



# VIDYAVARDHAKA COLLEGE OF ENGINEERING

P.B. No.206, Gokulam, III - Stage, Mysore - 570 002, Karnataka, INDIA.

Phone: +91 821 4276201 / 202 / 225, Fax :+91 821 2510677

Web :<http://www.vvce.ac.in>

**Department Of Electronics and Communication Engineering**

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## COURSE OUTCOMES OF 10 SCHEME SUBJECTS

**Subject Code : 10MAT31**  
**Course Code : C201**  
**Course Name : Engg. Mathematics III**

- CO1** : Apply Fourier series towards technical field and Solve integral equations using Fourier Transform.
- CO2** : Derive and obtain the solutions of standard PDE. Find the solutions of numerous boundary value problems of engineering such as conduction of heat, transverse vibration of a string and etc.
- CO3** : Apply least square method to fit various curves for the given data and interpret the relation, get familiar with the advent of high speed digital computers and increasing demand for numerical answers to various problems, numerical techniques.
- CO4** : Apply various numerical techniques to obtain the solution of PDE.
- CO5** : Apply Z-Transform to obtain the solution of difference equations.

**Subject Code : 10ES32**  
**Course Code : C202**  
**Course Name : Analog Electronic Circuits**

- CO1** : Apply the knowledge of working principles of semiconductor diodes, BJTs, FETs, amplifiers and oscillators in building electronic circuits.
- CO2** : Develop various types of amplifiers and oscillator circuits for given specifications.
- CO3** : Analyze various BJT, FET circuits and their working at low and high frequencies by manual calculations and using circuit simulation tools.
- CO4** : Justify the usage of various electronic components such as diodes, BJTs, FETs in different electronic circuits.
- CO5** : Construct various electronic systems to satisfy specified gain, input impedance, output impedance and frequency response.



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**Subject Code : 10ES33**  
**Course Code : C203**  
**Course Name : Logic Design**

- CO1.** Definition of Boolean algebra, Basic Theorems and Properties of Boolean Algebra. Boolean Functions. Canonical and Standard Forms. Other Logic Operations. Digital Logic Gates. Integrated Circuits.
- CO2.** Differentiate between combinational and sequential circuits. Explain K- Map Method (2, 3, 4, 5-Variable Map) SOP/POS Simplification. Don't-Care Conditions.
- CO3.** Apply Boolean algebra for realizing combinational and sequential circuits.
- CO4.** Analyze the operation of combinational and sequential circuits.
- CO5.** Design synchronous and asynchronous counters, registers, mealy-Moore models with state diagrams.

**Subject Code : 10ES34**  
**Course Code : C204**  
**Course Name : Network Analysis**

- CO1.** Solve electrical circuits by applying the knowledge of mesh and nodal method, network topology and demonstrate using circuit simulation tools.
- CO2.** Analyze complex electric circuits using different transformation techniques, network theorems and Laplace transforms to arrive at feasible solutions.
- CO3.** Analyze series and parallel resonant circuits and measure the performance.
- CO4.** Evaluate the behavior of R, R-L, R-L-C electrical circuits considering Initial conditions.
- CO5.** Construct two port models for given network by determining Z, Y, h and T parameters.



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**Subject Code : 10IT35**  
**Course Code : C205**  
**Course Name : Electronic Instrumentation**

- CO1** : Describe errors, basic working principle of digital voltmeters, oscilloscope, signal generators and transducers.
- CO2** : Differentiate the types of errors, digital instruments, various types of oscilloscopes, special oscilloscopes, bridges and signal generators.
- CO3** : Apply the knowledge of errors to overcome possible errors in the instruments and also able to choose appropriate method and instrument for measurement.
- CO4** : Distinguish the various types of active and passive transducer, LED and LCD display, ac and dc Bridges.
- CO5** : Determine the values of unknown component such as R,L,C using various types of dc and ac bridges.



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**Subject Code : 15ES36**  
**Course Code : C206**  
**Course Name : Field Theory**

- CO1** : Solve engineering problems related to vector analysis, conductors, dielectrics, inductance, capacitance, electric and magnetic fields.
- CO2** : Explain the maxwell's equations and apply them in solving problems related to static and time varying fields.
- CO3** : Analyze the difference between electric and magnetic fields and various types of charge distributions.
- CO4** : Examine problems related to electromagnetic wave propagations and study its impact on ecosystem.
- CO5** : Evaluate the strength of the electromagnetic fields and determine its behavior in different medium.



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**Subject Code : 10ESL37**  
**Course Code : C207**  
**Course Name : Analog Electronics Lab**

- CO1** : Apply the working principles of Semiconductor diode to build and test rectifiers, clipping and clamping circuits.
- CO2** : Demonstrate the use of Thevenin's and Maximum power transfer theorem in various electrical circuits.
- CO3** : Analyze the impact of bootstrapping on various parameters such as input impedance, output impedance and frequency response of Darlington Emitter Follower.
- CO4** : Evaluate the frequency response of amplifier circuits and find input and output impedance by building circuits and by using simulation tools.
- CO5** : Design and test RC phase shift oscillator, Hartley's oscillator and Colpitt's oscillator for specified frequency of oscillations.
- CO6** : Apply sound mind in developing electronic systems that are safe to use and not hazardous to the environment.



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**Subject Code : 10ESL38**  
**Course Code : C208**  
**Course Name : Logic Design Lab**

- CO1.** Familiarization with Digital Integrated Circuits.
- CO2.** To Verify the Behavior of combinational and sequential circuits using Truth Table.
- CO3.** Perform basic arithmetic operations addition, subtraction, comparator, encoders, decoders, shift registers, flip flops using Digital Integrated Circuits.
- CO4.** Realize the combinational and sequential circuits using Universal gates.
- CO5.** Design of sequential systems such as counters, Sequence Generator.



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**Subject Code : 10MAT41**  
**Course Code : C209**  
**Course Name : Engineering Mathematics IV**

- CO1** Employ different numerical methods to solve the ordinary differential equations of first and second order, simultaneous ODE of first order
- CO2** Apply the concept of function of complex variables in various fields. Develop problem solving skills using Cauchy-Riemann equation and apply of Cauchy – Riemann equation to solve flow problems in electric field. Understand Cauchy's theorem and Cauchy's integral formula to evaluate complex integrals.
- CO3** Apply special functions like Bessel function to solve the boundary value problems with axial symmetry and Legendre polynomial to solve boundary value problems with spherical symmetry.
- CO4** Use the knowledge of probability and be familiar with various probability distributions which enable to fit a mathematical model to the given data. Apply Baye's rule to find the posteriori probability when the apriori probability is known.
- CO5** Employ the concept of population, sample, Sampling and to draw inference about population based on numerical data obtained from the sample using Student's t- test and Chi-square test.



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**Subject Code** : 10ES42  
**Course Code** : C210  
**Course Name** : Microcontroller

- CO1** : Develop programs using appropriate addressing modes with suitable instruction set in assembly as well as C-programming using suitable tools.
- CO2** : Choose appropriate baud rate, data format and flow control required for serial communication for various applications.
- CO3** : Analyze the working of timers/counters and interrupts in 8051 microcontrollers to develop timing critical applications.
- CO4** : Interface various peripheral devices such as LCD, Data Acquisition Systems and various sensors.
- CO5** : Design microcontroller-based systems using suitable IDE to satisfy given requirements and standard.

**Subject Code** : 10EC43  
**Course Code** : C211  
**Course Name** : Control Systems

- CO1.** Apply the knowledge of mathematics and engineering to analyze closed-loop and open loop control systems and various mathematical models for stability and steady-state performance
- CO2.** Apply mathematical techniques to perform time & frequency response analysis of a control system.
- CO3.** Analyze the stability of a system from the transfer function and by using the properties of state transition matrix, RH criterion, root locus, bode plots, Nyquist criterion and find the transfer function.
- CO4.** Determine the transfer functions using block reduction & signal flow graph techniques and verify the stability of the system using various stability analysis methods.
- CO5.** Designing a closed-loop control system to satisfy dynamic performance specifications using frequency response, root-locus, and state-space techniques, as well as steady state error specifications.





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**Subject Code : 10EC44**  
**Course Code : C212**  
**Course Name : Signals and Systems**

- CO1.** Choose appropriate elements and relevant mathematical operations to be applied on signals to build a system for given specification.
- CO2.** Develop mathematical and block diagram representation for a given LTI system.
- CO3.** Calculate the system output using time and frequency domain methods.
- CO4.** Analyze LTI systems using time and frequency domains to characterize the behavior.
- CO5.** Select appropriate Fourier analysis methods for different classes of signals and systems.
- CO6.** Formulate system transfer function to satisfy given constraints such as stability, type of impulse response and causality and verify using computer packages.



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**Subject Code : 10EC45**  
**Course Code : C213**  
**Course Name : Fundamentals of HDL**

- CO1 : Describe digital circuits utilizing various constructs of VHDL and Verilog.
- CO2 : Compare and contrast different styles of description in HDL.
- CO3 : Analyze the steps involved in the synthesis of HDL code.
- CO4 : Model the digital systems using Dataflow, Behavioural, Structural and Mixed Type and Mixed Language styles in HDL for given functionality.
- CO5 : Compose optimized HDL code using Procedure, Tasks, Functions and file processing.

**Subject Code : 15EC46**  
**Course Code : C214**  
**Course Name : Linear Integrated Circuits**

- CO1 : Explain the basic concepts of Op-amp, Op-amp parameters and different configuration of Op-amps.
- CO2 : Analyze the working of Op-amps as DC amplifiers, AC amplifiers and their frequency response.
- CO3 : Illustrate the applications of Op-amps in sample and hold circuits, V to I and I to V converters, waveform generators oscillators.
- CO4 : Exemplify the working of voltage regulators, general purpose and switching regulators.
- CO5 : Design Schmitt trigger circuits, active high pass and low pass filters for given specifications using OPAMPS.
- CO6 : Investigate the operation of basic timer circuits, PLL-operating principle, VCO, A/D and D/A converters.



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**Subject Code** : 10ECL47  
**Course Code** : C215  
**Course Name** : **Microcontroller Lab**

- CO1** : Apply the knowledge of mnemonics of 8051 to develop Assembly Language Code to perform different data transfer, arithmetic, logical operations & Code conversion.
- CO2** : Analyze the working of timers in 8051 microcontroller by generating delays.
- CO3** : Interface alphanumeric LCD Panel, External ADC, Stepper and DC Motor with 8051 microcontroller using C programming language.
- CO4** : Design a simple calculator using seven segment display and Hex keyboard in C programming language.
- CO5** : Design microcontroller based systems using suitable IDE to satisfy given requirements and standards.

**Subject Code** : 15ECL48  
**Course Code** : C216  
**Course Name** : **HDL Lab**

- CO1** : Describe the importance of modern programmable logic devices.
- CO2** : Demonstrate different styles of writing HDL code.
- CO3** : Use Xilinx tools in digital circuit modeling, simulation, functional verification in VHDL, Verilog.
- CO4** : Validate and synthesize a digital circuit to FPGA board using HDL.
- CO5** : Validate and implement working circuits on FPGA using interfaces in VHDL.



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**Subject Code : 10AL51**  
**Course Code : C301**  
**Course Name : Management and Entrepreneurship**

- CO1.** Explain the functions of management professional and discuss various management approaches.
- CO2.** Exhibit leadership through rational decision making for selection, recruitment of eligible employees and direct them towards achieving organizational objectives.
- CO3.** Explore the qualities of entrepreneur, their impact on economic development along with barriers encountered for their growth.
- CO4.** Illustrate various stages and guidelines followed in carrying out a project and discuss about feasibility studies.
- CO5.** Distinguish between variety of schemes and institutional supporting agencies available for the development of Small scale industries.



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**Subject Code : 10EC52**  
**Course Code : C302**  
**Course Name : Digital Signal Processing**

- CO1** : Apply the knowledge of signals, types of signals, DFT, FFT, Basic Filters (Butterworth, Chebyshev), Z-transform and Realization of Structures of FIR & IIR Filter in performing Digital signal processing operations.
- CO2** : Analyze the difference between DFT, & FFT, Butterworth & Chebyshev, IIR & FIR Filter, and also direct form I & Direct form II, Parallel & Cascade form.
- CO3** : Examine the Properties of DFT, Circular convolution & its relationship to linear convolution and how circular convolution can be achieved via the DFT.
- CO4** : Evaluate the Performance of FFT using DFT (Decimation in time and frequency FFT algorithms for efficient computation of the DFT), Order of the Filter, Realization of the Filter using direct form I & II, Parallel, Cascade and lattice structure, & prove the order of the digital filters (IIR) theoretically and practically by using MATLAB.
- CO5** : Design a digital IIR filter using IIV, BT, Matched Z-Transform, & FIR Window method. Implement digital filters in a variety of forms:-Direct form I & II, Parallel, Cascade and lattice structure.



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**Subject Code : 10EC53**  
**Course Code : C303**  
**Course Name : Analog Communication**

- CO1** : APPLY the concepts of random and Gaussian process that are essential in communication systems.
- CO2** : Analyze the principles, generation, reconstruction and applications of amplitude modulation.
- CO3** : Interpret the principles, generation, reconstruction and applications of frequency modulation.
- CO4** : Examine the types of noise that are encountered in communication systems.
- CO5** : Analyze the performance of AM and FM systems in the presence of noise.
- CO6** : Evaluate different modulation schemes to solve problems of communication systems and ability to engage in self-study.

**Subject Code : 15EC54**  
**Course Code : C304**  
**Course Name : Microwaves and Radar**

- CO1** : Apply the knowledge of microwave transmission lines and waveguides in solving problems involving microwave component.
- CO2** : Choose appropriate microwave devices in implementing microwave electronic circuits based on their working principles.
- CO3** : Analyze behaviour of microwave devices using S parameters and modes of microwave propagation using suitable tools.
- CO4** : Design various microwave strip lines for given specification.
- CO5** : Solve ranging and detection problems by making use of concepts of RADAR and Doppler Effect.



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**Subject Code : 10EC55**  
**Course Code : C305**  
**Course Name : Information Theory and Coding**

- CO1.** Apply the concept of average information content, entropy and mutual information to design efficient encoding schemes for communication system.
- CO2.** Construct different source coding, channel coding and error control coding schemes to maximize rate efficiency and confidentiality of information transmission.
- CO3.** Analyze the capacity of different types of communication channel to select better encoding scheme.
- CO4.** Measure the performance of communication channel using appropriate tools.
- CO5.** Investigate different errors that can occur in digital communication system.

**Subject Code : 10EC56**  
**Course Code : C306**  
**Course Name : Fundamentals of CMOS and VLSI**

- CO1 :** Apply the knowledge of fabrication and working of MOS transistors in choosing appropriate technologies in designing ICs.
- CO2 :** Realize the given logical function using appropriate Logic structures as per given specification.
- CO3 :** Analyze basic circuit parameters and study the effects of scaling in MOS circuits.
- CO4 :** Evaluate performance of subsystems and layout issues.
- CO5 :** Design nMOS and CMOS subsystems using structured approach with stick diagrams and layouts.



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**Subject Code : 10ECL57**  
**Course Code : C307**  
**Course Name : DSP Lab**

- CO1** : Demonstrate (Apply the knowledge of) signals, using the discrete Fourier transform (DFT), FFT, Basic Filters (Butterworth, Chebyshev), Z-transform, & Realization Structures of FIR & IIR Filter.
- CO2** : Analyse the Properties of DFT & Perform circular convolution, its relationship to linear convolution, and how circular convolution can be achieved via the DFT.
- CO3** : Analyse the concepts of Sampling Theorem & correlation of signals.
- CO4** : Evaluate the Performance of FFT using DFT (Decimation in time and frequency FFT algorithms for efficient computation of the DFT), Order of the Filter, Realization of the Filter using direct form I & II, Parallel, Cascade and lattice structure, & prove the order of the digital filters (IIR) theoretically and practically.
- CO5** : Design a digital IIR filter using IIV, BT, Matched Z-Transform, & FIR Window method. Implement digital filters in a variety of forms:-Direct form I& II, Parallel, Cascade and lattice structure.





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**Subject Code : 10ECL58**  
**Course Code : C308**  
**Course Name : Analog Communication Lab**

- CO1** : Apply the acquired knowledge for design and implementation of various applications of operational amplifiers.
- CO2** : Analyze different kinds of modulation and demodulation techniques.
- CO3** : Analyze and verify the applications of timer circuits.
- CO4** : Design and test the behavior of second order Low pass, High pass, Band pass and Band elimination active filters based on given specifications.
- CO5** : Design the circuits to regulate the DC power supply.
- CO6** : Demonstrate the modulation techniques using simulation tool by individual and team work.



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**Subject Code : 10EC61**  
**Course Code : C309**  
**Course Name : Digital Communication**

- CO1** : Apply the concepts of sampling, quantization, encoding & reconstruction in processing digital signals.
- CO2** : Identify various design requirements and characteristics of signals to apply appropriate waveform coding and digital modulation techniques.
- CO3** : Determine quantization noise, SNR, probability of errors and measure power spectra of discrete PAM signals to estimate performance of various signaling formats.
- CO4** : Develop optimum receiver by applying theory of detection and estimation.
- CO5** : Explore the concepts of ISI, Nyquist criteria, Eye pattern and Adaptive Equalization for data analysis and Infer the performance of various spread spectrum modulation techniques.



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**Subject Code : 10EC62**  
**Course Code : C310**  
**Course Name : Microprocessor**

- CO1.** Describe the architecture of microprocessors, co-processors, and advanced microprocessors.
- CO2.** Enumerate the addressing modes, instruction set, interrupts and concepts of interfacing and bus standards.
- CO3.** Bring out the differences between processor and co-processor, differentiate basic configurations and discuss the system bus architecture.
- CO4.** Construct programs to run on 8086 microprocessor-based systems, Demonstrate and devise techniques for faster execution of instructions.
- CO5.** Analyze the architecture of advanced processors and its programming.

**Subject Code : 10EC63**  
**Course Code : C311**  
**Course Name : Microelectronic Circuits**

- CO1.** Apply the knowledge of MOSFETs in the design of linear and nonlinear circuits.
- CO2.** Realize the given logical function using CMOS logic structures as per given specification.
- CO3.** Perform AC, DC and Transient analysis on linear circuits.
- CO4.** Examine low and high frequency response of amplifiers.
- CO5.** Compare, contrast and choose appropriate amplifier, biasing and feedback techniques.



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**Subject Code : 10EC64**  
**Course Code : C312**  
**Course Name : Antennas and Propagation**

**CO1.** Apply the parameters of antenna to determine radiation patterns.

**CO2.** Derive the expression for radiation patterns of various antennae.

**CO3.** Distinguish various types of Wire, Aperture, Array and Patch Antennas

**CO4.** Design an array antenna for N isotropic sources.

**CO5.** Evaluate the performance characteristics of various antennae.

**CO6.** Explore the concepts of various radio propagations and calculate various parameters.

**Subject Code : 10EC65**  
**Course Code : C313**  
**Course Name : Operating Systems**

**CO1.** Explain the concepts of memory allocation, Virtual memory, scheduling and message passing.

**CO2.** Explain the structure of OS, the file system and the classes of an OS.

**CO3.** Demonstrate the procedure for installing OS by understanding the structure and installation of an OS.

**CO4.** Apply the knowledge of virtual memory, memory allocation and multiprogramming concepts for scheduling the processes for execution.

**CO5.** Illustrate memory management by OS and relate the concepts of scheduling and multiprogramming to real time systems.



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**Subject Code : 10EC666**  
**Course Code : C314**  
**Course Name : Digital System Design using Verilog**

- CO1.** Comprehend the basic theory and operation of Verilog and real world problem design.
- CO2.** Analyze the concept of memory, Implementation fabrics, error detections and error correction codes
- CO3.** Analyze the concept of pipelining and parallel processing
- CO4.** Apply and compare the concepts of assembly language programming and HDL Programming for digital system design
- CO5.** Analyze and evaluate the design of combinational and sequential circuits
- CO6.** Comprehend the basic theory and operation of Verilog and real world problem design

**Subject Code : 10ECL67**  
**Course Code : C315**  
**Course Name : Analog Communication Lab**

- CO1** : Apply the concepts of modulation and demodulation to perform ASK,FSK,PSK,DPSK, & QPSK generation and detection.
- CO2** : Demonstrate and infer the time division multiple access implementation in communication channels.
- CO3** : Implement PCM generation and detection using a CODEC Chip.
- CO4** : Demonstrate Analog and Digital communication link using optical fibre.
- CO5** : Analyze the characteristics of ring resonator, power divider, couplers and various antennas used in communication systems.



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**Subject Code : 10ECL68**  
**Course Code : C316**  
**Course Name : Microprocessor Lab**

- CO1** : Develop structured programs in assembly language with an ability to test and debug them in the laboratory.
- CO2** : Demonstrate and explain techniques for faster execution of instructions improve speed of operations and enhance performance of microprocessors.
- CO3** : Inspect hands-on experience in doing experiments on microprocessors by using hardware kit in the laboratory and present the report.
- CO4** : Analyze the reason behind the cost of executing instructions in terms of time and space in programs.
- CO5** : Interpret the execution of programs in different assemblers.



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**Subject Code : 10EC71**  
**Course Code : C401**  
**Course Name : Computer Communication Network**

- CO1** : Explain the terminology and concepts of the OSI reference model and the TCP/IP reference model, Telecommunication techniques, various protocols and their working
- CO2** : Apply the knowledge of random access, controlled access and channelization method to control the access over the channel.
- CO3** : Explain the types of Ethernet and understand the IEEE standards.
- CO4** : Compare the strengths and weaknesses of different protocols for noisy and noiseless channels.
- CO5** : Analyze and design the topological and routing strategies for an IP based networking infrastructure.
- CO6** : Analyze the working of IPV4, IPV6, TCP and UDP datagram formats.

**Subject Code : 10EC72**  
**Course Code : C402**  
**Course Name : Optical Fiber Communication**

- CO1.** Describe various blocks of optical fiber communication system, optical networks & amplifiers, their merits and demerits along with light propagation properties
- CO2.** Distinguish between various fiber losses such as attenuation, absorption, scattering losses as well as fiber alignment and joint loss
- CO3.** Illustrate the behavior of optical transmitters & receivers for analog & digital mode of operation
- CO4.** Investigate the performance of Analog & Digital links with their parameters.
- CO5.** Integrate the Active and Passive components in a WDM system.



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**Subject Code : 10EC73**  
**Course Code : C403**  
**Course Name : Power Electronics**

- CO1** Explain the basic theory of power electronics, operation of power semiconductor devices and power electronics converters.
- CO2** Explicate the operation of power transistors, its switching characteristics, gate/base drive requirements and need for isolation.
- CO3** Analyze the operating states of SCR, turn on and turn-off methods, the concept of Snubber circuits and Thyristor firing circuits, commutation and its types.
- CO4** Illustrate the working principle of controlled converters, its operation with R and RL load.
- CO5** Analyze the working of AC voltage controllers, ON-OFF and phase control methods with different load conditions
- CO6** Interpret the working principles of different types of choppers and inverters, and its operation under different load conditions

**Subject Code : 10EC74**  
**Course Code : C404**  
**Course Name : Embedded System Design**

- CO1** : Explain the concepts of embedded system design, development process, partitioning & decomposition and life cycle models.
- CO2** : Explore the hardware core components of an embedded system and design SRAM & DRAM memory subsystems.
- CO3** : Examine the performance evaluation and optimization techniques for coding embedded system.
- CO4** : Distinguish scheduling techniques in an Operating system with reference to CPU resource utilization.





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**Subject Code** : 10EC756  
**Course Name** : Speech Processing

- CO1.** Outline the physiological process of speech production & perception and discuss acoustic phonetics and classification of different speech sounds & representation.
- CO2.** Describe time domain and frequency domain algorithms required for speech processing.
- CO3.** Apply time domain and frequency domain algorithms, on speech to find, enhance and modify speech parameters.
- CO4.** Explain filter banks for analysis – synthesis systems and homomorphic processing techniques for deconvolution process.
- CO5.** Analyze the algorithms used in speech enhancement, automatic voice response systems, speech recognition, speech synthesis and applications.



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**Subject Code** : 10ECL77  
**Course Code** : C407  
**Course Name** : VLSI Lab

- CO1** : Apply the Knowledge of Linux operating system to manage the files and work on Cadence tool.
- CO2** : Apply the knowledge of HDL (combination and sequential), VLSL (analog and digital) for performing simulation &  $\lambda$  based design rules (Digital & Analog) for drawing layout.
- CO3** : Analyze and synthesize the HDL codes by applying constraints.
- CO4** : Analyze the layout by checking DRC & LVS.
- CO5** : Evaluate the performance of the layout by back annotation to schematic and simulating it.
- CO6** : Design analog & digital circuit using cadence tool.

**Subject Code** : 10ECL78  
**Course Code** : C408  
**Course Name** : Power Electronics Lab

- CO1.** Demonstrate VI characteristics of SCR and determine holding current, latching current and breakover voltage.
- CO2.** Demonstrate different types of triggering methods.
- CO3.** Demonstrate the speed control operation of DC, stepper as well as universal motors.
- CO4.** Analyze the VI characteristics of MOSFET, IGBT, DIAC.
- CO5.** Analyze the operation of inverters, voltage commutated chopper and LC commutation circuits.
- CO6.** Evaluate converters and observe the output for different load conditions.



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**Subject Code : 10EC81**  
**Course Code : C409**  
**Course Name : Wireless Communication**

- CO1.** Make use of various standards, technologies and architecture of wireless networks to describe wireless communication networks.
- CO2.** Analyze the quality of service provided by cellular networks during call handoff and location update processes.
- CO3.** Compare and contrast various network protocols and multiple access techniques used in mobile communication.
- CO4.** Determine various modulation and diversity techniques required to improve performance of mobile radio channels.
- CO5.** Optimize network capacity of GSM systems using cellular capacity expansion techniques.



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**Subject Code : 10EC82**  
**Course Code : C410**  
**Course Name : Digital Switching Systems**

- CO1.** Describe the basic types of switching systems in telecommunication, Network Structure, services and telecommunication transmission methods
- CO2.** Explain the concepts DSS building blocks, Basics of Call processing, software architectures and maintenance of DSS.
- CO3.** Analyse the different types of switching methods like circuit switching, distribution switching, and electronic switching.
- CO4.** Distinguish between space and time switching networks, different levels software architectures.
- CO5.** Determine the Grade of service of traffic measurement by deriving the lost call systems and queuing systems
- CO6.** Design of progressive gradings, two stage and three stage networks to solve grade of service linked systems.



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**Subject Code : 10EC832**  
**Course Name : Network Security**

- CO1.** Apply the principles of cryptography to develop robust security systems.
- CO2.** Analyze various threats and counter measures available to enhance security of software and online applications.
- CO3.** Assess the risks of various cryptanalytic attacks and to provide data security using various password management techniques.
- CO4.** Design various encryption and decryption algorithms using symmetric ciphers and public key cryptosystem.
- CO5.** Develop secure web applications meeting standards for given requirements.



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**Subject Code** : 10EC843  
**Course Name** : GSM

- CO1** Apply the knowledge of fundamentals of communication system to describe architecture of GSM, objectives, subsystems of GSM, various interfaces and management of GSM networks.
- CO2** Infer different techniques to reduce interference in GSM and compare GSM with other cellular networks.
- CO3** Distinguish different logical channels, GSM bursts, GSM messages, location registration techniques, speech codec's, speech coding techniques for speech encoding and transmission.
- CO4** Inspect different data services, call flow scenarios, security algorithms and token-based authentication techniques for providing privacy and security to GSM.
- CO5** Apply the knowledge of teletraffic models, call models, spectral efficiency, receiver sensitivity, selection of modulation schemes, link budget, data encryption techniques for planning and design of wireless network.



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**Subject Code : 10ECP85**  
**Course Code : C415**  
**Course Name : Project work**

- CO1** : Apply relevant knowledge and skills to a given problem in diverse fields of engineering.
- CO2** : Identify the needs of society and formulate sustainable solution.
- CO3** : Able to interact effectively with the members associated with project and work as a part of team with professionalism.
- CO4** : Evaluate the possible environmental hazards of the project and take appropriate actions to circumvent them.
- CO5** : Evaluate the challenges and risks involved in the execution of the project and handle them effectively.

**Subject Code : 10ECS86**  
**Course Code : C416**  
**Course Name : Seminar**

- CO1** : Present the complex technical concepts effectively in public/professional context.
- CO2** : Deliver well rehearsed and interactive presentations by using modern tools and technologies.
- CO3** : Develop audience – centered presentations satisfying professional objectives.
- CO4** : Enhance one’s own intellectual skills by utilizing available technical resources
- CO5** : Demonstrate effective writing skills by employing techniques of academic writing, including invention, research, critical analysis and evaluation, and revision.



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