



Department of Electronics and Communication Engineering

DELHI TECHNOLOGICAL UNIVERSITY

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ELECTRO MAGNETICS (EE262)

COURSE OUTCOMES

EE262.1	Ability to apply knowledge of mathematics, science, and engineering to the analysis and Comprehend basic principles of Vector Analysis such as Coordinate Systems and transformations, divergence, gradient and curl operators.
EE262.2	Analyze and apply laws and methods to solve problems in electro-statics and magneto-statics.
EE262.3	Apply Maxwell's equations to solve problems in electromagnetics.
EE262.4	Elucidate, formulate and analyze electromagnetic wave propagation in various kinds of media.
EE262.5	Calculate parameters/metrics in problems involving transmission lines and waveguides.



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EDC-1 LABORATORY

ANALOG ELECTRONICS II (EC202)

COURSE OUTCOMES

EC202.1	Identify the high frequency limitations of BJTs and JFETs/MOSFETs and determine frequency response of single and multistage amplifiers.
EC202.2	Explain the concept of and analyze the performance of negative feedback circuits
EC202.3	Describe the concept of positive feedback and criterion for oscillations, analyse and design different BJT based oscillators
EC202.4	Differentiate between the voltage, current and power amplifier and design the power amplifiers for required applications.
EC202.5	Describe the fabrication process of devices.
EC202.6	Design, construct and take measurement of various analog circuits and compare experimental results in the laboratory with theoretical analysis.



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DIGITAL ELECTRONICS LABORATORY

DIGITAL DESIGN II (EC204)

COURSE OUTCOMES

EC204.1	Design the combinational and sequential digital circuits using VHDL/Verilog
EC204.2	Implement state tables and circuits using Finite State Machine
EC204.3	Illustrate state minimization and hazards for Synchronous and asynchronous sequential machines
EC204.4	Simplify races and faults for asynchronous sequential machines
EC204.5	Design the Programmable Logic Devices and realization of algorithmic state machines.



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TELECOMMUNICATION LAB

COMMUNICATION SYSTEMS (EC206)

COURSE OUTCOMES

EC206.1	Comprehend introductory principles of communication systems such as types of signals and the process of modulation
EC206.2	Elucidate the process of amplitude, frequency and phase modulation and describe the design of their transmitters, and receivers
EC206.3	Apply sampling theory and analyze pulse code modulation and delta modulation
EC206.4	Apply the knowledge of random variables and processes to study noise in communication systems
EC206.5	Compare the noise performance and design tradeoffs of various modulation schemes



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MICROPROCESSOR LAB

COMPUTER ARCHITECTURE (EC208)

COURSE OUTCOMES

EC208.1	Identify the organization and structure of digital computer including differentiation of hardwired and microprogrammed control units.
EC208.2	Develop computer arithmetic algorithms and their hardware implementation.
EC208.3	Organize and interface different types of memories and input output devices.
EC208.4	Evaluate the system performance using pipelining and parallel processing.
EC208.5	Design a basic computer system.



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VLSI CAD LABORATORY

VLSI DESIGN (EC302)

COURSE OUTCOMES

EC302.1	Describe the technology, design concepts, electrical properties and modelling of MOS device
EC302.2	Predict the impact of scaling on MOS device.
EC302.3	Analyze static and timing parameters of inverters and design inverters as per specification
EC302.4	Design static combinational logic circuits using CMOS, Transmission gates and complementary pass transistor logic
EC302.5	Apply dynamic circuit techniques to combinational circuit design
EC302.6	Design and analyze Static and Dynamic Sequential logic circuit and evaluate timing parameters
EC302.7	Understand VLSI design methodologies and implementation methods
EC302.8	Compare experimental results in the laboratory with theoretical analysis



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ADSP LABORATORY

DIGITAL SIGNAL PROCESSING (EC304)

COURSE OUTCOMES

EC304.1	Comprehend the basics of a DSP systemsuchasdigitalsignalprocessing and analog to digital conversion
EC304.2	Implementation of Z-transform, DFT, FFT and implementation of various algorithm
EC304.3	Design, analyse and implement FIR and IIR systems in their direct, cascade and lattice forms
EC304.4	Design FIR and IIR Filters using windows, sampling methods, impulse invariance method and other standard method
EC304.5	Understand the basics of multirate digital signal processing and develop its applications, Understanding of the concept of finite word length effect in



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MICROPROCESSOR LAB

EMBEDDED SYSTEMS (EC306)

COURSE OUTCOMES

EC306.1	Comprehend basic principles of a microcontroller and identify its need.
EC306.2	Identify basic architecture of a 8-bit, 16-bit and 32 bit Microcontroller and demonstrate programming skills using PIC and ARM microcontroller.
EC306.3	Describe the internal architecture and interfacing of different peripheral devices with Microcontrollers.
EC306.4	Illustrate the need and working principles of Digital Signal Processors and their variants
EC306.5	Discuss memory organization of ARM Microcontroller and its variants', RT-Linux introduction, RTOS kernel and Real-Time Scheduling Bus structure



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TESTING AND DIAGNOSIS OF DIGITAL SYSTEM DESIGN (EC310)

COURSE OUTCOMES

EC310.1	List the testing techniques for digital circuits
EC310.2	Examine a digital circuit for various types of faults
EC310.3	Differentiate between testing and diagnosis of faults
EC310.4	Design a self-testing circuit
EC310.5	Determine the efficacy of a given testing algorithm, Detect the faults in synchronous circuits.



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WIRELESS SENSOR NETWORKS (EC316)

COURSE OUTCOMES

EC316.1	Explain the Fundamental Concepts and applications of ad hoc and wireless sensor networks.
EC316.2	Evaluate the performance of schedule based and random Medium Access Control protocols for power consumption, fairness, channel utilization and control packet overhead.
EC316.3	Evaluate the performance of transport control protocols for congestion detection and avoidance, reliability and control packet overhead parameters.
EC316.4	Discuss the WSN routing issues by considering QoS measurements.
EC316.5	Analyze the various applications of sensor networks and deploy security mechanisms.



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WIRELESS COMMUNICATION (EC404)

COURSE OUTCOMES

EC404.1	Acquire knowledge about basics of Wireless Communication
EC404.2	Acquire knowledge about Cellular Mobile System Architecture, Fundamentals & associated concepts
EC404.3	Acquire knowledge about Evolution of different Cellular Systems.
EC404.4	Acquire knowledge about signal propagation & related issues
EC404.5	Acquire knowledge of various new wireless technologies



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RADAR AND SATELLITE (EC438)

COURSE OUTCOMES

EC438.1	Introduction to radar, its frequencies & bands
EC438.2	Understand principle of operation of CW FM Radar
EC438.3	Explain VSAT, GPS, Multiple Access Techniques
EC438.4	Compare & contrast communication satellites
EC438.5	Design satellite link and analyze the same



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ROBOTICS AND MACHINE VISION (EC422)

COURSE OUTCOMES

EC422.1	To describe the mathematical modelling of robotics and understand concept of homogenous transformation.
EC422.2	To evaluate forward kinematic models and understand kinematic constraints and mobile robot maneuverability and motion control.
EC422.3	To categorize the classification of sensors and evaluate various performance characteristics of sensor and understand the issues with sensor noise.
EC422.4	To analyze the feature extraction and object recognition methods and algorithms for the tracking of objects
EC422.5	To describe the localization requirement for mobile robot and their challenges and path planning and navigation.



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MACHINE LEARNING (EC412)

COURSE OUTCOMES

EC412.1	Describe the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc
EC412.2	Explain the underlying mathematical relationships within and across Machine Learning algorithms.
EC412.3	Compare and contrast different paradigms for learning (supervised, unsupervised, etc.).
EC412.4	Evaluate the models and optimize the models learned.
EC412.5	Design and implement the appropriate machine learning techniques for different real-world problems.



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SPEECH RECOGNITION (EC328)

COURSE OUTCOMES

EC328.1	Illustrate how the speech production is modelled.
EC328.2	Signal digitization and basic signal processing in time and frequency domains.
EC328.3	Summarize the various techniques involved in collecting the features from the speech signal in both time and frequency domain.
EC328.4	Compare the various techniques involved in speech and speaker detection.
EC328.5	Statistical framework used for automatic speech recognition



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INFORMATION THEORY AND CODING (EC322)

COURSE OUTCOMES

EC322.1	Understand and apply fundamental concepts in information theory such as probability, entropy, information content and their inter-relationships.
EC322.2	Compute information theoretic quantities, construct bounds and implement algorithms for source coding and noisy channel theorems
EC322.3	Apply linear block codes for error detection and correction
EC322.4	Understand Binary Cyclic Codes, encoding with $(n-k)$ -Stage Shift Register and Syndrome Calculations and Error Detection
EC322.5	Apply convolution codes for performance analysis for error detection and correction



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PATTERN RECOGNITION (EC416)

COURSE OUTCOMES

EC416.1	Understand fundamental concepts of Pattern classification, structural pattern recognition, and pattern classifier combination techniques.
EC416.2	Summarize, assess, and relate research in the domain of pattern recognition in verbal and written form.
EC416.3	Apply pattern recognition performance evaluation methodologies and evaluate comparisons of techniques in the academic literature.
EC416.4	Use pattern recognition techniques to solve real-world challenges like document recognition and analysis.
EC416.5	Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.



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ADVANCE COMPUTER ARCHITECTURE (EC430)

COURSE OUTCOMES

EC430.1	Describe the basic architectures like RISC and CISC
EC430.2	Explain Pipelined and Multiprocessors systems architecture
EC430.3	Understand and analyse the memory systems and their implementations
EC430.4	Designing different peripheral devices
EC430.5	Manage interfacing issues related to I/O devices for driving advanced hardware.
EC430.6	Investigate architectural updates



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EDC-1 LABORATORY

ANALOG ELECTRONICS (EC201)

COURSE OUTCOMES

EC201.1	Explain the principles of operation of semiconductor devices such as diode, BJT, JFET and MOSFET;
EC201.2	Determine parameter values for large and small signal models for diodes, BJTs and MOSFETs based on knowledge of the device structure, dimensions, and bias conditions.
EC201.3	Determine, compare, and contrast the performance parameters of single stage amplifier circuits using BJTs and MOSFETs.
EC201.4	Differentiate between single stage and multistage amplifiers, analysis and determine performance parameters of multistage amplifiers.
EC201.5	Analyze and design analog electronic circuits using discrete components.
EC201.6	Design, construct and take measurement of various analog circuits and compare experimental results in the laboratory with theoretical analysis.



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DIGITAL ELECTRONICS LABORATORY

DIGITAL DESIGN-I (EC203)

COURSE OUTCOMES

EC203.1	Acquired knowledge to determine the philosophy of number systems, codes and logic families.
EC203.2	Simplify logic expression using Boolean law, Skills to minimize logic expression using k-map and tabular method.
EC203.3	Design of various combinational and sequential logic circuits for arithmetic and logical operation
EC203.4	Application and design of shift register and memories
EC203.5	To know about design of timing circuits and their applications



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ADSP LABORATORY

SIGNALS AND SYSTEMS (EC205)

COURSE OUTCOMES

EC205.1	Describe signals and systems mathematically in time domain and transform domains, and demonstrate the mathematical modelling of signals and systems in
EC205.2	Classify signals, systems and filters based on their properties and determine the response of a LTI system using impulse response and convolution
EC205.3	Apply various transform techniques for the analysis and design of complex continuous time and discrete time signals and LTI systems
EC205.4	Appraise sampling theorem, reconstruction of a signal from its discrete samples
EC205.5	Analyze LTI systems using power/energy spectral density



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ENGINEERING ANALYSIS AND DESIGN (EC207)

COURSE OUTCOMES

EC207.1	Acquire knowledge about basic concepts of circuit analysis
EC207.2	Understand various type of responses for different type of excitations for RC, RL and RLC circuits
EC207.3	Skill to solve circuits with node, mesh analysis
EC207.4	Ability to find two port network parameters and composite network parameters
EC207.5	Ability to synthesize one port passive network (LC, RC&RL)



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EDC-1 LABORATORY

ELECTRONIC INSTRUMENTATION & MEASUREMENTS (EE251)

COURSE OUTCOMES

EE251.1	To understand and analyze dc and ac bridges
EE251.2	Explain different types of voltmeters & ammeters
EE251.3	Compare and contrast different types of sensors
EE251.4	Understand principle of operation of CRO, function generator, etc
EE251.5	Analyze IEEE-488 GPIB.



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TELECOMMUNICATION LAB

DIGITAL COMMUNICATION (EC301)

COURSE OUTCOMES

EC301.1	Acquired knowledge about of basic analog and digital communication.
EC301.2	Acquired knowledge about, quantization and coding
EC301.3	Acquired knowledge about different Mary modulation techniques
EC301.4	Acquired knowledge about of Inter Symbol Interference (ISI).
EC301.5	Acquired knowledge different estimation methods



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LINEAR INTEGRATED CIRCUITS LABORATORY

Linear Integrated Circuits

COURSE OUTCOMES

EC303.1	Infer the DC and AC characteristics of operational amplifiers and its effect on output and their frequency response.
EC303.2	Analyze and design the linear and non-linear applications of an opamp and special application ICs.
EC303.3	Describe and compare the working of multivibrators using IC 555 and general purpose opamp.
EC303.4	Design and use of the Operational Transconductance Amplifier as a basic building block.
EC303.5	Determine the function of application specific ICs such as Voltage regulators, PLL and its application in communication.



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MICROPROCESSOR AND INTERFACING (EC313)

COURSE OUTCOMES

EC313.1	Describe the basics of microprocessors and comprehend their need
EC313.2	Identify the basic architecture of different microprocessors
EC313.3	Demonstrate programming skills using the 8085 microprocessor and the 8086 microprocessor language
EC313.4	Describe the internal architecture and comprehend the interfacing of different peripheral devices with 8085 and 8086 Microprocessor
EC313.5	Describe briefly the functioning of 80188, 286, 386, 486 and Pentium processors



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CONTROL SYSTEM (EC323)

COURSE OUTCOMES

EC323.1	Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form.
EC323.2	Analyze the response of the closed and open loop systems.
EC323.3	Analyze the stability of the closed and open loop systems.
EC323.4	Formulate different types of analysis in frequency domain to explain the nature of stability of the system.
EC323.5	Develop and analyze state space models.



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COMPUTER COMMUNICATION NETWORK (EC315)

COURSE OUTCOMES

EC315.1	Define computer networks and layered architecture
EC315.2	Classify different protocols associated with each layer of OSI/TCP-IP model
EC315.3	Apply real time medium access protocols, their collision and IEEE standards,
EC315.4	Distinguish different routing and congestion control algorithms for network layer
EC315.5	Compare error and flow control mechanism between DLL and Transport layers



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ANALOG CIRCUITS DESIGN LAYOUT (EC361)

COURSE OUTCOMES

EC361.1	Describe the MOS basics and analyze the small signal and SPICE model of MOSFET.
EC361.2	Draw the layout of MOS devices, resistors and capacitors and perform physical verification.
EC361.3	Explain and differentiate different current mirror.
EC361.4	Design and discuss various single stage amplifiers.
EC361.5	Design and discuss various multi stage amplifiers.



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COMPUTER VISION (EC353)

COURSE OUTCOMES

EC353.1	Learn the fundamentals of modern computer vision theory, as well as the problems and current solutions.
EC353.2	Implement and test several basic computer vision techniques, such as picture filtering, restoration, segmentation, and calibration.
EC353.3	Analyze and assess the development and integration of computer vision algorithms and systems critically.
EC353.4	Through a team research project, project report, and presentation, design and demonstrate a working computer vision system.
EC353.5	Continue to critically review and assess scientific literature and apply the knowledge and skills gained from the course in developing innovative applications



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ADSP LABORATORY

DIGITAL IMAGE PROCESSING (EC357)

COURSE OUTCOMES

EC357.1	Define 2-D signals and systems, image acquisition, sampling, quantization, 2D signals and systems, image transforms,, basics of color image processing
EC357.2	Explain the mathematical tools used for digital manipulation of images.
EC357.3	Employ pre-processing, enhancement, filtering and noise removal technique.
EC357.4	Distinguish spatial domain and frequency domain filtering, enhancement and restoration.
EC357.5	Evaluate and defend various application specific techniques for enhancement, denoising, morphology, segmentation and compression
EC357.6	Identify, formulate a wide range of real-world problems and design and develop solutions to these problems



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INFORMATION THEORY AND CODING (EC427)

COURSE OUTCOMES

EC427.1	Representation of mathematical models for each block of communication systems and analysis of channel
EC427.2	Describing various parameters if information theory and channel theorems and their limitations
EC427.3	To study the linear block codes for error control.
EC427.4	To study the basic structure and properties of cyclic codes
EC427.5	Study of multiple error correcting codes



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MICROWAVE AND OPTICAL COMMUNICATION LABORATORY

MICROWAVE ENGINEERING (EC405)

COURSE OUTCOMES

EC405.1	To define and explain the microwave sub bands, various parameters and its applications
EC405.2	To describe the various components of microwave and their practical applications
EC405.3	To describe various microwave tubes, state of art performance figures, relative advantages and applications of competing devices
EC405.4	To describe various semiconductor microwave devices, their state of the art performance figures and comparison from practical point of view
EC405.5	Qualitative and quantitative analysis of various microwave components.



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MICROWAVE AND OPTICAL COMMUNICATION LABORATORY

OPTICAL COMMUNICATION (EC407)

COURSE OUTCOMES

EC407.1	Describe the vector nature of light, and its propagation mechanism inside an optical fiber (ray and mode theory)
EC407.2	Apply mode theory to differentiate between the different kind of optical fibers based on their light transmission and dispersion characteristics
EC407.3	Illustrate the working principles of optical sources (LEDs and LASERS), and photo-detectors
EC407.4	Evaluate the performance of different types of optical switches and optical amplifiers
EC407.5	Design an optical communication system and evaluate its power and time budget



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INTERNET AND WEB TECHNOLOGIES (EC423)

COURSE OUTCOMES

EC423.1	Interpret user ids, passwords, message components and mailer features. Also originate mailing lists and chat rooms
EC423.2	Explain internet congestion, modes of connecting to internet and utilize DNS, IP.v6, internet tools
EC423.3	Describe world wide web, search strategies and working of search engines
EC423.4	HTML and hyperlinks using fornt page express and plugins
EC423.5	Extend, illustrate advanced HTML, PWS, IIS, Apache to design and modify web servers



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VLSI CAD LABORATORY

VLSI DESIGN (EC359)

COURSE OUTCOMES

EC359.1	Describe the technology, design concepts, electrical properties and modelling of MOS device
EC359.2	Predict the impact of scaling on MOS device.
EC359.3	Analyze static and timing parameters of inverters and design inverters as per specification
EC359.4	Design static combinational logic circuits using CMOS, Transmission gates and complementary pass transistor logic
EC359.5	Apply dynamic circuit techniques to combinational circuit design
EC359.6	Design and analyze Static and Dynamic Sequential logic circuit and evaluate timing parameters
EC359.7	Understand VLSI design methodologies and implementation methods
EC359.8	Compare experimental results in the laboratory with theoretical analysis



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BIOMEDICAL SIGNAL AND IMAGE PROCESSING (EC411)

COURSE OUTCOMES

EC411.1	Understand basic of different types of Biomedical signals and images like ECG, EEG and MRI and types of dependent and independent noises and artifacts in Biomedical signals
EC411.2	Understand parametric models for the Analysis of of biomedical signals, Open-Loop Identification, Closed-Loop Identification
EC411.3	Study latest ECG and EEG denoising methods/Techniques
EC411.4	Understand concepts of biomedical image segmentation, feature reduction and classification
EC411.5	Compare performance of different techniques/methods of biomedical image segmentation, feature reduction and classification