SARASWATI Education Society's

SARASWATI College of Engineering

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Kharghar, Navi Mumbai - 410 210.

Course Objectives and Course Outcomes

Odd Semester

Class: SE

Subject code: **ETC304**	Subject Name **:Circuit Theory & Networks**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Analyze the Circuits with independent and dependent sources.
2	Analyze magnetic circuits.
3	Apply time and frequency domain analysis to circuits
4	Compute network Topology, network Functions.
5	Apply/Compute two port networks, inter relationship among various circuit parameters, solve more complex network using these parameters.
6	Synthesize the network using passive elements

Course Outcomes:

At the end of course, students will attain an ability to:

1	Apply their knowledge in analyzing Circuits by using network theorems.
2	Analyze magnetic circuits.
3	Apply/Use the time and frequency method analysis to circuits
4	Compute network topology & network functions for one port and two port networks.
5	Find the various parameters of two port networks inter relationship among various circuit parameters, solve more complex network using these parameters
6	Synthesize the network using passive elements

Subject code:**ETC302**	Subject Name **:Electronics Devices and circuits-I**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Describe operation, DC analysis and AC models of semiconductor devices.
2	Study the concepts for the design of Regulators and Amplifiers.
3	Understand transistor biasing techniques and designing.
4	Use transistor modelling and small signal analysis of amplifier.
5	Analyse high frequency response for BJT and FET amplifiers.
6	Implement mini projects based on concept of electronics circuit concepts.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Apply the current voltage characteristics of semiconductor devices, analyze dc circuits and relate ac models of semiconductor devices.
2	Apply the concepts for the design of Regulators and Amplifiers.
3	Classify transistor biasing techniques and designing.
4	Analyze transistor modelling and small signal analysis of amplifier.
5	Evaluate frequency response to understand behaviour of Electronics circuits.
6	Design small signal amplifiers.

Subject code:**ETC304**	Subject **:Electronic Instrumentation and control**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Generate basic concepts and definitions in measurement.
2	Classify and explain Principles of working of sensors and component used in electronics measurement
3	Discover the basic knowledge of advanced electronics instruments and data acquisition systems applied in Wireless sensor network.
4	Use fundamental concepts of control system such as transfer function, mathematical modeling,
5	Make system's time and frequency-domain analysis with response to test inputs. Analysis includes the determination of the system stability
6	Develop concepts of stability and its assessment criteria.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Develop the basics of instruments and their application.
2	Illustrate principle of operation for various sensors.
3	Produce functional blocks of data acquisition system.
4	Compute transfer functions for given system.
5	Compose time domain and frequency domain parameter for Given system.
6	Construct stability of given system using appropriate criteria.

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Class: TE

Subject code:**ECL503**	Subject Name**: Business Communication & Ethics**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Describe professional ethics and codes of professional practice
2	Classify and explain effective communication and interpersonal skills.
3	Apply multidisciplinary approach towards all life tasks. Prescribe an environment for students to work on Multidisciplinary projects as part of different teams to enhance their team building capabilities like leadership, motivation, teamwork etc
4	Use their professional and ethical attitude, effective communication skills and teamwork with an ability to understand engineer's social responsibilities.
5	Support students with an academic environment where they will be aware of the excellence, leadership and lifelong learning needed for a successful professional career
6	Formulate students for successful careers that meets the global Industrial and Corporate requirement.

Course Outcomes:

At the end of course, students will attain anability to:

1	Illustrate a technical document using precise language, suitable vocabulary and appropriate style.
2	Demonstrate knowledge of professional and ethical responsibilities by effective communication in both verbal and written form
3	Develop the life skills with key expertise to progress professionally by building stronger relationships.
4	Sketch an entrepreneurial approach and ability for life-long learning. Demonstrate awareness of contemporary issues.
5	Apply the traits of a suitable candidate for pursuing higher education/ job interview, upon being trained in the techniques of presentation and Interview skills.
6	Deliver formal presentations, effectively implementing the verbal and non-verbal skills. Participate and succeed in Campus placements and competitive examinations

Subject code:**ECC503**	Subject Name: **Electromagnetic Engineering.**	Credits: 04

Course Objective:

At the end of course, student should be able to:

1	Show basic skills required to understand, develop and design various engineering applications involving electromagnetic fields.
2	Formulate foundations of electromagnetism for wireless communication and guided wave communication.
3	Differentiate between static electric, static magnetic and dynamic electromagnetic fields and phenomena of wave propagation.
4	Explain Maxwell's equations and their application in different media and also application of Maxwell's equations in the solution of uniform plane waves.
5	Illustrate use of Smith Chart and introduce transmission lines which is bridge between circuit theory and field theory.
6	Demonstrate applications of electromagnetism in guided and wireless communication as well as in different electronic systems.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Evaluate electromagnetic fields in planar, cylindrical and spherical geometries. Identify signals and functions of its components.
2	Solve electrostatic and magnetostatic problems in electronic systems.
3	Describe knowledge of time varying fields in wave propagation through different media.
4	Interpret Maxwell's equations physically and apply this knowledge to determine wave propagation.
5	Solve transmission line problems analytically as well as graphically.
6	Explain knowledge of static and time varying electromagnetic field theory in various applications.

Subject code:ECC502	Subject Name**: Digital Communication**	Credits: 04

Course Objective:

At the end of course, student should be able to:

1	Identify the signals & functions of its components.
2	Classify source encoder and finding out codewords using Shannon Fano and Huffman coding algorithm.
3	Estimate information, average information(Entropy).
4	Interpret channel encoder.

5	Detection and correction of error to produce optimum receiver.
6	Classify various digital modulation techniques.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Identify signals and functions of its components.
2	Construct codewords by applying Shannon Fano and Huffman coding algorithm.
3	Estimate information, average information(entropy) etc.
4	Design channel encoder.
5	Detect and correct error for optimum receiver mathematically.
6	Propose classification techniques in machine vision to classify objects.

Subject code**:ECC504**	Subject Name**: Discrete Time Signal Processing**	Credits: 04

Course Objective:

At the end of course, student should be able to:

1.	Extrapolate concept of DFT and FFT their application.
2.	Compute different design technique of digital IIR filters.
3.	Determine different design technique of digital FIR filters.
4.	Analyze performance of digital filters.
5.	Justify finite world length effect of Digital filters.
6.	Explain the DSP processor and its application.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Apply the concept of DFT and FFT.
2.	Design digital IIR filter with arbitrary specification.
3.	Assess the knowledge of design of digital FIR filter with arbitrary specification.
4.	Generalize the effect of hardware limitation on performance of digital filter.
5.	Illustrate finite word length effect of digital filters.
6.	Implement DSP Processor for real time application.

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Class: BE

Subject code : ETE701	Subject Name**:** :**Data compression & Encryption**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Explain students lossy and lossless compression techniques for different types of data
2	Teach students text compression and audio compression
3	Understand image,text and video compression techniques
4	Construct students Encryption techniques
5	Describe fundamentals on cryptography and data security
6	Discuss the knowledge of compression & encryption in various security systems

Course Outcomes:

At the end of course, students will attain an ability to:

1	Compare lossy and lossless compression techniques
2	Compute Text compression on video,text and image techniques
3	Evaluate Image compression and Video compression techniques
4	Classify Different encryption techniques
5	Basics of Data security and cryptography
6	Apply the basic techniques in various system security fields

Subject code:ECC702	Subject Name**: Mobile Communication**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Explain multiple access technics and OFDMA concept.
2	Interpret concept of cellular system design.
3	Extend knowledge in understanding GSM and CDMA technology.
4	Interrelate 2G,3G evolution.
5	Explain different types of wave propagation and mobile propagation.
6	Classify emerging technology for cellular standards.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Generalize GSM network architecture, speech coding, identifiers, services and system capacity.
2	Explain CDMA architecture, forward and reverse channels.
3	Differentiate 2G,2.5G and 2.75G mobile evolution.
4	Differentiate 4G emerging technology like SDR, MIMO etc.
5	Infer Small scale and large scale propagation.
6	Analyze indoor and outdoor Propagation models related to fading.

Subject code:ETC704	Subject **: Microwave and RADAR Engineering.**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Analyze microwave spectrum and waveguide transmission
2	Express microwave designing using smith charts and microwave signal generation.
3	Explain construction and working of different microwave devices.
4	Analyze the working of different microwave devices mathematically.
5	Justify the concept of RADAR and its applications.
6	Propose the application of microwave engineering.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Recognize the importance of microwave engineering.

2	Interrelate / Express the concept of waveguide transmission.
3	Demonstrate microwave designing using smith chart.
4	Inculcate construction and working of different microwave devices.
5	Demonstrate the concept of microwave signal generation and amplification.
6	Illustrate the characteristics and application of different semiconductor microwave devices.
7	Conclude the working principle of RADAR and its types.
8	Justify the different applications of RADAR and microwave engineering.

Subject code**:ETC703**	Subject : **Optical Communication and Networks**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Analyze the optical fiber structures.
2	Analyze the operation of LEDs, laser diodes, and PIN photodetectors (spectral properties, bandwidth, and circuits) and apply in optical systems.
3	Understand the principles, compare of single- and multi-mode optical fiber characteristics.
4	Apply the knowledge of different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
5	Learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principle of WDM.
6	Analyze design, build, and demonstrate optical fiber experiments in the laboratory.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Develop confidence for self education and ability for lifelong learning continue to be motivated to learn new concepts Become well conversant with waveguide transmission.
2	Apply the fundamental principles of optics and light wave to design optical fiber communication systems.
3	Identify structures, functions, materials, and working principle of optical fibers, light sources, couplers, detectors, and multiplexers
4	Design optical fiber communication links using appropriate optical fibers, light sources, couplers, detectors, and multiplexers.
5	Explore concepts of designing and operating principles of modern optical communication systems and networks.
6	Demonstrate the ability to design a system, component or process as per needs and specification

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Course Objectives and Course Outcomes

Even Semester

Class: SE

Subject code:**ECC402**	Subject Name **:Electronics Devices and circuits-II**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Use the operation of the various bias circuits of MOSFET.
2	Analyze and Design MOSFET bias circuits.
3	Apply the operation and design of multistage amplifier for a given specification.
4	Understand the operation and design of transformer coupled various types of power amplifier circuits.
5	Classify and describe the effects of negative feedback on amplifier circuits.
6	Describe the different RC and LC oscillator circuits to determine the frequency of oscillation.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Study the operation of bias circuit of MOSFET.
2	Use Design and analyze the operation of MOSFET.
3	Identify and use the multistage amplifier using BJT and FET in various configuration to determine frequency response and concept of voltage gain.
4	Illustrate different power amplifier circuits, their design and use in electronics and communication circuits.
5	Know about the concept of negative feedback amplifier and their characteristics.
6	Design the different oscillator circuits for various frequencies.

Subject code:ECC405	Subject : **Principles of Communication Engineering**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	State fundamentals of basic communication system.
2	Understand various modulation and demodulation techniques of analogcommunication and noise handling concepts.
3	Explain the working principle of transmitter and receiver used in analog communication system.
4	Illustrate analog pulse modulation and demodulation techniques.
5	Compare and contrast analog and digital communication system.
6	Propose Multiplexing and demultiplexing techniques.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Outline and identify and solve basic communication system.
2	Distinguish different modulation and demodulation techniques used in analog communication andthe concept of noise.
3	Explain transmitter and receiver circuits used in analog communication systems.
4	Illustrate Pulse communication and importance of sampling techniques in communication system.
5	Compare design issues, advantages, disadvantages and limitations of analog and digital communication systems.
6	Formulate the principle of multiplexing techniques

Subject code:**EC C404**	Subject Name **:Signals & Systems**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Explain the concept & theory of signals and systems in engineering field
2	Classify & analyze the signals & systems
3	Hypothesize the knowledge of time domain analysis of continuous & discrete time system
4	Apply the knowledge of frequency domain analysis of continuous & discrete time system
5	Use transform in analysis of system.
6	Judge the concept of state, state variables & application of signals & system

Course Outcomes:

At the end of course, students will attain an ability to:

1	Understand the concept & types of signals, classification of signals.
2	Analyze the classification of signals & systems through examples.
3	Compute the time domain analysis of continuous & discrete time system
4	Perform the knowledge of frequency domain analysis of continuous & discrete time system
5	Analyze the discrete time LTI system using Z transform
6	Express the concept of state, state variables & application of signals & system

Subject code:**ECC403**	Subject Name:**Linear Integrated Circuits**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Analyze and design differential amplifier, current sources and describe basics of Op-amp.
2	Enable students to analyze AC and DC characteristics of Op-Amp.
3	Design and explain different linear, nonlinear and mathematical application circuits using op-amps.
4	Discuss concept of ADC and DAC.
5	Illustrate and design voltage regulators using Op-amp.
6	Select and design circuits using special purpose ICs.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Explain various current mirror circuits and illustrate differential amplifier with active load.
2	Describe characteristics as well as linear and nonlinear applications of Op-amps.
3	Construct and compare different ADCs and DACs.
4	Recognize and design specific application using special purpose IC.
5	Design circuits for performing different mathematical operations.
6	Construct voltage regulator circuits.

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Class: TE

Subject code:**ECC603**	Subject Name**: Antenna and Radio Wave Propagation**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Interpret basic parameters of antenna.
2	Demonstrate/analyse different parameters of wire antennas
3	Justify the concept of antenna arrays and pattern multiplication.
4	Classify different special types of antennas.
5	Analyze the antenna measurement technique and radio wave propagation.
6	Explain the concept of Microstrip antennas.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Interpret basic parameters of antenna.
2	Demonstrate/analyse different parameters of wire antennas
3	Justify the concept of antenna arrays and pattern multiplication.
4	Classify different special types of antennas.
5	Analyze the antenna measurement technique and radio wave propagation.
6	Explain the concept of Microstrip antennas.

Subject code:**ECC602**	Subject Name**: Computer Communication Networks**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Analyze computer and communication networks.
2	Design of computer and communication networks.
3	Extrapolate and configure a network for an organization.
4	Formulate client-server socket programs.
5	Distinguish the traffic flow of protocol frames.
6	Identify the contents of protocol frames.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Design a small or medium sized computer network including media types, end devices, and interconnecting devices that meets a customer ‘s specific needs.
2	Perform basic configurations on routers and Ethernet switches.
3	Demonstrate knowledge of programming for network communications.
4	Learn to simulate computer networks and analyze the simulation results.
5	Troubleshoot connectivity problems in a host occurring at multiple layers of the OSI model.
6	Develop knowledge and skills necessary to gain employment as computer network engineer and network administrator.

Subject code:**ECC601**	Subject Name**: Microcontroller and Applications**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Develope knowledge and expertise in Microcontroller.
2	Design algorithm for microcontroller and it’s application.
3	Understand interfacing of peripheral devices.
4	Develope knowledge and expertise in ARM 7:32 bit microcontroller.
5	Describe ARM 7 Instructions.
6	Design algorithm for microcontroller and it’s application with Embedded C.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Understand detailed architecture of 8051 Microcontroller.
2	Classify/Illustrate different types of algorithm for microcontroller and it’s application.
3	Use/Apply the knowledge to interface various peripheral devices with microcontroller.
4	Understand detailed architecture of 8051 Microcontroller.
5	Classify/Illustrate different types of algorithm for ARM 7.
6	Develope programmes in ARM 7 using embedded C.

Subject code:ECCDLO6021	Subject Name : **Digital VLSI Design**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Implement MOS circuit logic design using various design styles with layouts.
2	Study fundamental of memory and storage circuits.
3	Understand designing of Adders, Multipliers and Shifters with their circuit design issues.
4	Highlight circuit design issues in the context of VLSI technology.
5	Illustrate HDL for system based and data path design.
6	Acquire knowledge of RTL designing.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Realize logic circuits with different design styles.
2	Understand operation of memory, storage circuits and data path elements.
3	Interpret Adders, Multipliers and shifters using logic design styles.
4	Demonstrate an understanding of system level design issues such as protection, clocking and routing.
5	Simulate & Synthesize digital circuits using HDL Language.
6	Implement RTL designing for Practical Applications like High level state machine and FIR filter design.

Subject code:**ECC604**	Subject Name: **Image Processing & Machine Vision**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Describe mathematical models of digital image processing.
2	Classify and explain different types of image transforms.
3	Apply time and frequency domain techniques for image enhancement.
4	Use Image morphological and restoration techniques for image correction.
5	Analyse image segmentation techniques to recognize various shapes/ objects in an image.
6	Formulate classification techniques in machine vision to classify objects.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Describe mathematical models of digital image processing.
2	Classify/Illustrate different types of image transforms.
3	Use/Apply time and frequency domain techniques for image enhancement.
4	Identify and Use morphological and restoration techniques for image correction.
5	Analyse image segmentation techniques to recognize various shapes in an image.
6	Propose classification techniques in machine vision to classify objects.

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Class: BE

Subject code: **ETL802**	Subject Name: **Satellite Communication and Networks**	Credits:04

Course Objective:

At the end of course, student should be able to:

1.	Describe an in-depth understanding of different concepts used in a satellite communication system.
2.	Demonstrate the satellite communication system operation and planning.
3.	Explain the tools necessary for the calculation of basic parameters in a satellite communication system
4.	Express aspects of satellite communication like orbital mechanics, launching techniques, satellite link design, earth station technology and different access system towards a satellite.
5.	Summarize modern satellite multiple access techniques, modulation and coding schemes.
6.	Analyze the details of satellite networks along with the optical communication

Course Outcomes:

At the end of course, students will attain an ability to:

1.	State the basics of satellite communication.
2.	Express the operation of satellite communication system.
3.	Summarize the science behind the orbiting satellites, various multiplexing schemes and earth station parameters used for satellite communication.
4.	Explain and analyse link budget of satellite signal for proper communication
5.	Inculcate the aspects of satellite communication like orbital mechanism, earth station technology etc.
6.	Compare the different application of satellite communication.
	Translate the modern techniques used in satellite communication.
	Review satellite networking and satellite personal communication.

Subject code: **ETL803**	Subject Name**: Telecom Network and Management**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Demonstrate fundamentals of network management.
2	Understand the design, analysis, operations of modern data communication networks.
3	Analyze network informative system.
4	Develop the confidence for self-education on management of networks
5	Improve continuously technical knowledge on telecommunication network management.
6	Develop an ability for lifelong learning about network management.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Acquire the basic principles of network management.
2	Realize the design, analysis, operations of modern data communication networks
3	Demonstrate management of modern communication networks.
4	Analyze the working knowledge of Broadband network management.
5	Understand essentials of telecommunication network management
6	Demonstrate the ability to design a network management system, its component or process as per needs and specification.

Subject code:**ETL801**	Subject Name**: Wireless Communication**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Understand the various emerging wireless technologies like Bluetooth, Zigbee, Wimax, RFID
2	Understand and learn the current development in the wireless networks and technologies.
3	Apply the mathematical models for planning the radio frequency networks like CDMA, GSM, LTE.
4	Apply the acquired knowledge of wireless networks to design systems for various application
5	Acquire the technical and managerial skills to flourish in the domain.
6	Demonstrate the theoretical and practical knowledge of wireless networks to find solutions and seek employment in the area

Course Outcomes:

At the end of course, students will attain an ability to:

1	Apply their knowledge of various protocols and recent trends for wireless technologies.
2	Design various systems as an application to the various technologies studied.
3	Apply their knowledge of design and plan the RF networks.
4	Design of mobile wireless network and Phases of planning.
5	Understand the Sensor network architecture and WSN applications.
6	Illustrate the Middleware protocol and network management issues of sensor network.

Subject code:**ETC803**	Subject Name:**Internet and Voice Communication**	Credits:04

Course Objective:

At the end of course, student should be able to:

1	Explain signal and data transmission over communication channel.
2	Describe transmission control protocol and internet protocol.
3	Interpret detail working of application layer and transport layer of TCP.
4	Explain internetworking layer of IP.
5	Demonstrate digitization of audio and video and compression techniques.
6	Discuss voice over IP as areal time interactive audio and video service.

Course Outcomes:

At the end of course, students will attain an ability to:

1	Implement LAN using static and dynamic addressing techniques.
2	Illustrate concept of encapsulation and its relationship to layering in network model.
3	Compare byte stream sliding window and traditional algorithm.
4	Illustrate routers, DHCP, routing function and switching function.
5	Describe internetworking layer of IP.
6	Demonstrate working of DNS in global internet including caching and root servers.