Department of Electronics and Communication Engineering

OFFERED PROGRAMMES

Department of Electronics & Communication Engineering offers three programs that are affiliated to C.S.J.M.University, Kanpur and recognized by AICTE:

- **Bachelor of Technology Degree in Electronics & Communication Engineering.**
- **M. Sc. (two years) Programme in Electronics.**
- **Integrated M. Sc. (four years) Programme in Electronics.**

Program Outcomes (POs):

- **PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
- **PO2: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations
- **PO3: Problem analysis:** Recognize, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
- **PO4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions
- **PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
- **PO6: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
- **PO7: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
- **PO8: Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
- **PO9: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
- **PO10: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

- **PSO1: Circuit Design Concepts:** Apply basic and advanced electronics for implementing and evaluating various circuit configurations.
- **PSO2: VLSI and Signal Processing Domain:** Demonstrate technical competency in the design and analysis of components in VLSI and Signal Processing domains.

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- **PSO3: Communication Theory and Practice:** Possess application-level knowledge in theoretical and practical aspects required for the realization of complex communication systems.

Course Outcomes (COs):

ECE-S508	Course Outcome: 1. To understand the basics of satellite orbits. 2. To analyze the geostationary and non geostationary orbits. 3. To acquire the knowledge about launching procedures. 4. To understand the satellite segment and earth segment. 5. To analyze the Satellite Uplink and Downlink. 6. To understand the G/T ratio-Performance Impairments-System noise. 7. The Equipment Measurements on G/T, C/N, EIRP was discussed. 8. To understand the basics of Modulation and Multiplexing and Spread Spectrum communication. 9. Demonstrate the basic principle of RADAR System and Solve the RADAR Equation and to calculate Transmitter power. 10. Analyze the working principle of CW and Frequency Modulated Radar and Tracking Radar principle. 11. Calculate Noise Figure and Noise Temperature in Radar Receivers and can describe antennas used for Radars.
ECE-S 501	**Outcomes:** 1. Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices. 2. Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits 3. Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields. 4. Formulate and analyze a power electronic design at the system level and assess the performance. 5. Identify the critical areas in application levels and derive typical alternative solutions, select suitable power converters to control Electrical Motors and other industry grade apparatus. 6. Recognize the role power electronics play in the improvement of energy usage efficiency and the applications of power electronics in emerging areas.
ECE-S-406	**Course Learning Outcomes**: 1. Identify the various design limits material used for fabrication. 2. Describe the Performance of technology scaling. 3. Understand the complexities involved in the integrated circuits. 4. Apply principles to Identify and Analyze the various steps for the fabrication of various components 5. Assess the various reliability issues in VLSI technology 6. Analysis of the operation of MOS transistor 7. Analysis of the physical design process of VLSI design flow 8. Analysis of the design rules and layout diagram 9. Design of Adders, Multipliers and memories etc

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	10.Making sense of the ASICs 11.Getting the idea of design approach
ECE-S405	**Course Outcomes:** 1. Recognize and classify the structures of Optical fiber and types. 2. Transmission Characteristics of fiber like attenuation and dispersion. Analyze various coupling losses. 3. Manufacturing techniques of fiber/cable. 4. Principle and operation of the optical sources and detectors such as LASER, LED & APD. 5. Optical Amplifier: The basic concepts of optical networks, Describe about the SONET/SDH, WDM. 6. Familiar with Design considerations of fiber optic systems, OTDR.Non communicational applications of optical fiber 7. To perform characteristics of optical fiber, sources and detectors, design as well as conduct experiments in software and hardware, analyze the results to provide valid conclusions
ECE 404	Outcome: After successful completion of the course, the students are able to demonstrate knowledge on: cellular concepts like frequency reuse, fading, equalization, GSM ,CDMA and can apply the concept to calculate link budget using path loss model They can analyse different multiple access techniques in mobile communication with equalization and different diversity techniques and can apply the concept of GSM in real time applications..
ECE-S403	**Course Outcomes:** Upon successful completion of this course the students will have developed following skills/abilities: 1. Interpret, represent and process discrete/digital signals and sytems 2. Thorough understanding of frequency domain analysis of discrete time signals. 3. Ability to design & analyze DSP systems like FIR and IIR Filter etc. 4. Practical implementation issues such as computational complexity, hardware resource limitations as well as cost of DSP systems or DSP Processors. 5. Understanding of spectral analysis of the signals
ECE 402	*Outcome:* Upon successful completion of this course, the student will be able to understand the basic principles of network design and the concept of data communication within the network environment. They will understand the conflicting issues and resolution techniques in data transmission and the setting up of a network environment with all the necessary data communication components, procedure and techniques that make it functional.
ECE-401	**Course outcomes (CO):** CO1: Apply the knowledge of statistical theory of communication and explain the conventional digital communication system. CO2: Apply the knowledge of signals and system and evaluate the performance of digital communication system in the presence of noise. CO3: Apply the knowledge of digital electronics and describe the error control codes like block code, cyclic code. CO4: Describe and analyze the digital communication system with spread spectrum modulation. CO5: Design optimal detectors in presence of AWGN.

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ECE S309	**Course outcomes (CO):** 1.Explain different parameters of antenna and antenna systems 2. Apply knowledge gained on modeling and performance analysis of various antenna types. 3. Design, synthesize and analyze the types of antennas. 4. Model and Compute the radiation characteristics and other performance parameters. 5. Explain different types of waveguides and their respective modes of propagation. 6. Analyze typical microwave networks using impedance, admittance, transmission and scattering matrix representations. 7. Design microwave matching networks using L section, single and double stub and quarter wave transformer. 8. Explain working of microwave passive circuits such as isolator, circulator, Directional couplers, attenuators etc. 9. Describe and explain working of microwave tubes and solid state devices.
ECE-308	**Course Outcomes:** **CO1**: Apply the knowledge of statistical theory of communication and explain the conventional digital communication system. **CO2:** Amplitude modulation, DBBSC,SSBSC VSBSC, Frequency modulation and demodulations, PAM,PWM ,PPM and digital modulation techniques such as ASK,FSK ,PSK.
ECE-S307	**Course Outcomes:** 1. Infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques. 2. Elucidate and design the linear and non-linear applications of an opamp and special application Ics. 3. Explain and compare the working of multivibrators using special application IC 555 and general purpose opamp. 4. Classify and comprehend the working principle of data converters. 5. Illustrate the function of application specific ICs such as Voltage regulators, PLL and its application in communication
ECE-S306	**Course Outcomes:** 1. Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form. 2. Characterize any system in Laplace domain to illustrate different specification of the system using transfer function concept. 3. Interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis. 4. Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions. 5. Formulate different types of analysis in frequency domain to explain the nature of stability of the system. 6. Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.
ECE-305	**Course outcomes (CO):** **CO1**: Selection of materials for modern engineering applications. Structure and properties of metals, ceramics and polymers starting with fundamental atomic. **CO1**:2- Identify the fabrication methods of integrated circuits, Classify and describe the semiconductor devices for special Applications. **CO3**. Applications and properties of dielectric materials & magnetic materials.

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ECE-S304	**Course Outcomes:** At the end of the course, students will develop ability to define the history of microprocessors, describe the architectures of 8085 and 8086 microprocessors. Draw timing diagram. Write programs using 8085 and 8086. Distinguish between the different modules of operation of microprocessors. Interface peripherals to Microprocessor. Interfacing of memory with Microprocessor. Architecture of Microcontroller &Basic Assembly language programming concept.
ECE-S-303	**Course Outcomes** 1.General concepts of measurement 2. Electrical measurement techniques and classical measuring instruments 3. Modern measurement techniques and instruments 4. Brief concepts of sensors and transducers 5. Electronic measurement systems and related components including signal generators, analysers, data acquisition systems, storage and display devices 6. Applications of the concepts of electrical and electronic measurement systems in special-purpose measurements including magnetic measurements, fibre optic measurements, RF and microwave measurements
ECE-S302	This course trains students for an intermediate level of fluency with signals and systems in both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing (including audio, image and video processing),communication theory, and system theory, control and robotics **Course Outcomes:** 1.Understand mathematical description and representation of continuous and discrete time signals and systems and its classification. 2.Analyze CT and DT systems in Time domain using convolution 3.Represent CT and DT systems in the Frequency domain using Fourier analysis tools like CTFS, CTFT, DTFS and DTFT Plot Fourier transformmagnitude and phase functions.4.Conceptualize the effects of sampling a CT signal.The basic concept of probability, random variables & random signals5.Analyze CT and DT systems using Laplace transforms and Z Transforms.
ECE S 301	**Outcomes:** 1. To explain the theoretical principles essential for understanding the operation of electronic circuits, 2. measure the characteristics of electronic circuits and present experimental results 3. analyze electrical circuits and calculate the main parameters, 4. develop, design and create simple analogue and digital electronic circuits, 5. choose an engineering approach to solving problems, starting from the acquired knowledge essential for the design of electronic circuits
ECE-S-205	**Course Outcomes** 1. To differentiate different types of coordinate systems and use them for solving the problems of electromagnetic field theory. 2. To describe static electric and magnetic fields, their behavior in different media, associated laws, boundary conditions and electromagnetic potentials. 3. To use integral and point form of Maxwell`s equations for solving the problems of electromagnetic field theory.

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	4. To describe time varying fields, propagation of electromagnetic waves in different media, pyonting theorem, their sources & effects and to apply the theory of electromagnetic waves in practical problems. 5. To apply concepts of Wave reflection and refraction, Smith Chart in practical Field.
ECE S204	**Course outcomes (CO):** 1. Understand the working principles of Transformer and Induction Motor. 2. Calculate the Performance of both transformer and induction motor. 3. Identify different speed controlling techniques of Induction motor for the given application. 4. Identify suitable transformer depending on the application of transmission and distribution. 5. Calculate the load sharing of different transformers in the power engineering.
ECE-S203	**Course outcomes (CO):** At the end of the course the student should be able to examine the structure of number systems and perform the conversion among different number systems. To understand the Digital Logic Family. Illustrate reduction of logical expressions using boolean algebra, k-map and implement the functions using logic gates. Realize combinational circuits for given application. Design and analyses synchronous and asynchronous sequential circuits using flip-flops. To analyse different types of multivibrators and to study static and dynamic RAMs, ROM, EPROM, and EEPROM. Implement combinational logic circuits using programmable logic devices.
ECE-S202	**Course outcomes (CO):** 1. Understand the concept of graph theory using different analysis methods 2. Apply different network functions for the analysis of electrical networks 3. Understand the concept of two port networks 4. Understand the properties of network functions **5.** Explain about the fundamental and types of filter
ECE-S201	**Course outcomes** 1. Describe the properties of materials and Application of semiconductor electronics 2. Apply the knowledge of semiconductors to illustrate the functioning of basic electronic devices. 3. Classify and describe the semiconductor devices for special Applications 4. Understand major properties of semiconductor materials, explain energy band diagrams and connections with the device structures and properties; 5. Understand and utilize the basic governing equations to analyze semiconductor devices; design semiconductor devices and calculate device characteristics; 6. Quantitatively evaluate limitations in design of circuits based on specific semiconductor devices; 7. Understand and outline major steps of semiconductor device fabrication.
ESC-S101	**Course Outcome:** 1. Predict the behaviour of any electrical and magnetic circuits. 2. Formulate and solve complex AC, Dc circuits.

	3. Realize the requirement of transformers in transmission and distribution of electric power and other applications. 4. To give knowledge of some basic electronic components and circuits. 5. To introduce basics of diode and transistor circuits 6. To understand working of some I C based circuits 7. To study logic gates and their usage in digital circuit s. 8. The associated Laboratory Practical course is designed to understand working of various Electronic circuits. The students will u understand how to u se the basic test and measuring instruments to test the circuits.

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	M.Sc. Electronics
ELC-102	**Course Outcome:** 1. Understand mathematical description and representation of continuous and discrete time signals and systems. 2. Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system. 3. Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms. 4. Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain. 5. Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event. 6. Understand the problems of probability and able to solve them. Also come to know the problems of measures of central tendency. 7. Learn about Newton-Cote's quadrature formula, Trapezoidal rule, Simpson's rules, Weddle's rule. 8. Understand the problems of Numerical methods for Solution of Ordinary Differential Equation-
ELC103	**Course outcomes:** 1. To describe the advantages of a high level language like C/C++, the programming process, and the compilation process. 2.To describe and use software tools in the programming process. 3.To apply good programming principles to the design and implementation of C/C++ programs 4.To design, implement, debug and test programs using the fundamental elements of C/C++. 5.To demonstrate an understanding of primitive data types, values, operators and expressions in C/C++,use of numeric arrays, pointers
ELC 104	**Course Outcome:** On successful completion of the course, the students will be able to 1. Describe the properties of materials and Application of semiconductor electronics 2. Apply the knowledge of semiconductors to illustrate the functioning of basic electronic devices. 3. Demonstrate the switching and amplification Application of the semiconductor devices.

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	4. Demonstrate the control Applications using semiconductor devices. 5. Classify and describe the semiconductor devices for special Applications and power electronics devices.
ELC201	**Course outcomes (CO):** 1. The System Function 2. Characterization and Discussion of Responses in Networks 3. Properties of Input Impedance 4. Synthesis or LC or RC input impedances 5. Transfer Function Synthesis 6. Second Order Systems A. Low Pass B. High Pass C. Band Pass D. Band Stop E. All Pass 7. RC Oscillators 8. Magnitude and Phase Functions 9. Approximations A. Butterworth B. Chebyshev C. Linear Phase D. Phase Equalization
ELC-202	**Course outcomes:** 1) Explain about Electromagnetic Plane wave, smith chart and different types of theorem. 2) Differents types of transmission line 3) Different types of waveguides and their respective modes of propagation. 4) Understand about working of microwave passive circuits 5) Understand about working of microwave tubes and solid state devices and their applications. 6) Understand about the operation of RADAR systems and recite their applications.
ELC203	**Course Outcome:** On successful completion of the course, the students will be able to 1. Students will demonstrate the use of analog circuit analysis techniques to analyze the operation and behaviour of various amplifers circuits. 2. Students will demonstrate their knowledge by designing analog and op-amp circuits.
ELC204	**Course outcomes:** **Expected Course Outcomes Upon completion of this course, the students will be able to:** 1. Have a thorough understanding of the fundamental concepts and techniques used in

	digital electronics. 2. To understand and examine the structure of various number systems and its application in digital design. 3. The ability to understand, analyze and design various combinational and sequential circuits. 4. Ability to identify basic requirements for a design application and propose a cost effective solution. 5. The ability to identify and prevent various hazards and timing problems in a digital design. 6. To develop skill to build, and troubleshoot digital circuits.
ELC301	**Course outcomes :** 1.A thorough knowledge on open loop and closed loop control systems, concept of feedback in control systems. 2. Understanding of transfer function representation through block diagram algebra and signal flow graphs. 3.Time response analysis of different order systems through their characteristic equation. 4. Time domain specifications, stability analysis of control systems in s-domain through-H criteria. 5. Root locus techniques, frequency response analysis through Bode diagrams and Polar plots.
ELC302	**Course outcomes :** .Understand the fabrication process of IC technology · Analysis of the operation of MOS transistor · Analysis of the physical design process of VLSI design flow · Analysis of the design rules and layout diagram · Design of Adders, Multipliers and memories etc · Making sense of the ASICs · Getting the idea of design approach
ELC-303	**Course Outcome:** On completion of the course, student will be able to understand working of waveform coding techniques and analyse the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency. They can perform the time and frequency domain analysis of the signals in a analog & digital communication system. They can design analog & digital communication system

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ELC304	**Course Outcome:** After completing the course, the students should be able: 1.General concepts of measurement 2. Electrical measurement techniques and classical measuring instruments 3. Modern measurement techniques and instruments 4. Brief concepts of sensors and transducers 5. Electronic measurement systems and related components including signal generators, analysers, data acquisition systems, storage and display devices 6. Applications of the concepts of electrical and electronic
ELC401	**Course Outcome:** Several radical wireless technologies have been developed in the last 10 years to enable broadband wireless access with rates in excess of 100 Mbps. These have subsequently led to the development of 3G and 4G wireless technologies such as HSDPA (High Speed Downlink Packet Access), LTE (Long Term Evolution) and Wi MAX (Worldwide Interoperability for Microwave Access). This has been made possible through breakthrough wireless technologies such as Code Division for Multiple Access (CDMA), Multiple Input Multiple Output (MIMO). These techniques form the basis of understanding the world of 3G/4G wireless communication systems. After the completion of this course student can analyse and present an elaborate method to the principles and performances of fundamental 3G/ 4G wireless technologies.
ELC402	**Course Outcomes:** At the end of the course, a student will be able to: 1. Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's and Microcontroller's internal architecture and its operation within the area of manufacturing and performance. 2. Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller. 3. Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) and Microcontroller to meet specified performance requirements. 4. Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor and microcontroller.

	5. Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices. 6. Evaluate assembly language programs and download the machine code that will provide solutions real-world control problems.
ELC403	**Course Outcomes:** 1.Recognize and classify the structures of Optical fiber and types. 2.Transmission Characteristics of fiber like attenuation and dispersion. Analyze various coupling losses. 3.Manufacturing techniques of fiber/cable. 4. Principle and operation of the optical sources and detectors such as LASER, LED & APD. 5.Optical Amplifier The basic concepts of optical networks, Describe about the SONET/SDH, WDM. 6. Familiar with Design considerations of fiber optic systems, OTDR. Non communicational applications of optical fiber
ELC404	**Course Outcome:** 1. Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices. 2. Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits 3. Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields. 4. Formulate and analyze a power electronic design at the system level and assess the performance. 5. Identify the critical areas in application levels and derive typical alternative solutions, select suitable power converters to control Electrical Motors and other industry grade apparatus. 6. Recognize the role power electronics play in the improvement of energy usage efficiency and the applications of power electronics in emerging areas
	Integrated M.sc Electronics

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EIC 104	**Course outcomes :** 1. Recall basic concepts of Electrical Engineering 2. Illustrate basics of AC circuits 3. Explain operative principle of transformer with background of magnetic circuits 4. Classify and compare different types of Electrical machines 5. Classify different electrical measuring equipment's and understanding their principles
1-EIC-105	**Course outcomes:** 1.To describe the advantages of a high level language like C/C++, the programming process, and the compilation process. 2.To describe and use software tools in the programming process. 3.To apply good programming principles to the design and implementation of C/C++ programs 4.To design, implement, debug and test programs using the fundamental elements of C/C++. 5.To demonstrate an understanding of primitive data types, values, operators and expressions in C/C++,use of numeric arrays, pointers
EIC-203	**Course outcomes:** CO1: To study basics of semiconductor & devices and their applications in different areas. CO2: To study different biasing techniques to operate transistor, FET, MOSFET and operational amplifier in different modes. CO3: Analyze output in different operating modes of different semiconductor devices. CO4: Compare design issues, advantages, disadvantages and limitations of basic electronics.
EIC-204	**Course outcomes:** 1. The System Function 2. Characterization and Discussion of Responses in Networks 3. Properties of Input Impedance 4. Synthesis or LC or RC input impedances 5. Transfer Function Synthesis 6. Second Order Systems A. Low Pass B. High Pass C. Band Pass D. Band Stop E. All Pass 7. RC Oscillators 8. Magnitude and Phase Functions 9. Approximations A. Butterworth B. Chebyshev C. Linear Phase D. Phase Equalization

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EIC-205	**Course outcomes:** 1. To differentiate different types of coordinate systems and use them for solving the problems of electromagnetic field theory. 2. To describe static electric and magnetic fields, their behaviour in different media, associated laws, boundary conditions and electromagnetic potentials. 3. To use integral and point form of Maxwell`s equations for solving the problems of electromagnetic field theory. 4. To describe time varying fields, propagation of electromagnetic waves in different media, pyonting theorem, their sources & effects and to apply the theory of electromagnetic waves in practical problems. 5. To apply concepts of Wave reflection and refraction, Smith Chart in practical Field.