduction techniques and signal flow graph method |
| | C211.3 | Determine the time domain specifications for first and second order systems · |
| | C211.4 | Determine the stability of a system in the time domain using Routh-Hurwitz criterion and Root-locus Technique. |
| | C211.5 | Determine the stability of a system in the frequency domain using Nyquist and bode plots and develop a control system model in continuous and discrete time using state variable techniques |
| **Signals and Systems/15EC44/ C212** | C212.1 | Classify the different types of signals and systems. |
| | C212.2 | Determine performance of the system in time domain for the given impulse response. |
| | C212.3 | Determine the spectral characteristics of given arbitrary time domain periodic signal |
| | C212.4 | Determine the spectral characteristics of given arbitrary time domain non-periodic signal |
| | C212.5 | Apply Z-transforms, Inverse Z - transforms and determine stability of LTI systems |
| **Principles of Communication Systems/15EC45/ C213** | C213.1 | Determine the performance of amplitude modulation schemes in time and frequency domains. |
| | C213.2 | Determine the performance of frequency modulation schemes in time and frequency domains. |
| | C213.3 | Characterize analog signals in time domain as random processes and in frequency domain using Fourier transforms. |
| | C213.4 | Determine the performance of analog communication systems. |
| | C213.5 | Analyse the characteristics of pulse modulation schemes |
| **Linear Integrated Circuits/15EC46/C214** | C214.1 | Explain op-amp circuit and its parameters. |
| | C214.2 | Design op-amp based DC & AC amplifiers. |
| | C214.3 | Develop Op-Amp based linear and non-linear circuits. |
| | C214.4 | Design first & Second Order Low Pass, High Pass, Band Pass, Band Stop Filters and Voltage Regulators |
| | C214.5 | Develop applications using linear IC's and Timers |

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| **Microprocessor Lab/15ECL47/ C215** | C215.1 | Develop 8086 assembly level programs to perform data transfer, arithmetic and logical operations. |
| | C215.2 | Develop 8086 assembly level programs to sort and search elements in a given array. |
| | C215.3 | Develop string transfer, string reversing, searching a character in a string with string manipulation instructions of 8086. |
| | C215.4 | Develop 8086 programs using concepts of procedures and macros. |
| | C215.5 | Design the 8086 processor-based applications by interfacing input and output devices. |
| **Linear ICs and Communication Lab/15ECL48/ C216** | C216.1 | Design and demonstrate the operation of instrumentation amplifier, oscillators, filters, DAC, adder, differentiator and integrator using linear ICs. |
| | C216.2 | Analyse multivibrator circuits using 555 timer |
| | C216.3 | Design and demonstrate pulse and flat top sampling techniques to generate digital signals |
| | C216.4 | Analyse the performance of AM, FM, DSB-SC and Mixer for communication system. |
| | C216.5 | Design frequency synthesizer by using PLL |
| **2015 Batch III Year** | | |
| **Management and Entrepreneurship Development/15ES51/C301** | C301.1 | Illustrate the fundamental concepts of Management and Planning |
| | C301.2 | Describe the functions of management and differentiate various leadership styles |
| | C301.3 | Describe the functions of Entrepreneurs and their social responsibilities and select a best Entrepreneurship model for the required domain of establishment |
| | C301.4 | Analyse the Institutional support by various state and central government agencies |
| | C301.5 | Apply different project network analysis techniques to design a project and understand the various levels of project management |
| **Digital Signal Processing/15EC52/ C302** | C302.1 | Solve DFT of real and complex discrete time signals. |
| | C302.2 | Determine response of LTI systems using time domain and DFT techniques. |
| | C302.3 | Determine DFT using FFT algorithms and appreciate the computational speed of the algorithms |

| | C302.4 | Design the digital filters and realize its structure using different forms |
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| **Verilog HDL/15EC53/ C303** | C303.1 | Describe the need of HDL with different design styles and design methodologies in HDL |
| | C303.2 | Design combinational logic in Gate level and Data flow style using Verilog HDL. |
| | C303.3 | Design Combinational and sequential circuits in behavioural modelling using Verilog HDL. |
| | C303.4 | Design Combinational and sequential circuits in all the three design styles with VHDL. |
| **Information Theory & Coding/15EC54/C304** | C304.1 | Apply the concept of Entropy for Dependent & Independent Sources and apply encoding techniques |
| | C304.2 | Determine a code word comprising of the check bits computed using Linear Block codes, Cyclic codes & Convolutional codes |
| | C304.3 | Design the encoding and decoding circuits for Linear Block codes, cyclic codes, convolution codes |
| | C304.4 | Determine the channel capacity of continuous and discrete communication channels using input, output and joint probabilities. |
| **Operating System/15EC553/ C305** | C305.1 | Explain the goals, structure, operation and types of operating systems. |
| | C305.2 | Apply scheduling techniques to find performance factors. |
| | C305.3 | Explain organization of file systems and IOCS. |
| | C305.4 | Apply suitable techniques for contiguous and non-contiguous memory allocation. |
| | C305.5 | Analyse message passing, dead lock detection and prevention methods. |
| **Object Oriented Programming Using C++/15EC 562/ C306** | C306.1 | Explain the basic concepts of object-oriented programming language |
| | C306.2 | Develop C++ object-oriented program using classes, objects, constructors, destructors and operator overloading. |
| | C306.3 | Explain and Analyse program Streams and Working with files. |

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| **8051 Microcontroller/15EC563/ C307** | C307.1 | Define an embedded system and describe the architecture of 8051 |
| | C307.2 | Apply the instructions in 8051 based embedded application programs. |
| | C307.3 | Apply the concepts of stack and subroutine in designing 8051 programming. |
| | C307.4 | Apply the concepts of timers and serial port UART in in generating delay and serial communication. |
| | C307.5 | Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 using 8051 I/O ports and interrupts. |
| **DSP Lab/15ECL57/ C308** | C308.1 | Model analog to digital conversion system using MATLAB |
| | C308.2 | Model discrete time signals and systems and its properties and results |
| | C308.3 | Analyse and implement different discrete computations on DSP processor |
| | C308.4 | Design the digital filters using a simulation tool and a DSP processor and verify the result |
| **HDL Lab/15ECL58/C309** | C309.1 | Simulate Combinational circuits in dataflow, behavioural and Gate level Abstractions. Using VHDL/Verilog |
| | C309.2 | Develop HDL code for sequential circuits like flip flops and counters in behavioural description and show simulation results. |
| | C309.3 | Develop and synthesize HDL code for Combinational and Sequential circuits on FPGA |
| | C309.4 | Develop, synthesize and implement HDL code on FPGA to interface input, output devices |
| **Digital Communication/15EC61/ C310** | C310.1 | Represent signals mathematically and Categorize different line coding formats |
| | C310.2 | Apply the concept of transmission of signals over AWGN channels |
| | C310.3 | Apply the concept of different digital modulation techniques. |
| | C310.4 | Design and analyse the transmission of signals through band limited channels |
| | C310.5 | Apply the principles of secured digital communication systems |

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| **ARM Microcontroller & Embedded Systems/15EC62/ C311** | C311.1 | Describe the architectural features and instructions of 32-bit microcontroller ARM Cortex M3. |
| | C311.2 | Describe the memory map of cortex m3 and apply the knowledge gained for Programming ARM Cortex M3 for different applications. |
| | C311.3 | Apply the knowledge in selecting basic hardware components in the design of embedded systems |
| | C311.4 | Describe the development of an embedded system using the hardware /software co-design and firmware design approaches. |
| | C311.5 | Apply the need of real time operating system for embedded system applications. |
| **VLSI Design/15EC63/C312** | C312.1 | Explain MOS transistor theory and CMOS process flow |
| | C312.2 | Draw stick diagram and layout for logic gates with physical design aspects |
| | C312.3 | Perform scaling of MOS devices and testing of VLSI circuits |
| | C312.4 | Design various subsystems |
| | C312.5 | Explain the basic FPGA Based Systems |
| **Computer Communication Networks/15EC64/ C313** | C313.1 | Identify the layering architecture of OSI reference model and TCP/IP protocol suite |
| | C313.2 | Identify the protocols and functions associated with each layer services. |
| | C313.3 | Describe the different networking architectures and their representations. |
| | C313.4 | List the different routing algorithms for routing of packets for wired communication |
| **Cellular Mobile Communication/15EC651/C314** | C314.1 | Explain statistical characterization of urban mobile channels to compute the performance for simple modulation schemes. |
| | C314.2 | Describe how the trunking interference that affect the overall capacity of cellular system. |
| | C314.3 | Explain the limitations of GSM, GPRS and CDMA to meet high data rate requirements and limited improvements that are needed. |

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| | C314.4 | Analyze the call process procedure between a calling number and called number for all scenarios in GSM or CDMA based systems. |
| | C314.5 | Explain and analyse voice and data call handling for various scenarios in GSM and CDMA systems for national and international interworking situations. |
| **Digital Switching Systems/15EC654/ C315** | C315.1 | Describe the electromechanical switching systems and compare with digital switching system |
| | C315.2 | Describe the telecommunication traffic and its measurements and design grading system. |
| | C315.3 | Compare and explain the technologies associated with the data switching operations |
| | C315.4 | Analyse the different software aspects of switching systems and its maintenance |
| **Digital System Design using Verilog/15EC663/ C316** | C316.1 | Construct and develop Verilog model for combinational and sequential circuits |
| | C316.2 | Design a semiconductor memory for specific chip design. |
| | C316.3 | Inspect IC's that are embedded in package and assembled in PCB's for different application. |
| | C316.4 | Describe synthesized process of different types of processor and I/O controllers that are used in embedded system. |
| | C316.5 | Explain the use of IC design methodologies to analyse complex digital systems. |
| **Embedded Controller Lab/15ECL67/C317** | C317.1 | Develop assembly level program using 32-bit ARM Cortex M3 microcontroller |
| | C317.2 | Develop ARM Cortex M3 based embedded c programs for different applications. |
| | C317.3 | Develop ARM Cortex M3 based embedded systems by interfacing I/O devices |
| | C317.4 | Develop C language programs and library functions for embedded system applications |
| **Computer Networks** | C318.1 | Develop and simulate networking algorithms using network simulator |
| | C318.2 | Make use of c programs to simulate different networking protocols |

| Lab/15ECL68/ C318 | C318.3 | Make use of c programs to develop different network configurations and measure the performance parameters. |
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| | C318.4 | Make use of c programs to demonstrate the data link and routing protocols using C programming. |
| **2015 Batch IV Year** | | |
| **Microwave and Antennas/15EC71/ C401** | C401.1 | Describe and analyse the microwave sources |
| | C401.2 | Analyse various parameters related to transmission lines and waveguides |
| | C401.3 | Analyse various parameters related to micro wave devices which can be used for several applications |
| | C401.4 | Explain the basics of antenna theory |
| | C401.5 | Analyse various antenna parameters to build RF system and select an antenna for various applications |
| **Digital Image Processing/15EC72/C402** | C402.1 | Explain the fundamental steps in digital image processing and apply some basic relationships between pixels to images |
| | C402.2 | Apply the different image transforms to images |
| | C402.3 | Analyse different restoration techniques and methods used in digital image processing |
| | C402.4 | Apply different color models, wavelet transforms and morphological operations to images |
| | C402.5 | Apply different segmentation techniques to images |
| **Power Electronics/15EC73/ C403** | C403.1 | Describe the characteristics of different power devices and identify their applications associated with it. |
| | C403.2 | Build DC-DC power converter using SCR |
| | C403.3 | Analyse the operation of inverter circuit and static switches. |
| | C403.4 | Determine the output response of a thyristor circuit with various triggering options. |
| | C403.5 | Determine the response of controlled rectifier with resistive and inductive loads. |

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| **Multimedia Communication/15EC 741/ C404** | C404.1 | Classify different multimedia networks and applications. |
| | C404.2 | Analyse different compression techniques to compress audio and video. |
| | C404.3 | Analyse compression techniques required to compress text and image and gain knowledge of DMS |
| | C404.4 | Analyse compression techniques required to compress audio and video. |
| | C404.5 | Gain fundamental knowledge about multimedia communication across different networks |
| **Digital Signal Processing Algorithm & Architecture/15EC751/C405** | C405.1 | Describe the basics of DSP, multi rate sampling and architecture of DSP processor. |
| | C405.2 | Compare different DSP processor architectures and explain the architecture of TMS320C54XX |
| | C405.3 | Develop assembly language program using instruction set of TMS320C54XX. |
| | C405.4 | Design FIR, IIR, interpolation, decimation filter and FFT algorithms |
| | C405.5 | Design of external memory architecture for TMS320C54XX.. |
| **Advanced Communication Lab/15ECL76/ C406** | C406.1 | Determine the characteristics and response of microwave devices and optical wave-guide. |
| | C406.2 | Calculate the characteristics of microstrip antennas and compute the parameters associated with it. |
| | C406.3 | Make use of MATLAB to Simulate the digital modulation schemes to compute its performance parameters |
| | C406.4 | Design and test the digital modulation circuits/systems and display the waveforms |
| **VLSI Lab/15ECL77/ C407** | C407.1 | Design and simulate various digital circuits using CAD tool |
| | C407.2 | Analyze DC, AC and Transient characteristics for analog circuits. |
| | C407.3 | Design and simulate basic CMOS circuits like inverter, common source amplifier and differential amplifiers. |
| | C407.4 | Design operational amplifier and analog/digital converters to meet desired parameters. |

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| | C407.5 | Design logic gates and shift registers and adders to meet desired parameters |
| **Project Work Phase –I/15ECP 78/ C408** | C408.1 | Identify, formulate and analyse engineering problems for the need of society. |
| | C408.2 | Design solutions for engineering problems using modern tool/technology to investigate with interpretation of data |
| | C408.3 | Analyse the impact of the engineering solutions in societal and environmental contexts for sustainable development with commit to professional ethics |
| | C408.4 | Work individually and in team, Communicate effectively through reports and presentations. |
| | C408.5 | Apply engineering, management and ethical principles for Project management and finance |
| **Wireless Cellular and LTE 4G Broadband/15EC81/ C409** | C409.1 | Model the system architecture and the functional standard specified in LTE 4G. |
| | C409.2 | Analyse the role of LTE radio interface protocols and EPS Data convergence protocols to set up, reconfigure and release data and voice from users. |
| | C409.3 | Compare the UTRAN and EPS handling processes from set up to release including mobility management for a variety of data call scenarios. |
| | C409.4 | Examine the Performance of resource management and packet data processing and transport algorithms. |
| **Fiber Optics & Networks/15EC82/ C410** | C410.1 | Explain the classification and working of optical fiber with different modes of signal propagation |
| | C410.2 | Analyse the transmission characteristics and losses in optical fiber communication. |
| | C410.3 | Construct the features and the characteristics of optical sources and detectors. |
| | C410.4 | Describe the construction and working principle of optical connectors, multiplexers and amplifiers |
| | C410.5 | Illustrate the networking aspects of optical fiber and describe associated standards |
| **Machine learning/15EC 834/ C411** | C411.1 | Explain the core concepts of Machine Learning |
| | C411.2 | Apply decision tree algorithm |

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| | C411.3 | Acquire knowledge and Apply neural networks, Bayesian techniques and instant based learning algorithms |
| | C411.4 | Apply analytical learning and reinforcement learning algorithms |
| **Network and Cyber security/15EC835/C412** | C412.1 | Apply network security protocols. |
| | C412.2 | Make use of the basic concepts of cyber security |
| | C412.3 | Identify the cyber security problems |
| | C412.4 | Describe Enterprise Security Framework |
| | C412.5 | Apply concept of cyber security framework in computer system administration |
| **Intern ship /Professional Practice/15EC84/ C413** | C413.1 | Apply gained knowledge and skills in engineering practice. |
| | C413.2 | Analyse and design solutions for engineering problems. |
| | C413.3 | Work individually, in team and communicate effectively through reports and presentations. |
| | C413.4 | Demonstrate and adapt to workplace attitude and ethics. |
| **Project Work/15ECP 85/ C414** | C414.1 | Identify, formulate and analyse engineering problems for the need of society. |
| | C414.2 | Design solutions for engineering problems using modern tool/technology to investigate with interpretation of data. |
| | C414.3 | Analyse the impact of the engineering solutions in societal and environmental contexts for sustainable development with commit to professional ethics |
| | C414.4 | Work individually and in team, Communicate effectively through reports and presentations. |
| | C414.5 | Apply engineering, management and ethical principles for Project management and finance. |
| **Seminar/15ECS86/ C415** | C415.1 | Identify and explore recent trends in Electronics and Communication Engineering. |
| | C415.2 | Prepare effective report on the selected topic. |
| | C415.3 | Prepare Power point presentation (PPT), Communicate and answer the queries. |