DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION

	COURSE OUTCOMES AND PROGRAM OUTCOMES (120)

CAY- (Even semester, 2023-24)

Course Name:	**Maths IV**		
Course Code	**ECC401**		
Faculty Name:	**Dr. Revathy Sundarajan**		
Year	2	**Sem**	IV

CO Number	Course Outcome
ECC401.1	Students will be able to (i) Obtain Eigen values and Eigen vectors for a given square matrix (ii) Define Metric spaces (iii) Define Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient
ECC401.2	Students will be able to (i) Infer properties of Eigen values and Eigen vectors (ii) Show if a given set is a vector space or not (iii) Interpret if a given distance / set is a metric / metric space (iv) Calculate conditional Probabilities using Bayes' theorem (v) Obtain pdf and cdf of discrete and continuous random variables (including special discrete – Binomial and Poisson and special continuous – normal) (vi) Calculate various probabilities of random variables following Binomial Poisson and Normal distributions (vii) Karl-Pearson's Coefficient of Correlation and Spearman's Rank Correlation and regression lines
ECC401.3	Students will be able to (i) Construct diagonal matrices using the concept of similarity (ii) Build functions of square matrices (iii) Obtain normal and orthogonal forms of Quadratic forms (iv) Obtain extremals of a given integral using the theory of Calculus of variations (v) Evaluate integrals using the different Cauchy's theorems (Integral theorem, Residue theorem) (vi) Obtain Taylor's and Laurent's series (vii) Identify orthogonal vectors and obtain orthonormal basis using Gram-Schmidt process (viii) Use Bayes' theorem to obtain conditional probabilities (x) Obtain MGF and hence obtain the mean and variance (up to first 4 moments) of a random variableObtain probabilities using correct interpretation of Binomial distribution, Poisson and normal approximations to binomial distribution and also Binomial approximation to normal distribution
ECC401.4	Students will be able to (i) Obtain extremals of a given integral under some constraints using the theory of Calculus of variations (Isoperimetric problems) (ii) Obtain probabilities and z-values for normal distributions

Course Name:	**Micro controller**		
Course Code	**ECC-402**		
Faculty Name:	**Prof Hemlata Mote**		
Year	2	**Sem**	IV

CO Number	Course Outcome
ECC402.01	Student will know basic features, architecture and pin configuration of 8051 and ARM7 microcontroller.
ECC402.02	Student will be able to demonstrate understanding of memory organization, Instruction set, addressing modes, I/O ports, counter/ timer, Interrupts, UART of 8051 and ARM7 microcontroller.
ECC402.03	Student will be able to apply knowledge of instruction set to write assembly language program for given logic.
ECC402.04	Student will be able to interface and program peripheral devices LED, LCD, and seven segment displays, Keyboard, ADC and DAC (0808/09), Stepper motor and relay, IR sensor with 8051 and ARM7 microcontroller.
ECC402.05	Students will analyse input/output interface and demonstrate knowledge via simulation.
ECC402.06	Student will be able to design microcontroller based system for various application

Course Name:	**Linear integrated Circuits**		
Course Code	**ECC403**		
Faculty Name:	**Prof Pratibha Dumane**		
Year	**2**	**Sem**	**IV**

CO Number	Course Outcome
ECC403.1	The student will be able to understand the fundamentals and areas of applications for the linear integrated circuits.
ECC403.2	The students will be able to identify the concepts to a particular circuit to build a given application in linear integrated circuits
ECC403.3	The student will be able to analyze important types of linear integrated circuits of day-to-day requirements.
ECC403.4	The student will be able to evaluate various parameters for any given linear integrated circuits
ECC403.5	The students will be able to apply the concepts to a particular circuit to build a given application in linear integrated circuits
ECC403.6	The students will be able to design a circuit for any particular applications in the area of linear integrated circuit.

Course Name:	**Signals and Systems**		
Course Code	**ECC404**		
Faculty Name:	**Prof Joshua Michale**		
Year	**2**	**Sem**	**IV**

CO Number	Course Outcome
ECC404.1	Students will be able to learn the mathematical description and representation of continuous and discrete time signals and systems.
ECC404.2	Students will be able to interpret & classify signals & systems based on their different properties.
ECC404.3	Students will be able to apply appropriate transforms on continuous-time and discrete-time signals to determine the response of LTI system.
ECC404.4	Students will be able to analyse the continuous-time and discrete time signals and system.
ECC404.5	Students will be able to evaluate the different signal processing algorithms to be used for various applications.
ECC404.6	Students will be able to realize and design recursive and non recursive systems.

Course Name:	Principles of Communication Engineering		
Course Code	ECC405		
Faculty Name:	Mrs. Namita Agarwal		
Year	2	Sem	IV

CO Number	Course Outcome
ECC405.1	The students will be able to describe the basic components, types of noise and principles of multiplexing techniques in a communication system.
ECC405.2	The students will be able to discuss the different types of modulation and demodulation techniques for analog communication.
ECC405.3	The students will be able to apply their knowledge in obtaining the different performance parameters of a communication system.
ECC405.4	The students will be able to analyze and compare Amplitude and Frequency Modulation/Demodulation and multiplexing systems.
ECC405.5	The students will be able to evaluate the performance of a communication system.
ECC405.6	The students will be able to justify the use of particular analog communication, pulse modulation and multiplexing technique.

Course Name:	MC LAB		
Course Code	ECL401		
Faculty Name:	Prof Hemlata Mote		
Year	2	Sem	IV

CO Number	Course Outcome
ECL401.1	Student will know basic features, architecture and pin configuration of 8051 and ARM7 microcontroller.
ECL401.2	Student will be able to demonstrate understanding of memory organization, Instruction set, addressing modes, I/O ports, counter/ timer, Interrupts, UART of 8051 and ARM7 microcontroller.
ECL401.3	Student will be able to apply knowledge of instruction set to write assembly language program for given logic.
ECL401.4	Student will be able to interface and program peripheral devices LED, LCD, and seven segment displays, Keyboard, ADC and DAC (0808/09), Stepper motor and relay, IR sensor with 8051 and ARM7 microcontroller.
ECL401.5	Students will analyse input/output interface and demonstrate knowledge via simulation.
ECL401.6	Student will be able to design microcontroller based system for various application

Course Name:	LIC LAB		
Course Code	ECL402		
Faculty Name:	Prof. Pratibha Dumane		
Year	2	Sem	IV

CO Number	Course Outcome
ECL402.1	The students will understand the working of various IC , timers and linear integrated circuits
ECL402.2	The students will be able to identify the particular circuit necessary to perform a particular operation
ECL402.3	The students will be able to analyze the working of differerent types of circuits
ECL402.4	The students will be able to evaluate various parameters of the given circuit.
ECL402.5	The students will be able to apply the concepts of the numerous ICs they learn in practical circuits
ECL402.6	The students will be able to design the circuit for a given application

	Principles of Communication Engineering Laboratory		
Course Code	ECL403		
Faculty Name:	Mrs. Namita Agarwal		
Year	2	Sem	IV

CO Number	Course Outcome
ECL403.1	The students will be able to experimentally demonstrate and explain the analog modulation techniques.
ECL403.2	The students will be able to experimentally implement and perform analog and pulse modulation techniques.
ECL403.3	The students will be able to find the different physical parameters of the various modulated signals.
ECL403.4	The students will be able to analyze the waveforms of various types of analog and pulse modulation methods.
ECL403.5	The students will be able to simulate and compare the different modulation techniques
ECL403.6	The students will be able to compute and verify the characteristics of modulation methods.

Course Name:	**Skill Lab: Python Programming**		
Course Code	**ECL404**		
Faculty Name:	**Prof. Joshua Michale**		
Year	2	**Sem**	IV

CO Number	Course Outcome
ECL401.1	Students will be able to Describe syntax and semantics in Python
ECL401.2	Students will be able to Illustrate different file handling operations
ECL401.3	Students will be able to Interpret object oriented programming in Python
ECL401.4	Students will be able to Design GUI Applications in Python
ECL401.5	Students will be able to Express proficiency in the handling Python libraries for data science
ECL401.6	Students will be able to Develop machine learning applications using Python

Course Name:	**Mini Project 1B**		
Course Code	**ECM401**		
Faculty Name:	**Mr. Ankur G, Freda C.**		
Year	2	**Sem**	IV

CO Number	Course Outcome
ECM401.1	Students will be able to Write basic codes for the Arduino board and Raspberry Pi using the IDE for utilizing the onboard resources
ECM401.2	Students will be able to comprehend codes and make changes to them to implement your application
ECM401.3	Students will be able to Apply the knowledge of interfacing different devices to the Arduino board to accomplish a given task.
ECM401.4	Students will be able to analyse results of the project and make necessary advancements in order to implement the end result.
ECM401.5	Students will be able to Design Arduino based projects for a given problem
ECM401.6	Students will be able to Design solutions societal/environmental / medical application

Course Name:	**Electromagnetics and Antenna**		
Course Code	**ECC601**		
Faculty Name:	**Dr. Ashwini Kotrashetti**		
Year	3	**Sem**	VI

CO Number	Course Outcome
ECC601.1	Student will be able to define and explain Maxwell's equations, various antenna parameters , different propagation effects.
ECC601.2	Student will be able to use Maxwell's equations for derivations of various antennas. They will be able to solve problems on antenna fundamentals
ECC601.3	Student will be able to apply concepts to compare various types of antennas based on the requirements /applications. They will be able to evaluate polarisation, impedance matching effects in antennas.
ECC601.4	Student will be able to analyse the radiation pattern, beamwidth, directivity, null directions for antenna array, yagi and log periodic antenna
ECC601.5	Student will be able to evaluate the given specifications to arrive at the appropriate design/circuit considerations of antennas
ECC601.6	Student will be able to suggest an appropriate design method of antenna system for the given specifications

Course Name:	**CCN**		
Course Code	**ECC602**		
Faculty Name:	**Prof. Aparna Telgote**		
Year	3	**Sem**	VI

CO Number	Course Outcome
ECC602.1	Students will be able to define and describe the basic concepts of computer networks
ECC602.2	Students will be able to discuss and explain the services provided, protocols used along with the design issues for each of the layers of computer networks.
ECC602.3	Students will be able to apply various error detection and correction methods along with routing algorithms .
ECC602.4	Students will be able to compare various protocols,multiple access techniques and routing algorithms used in computer networks.
ECC602.5	Students will be able to evaluate the performance of a computer network.
ECC602.6	Students will be able to formulate,design and apply subnet masks and addresses to fulfill networking requirements

Course Name:	Image Processing and Machine Vision (IPMV)		
Course Code	ECC603		
Faculty Name:	Prof. Hemlata Mote		
Year	3	Sem	VI

CO Number	Course Outcome
ECC603.1	Students will be able to know basics of image processing with fundamental processes.
ECC603.2	Students will be able to understand fundamental concepts of formation and sampling of images.
ECC603.3	Students will be able to improve the quality of an image in spatial domain as well as in frequency domain.
ECC603.4	Students will be able to interpret and analyze images in spatial and frequency domain.
ECC603.5	Students will be able to choose appropriate method to reconstruct original image from degraded image.
ECC603.6	Students will be able to design methods for processing images for human interpretation or further processing.

Course Name:	Artificial Neural Network and Fuzzy Logic (ANNFL)		
Course Code	ECC604		
Faculty Name:	Prof. Pratibha Dumane		
Year	3		VI

CO Number	Course Outcome
ECC604.1	Students will be able to define the various terms related to neural networks and also describe the neural network learning rules, their architectures (including Convolutional Neural Networks) and applications, fuzzy logic, fuzzy properties, fuzzy rules and fuzzy reasoning. (Remembering)
ECC604.2	Students will be able to explain the different types of supervised and unsupervised learning neural networks, fuzzification & defuzzification methods, fuzzy inference systems. (Understanding)
ECC604.3	Students will be able to select a particular neural network for specified application and apply fuzzy logic for specific applications. (Applying)
ECC604.4	The students will be able to apply the different algorithms for given specifications of neural networks and analyze their outputs and deduce fuzzy relations using fuzzy logic. (Analyzing)
ECC604.5	The students will be able to evaluate the given neural network for specific input patterns and activation functions. (Evaluating)
ECC604.6	The students will be able to solve problems that include uncertainty using fuzzy membership functions and compositions. (Evaluating)

Course Name:	Radar Engineering		
Course Code	ECCDLO6016		
Faculty Name:	Dr. Ashwini Kotrashetti		
Year	3		VI

CO Number	Course Outcome
ECCDLO6016.1	Student will be able to explain the fundamental concept of RADAR. They will be explain the working principle the different types of Radar displays and their application in real time scenario.
ECCDLO6016.2	Students will be able to demonstrate an understanding of the factors affecting the radar performance using Radar Range Equation.
ECCDLO6016.3	Students will be able to apply concepts of working principles to differentiate between different types of RADARS. Also they will be able to demonstrate an understanding of the importance of Matched Filter Receivers in Radars.
ECCDLO6016.4	Students will be able to analyze cases to identify the suitable measurement methodologies to characterize and verify the performance of radar systems
ECCDLO6016.5	Students will be able to evaluate design constraints for RADAR transmitters & receivers
ECCDLO6016.6	Students will be able to design radar systems computationally and use modern tools

Course Name:	DATABASE MANAGEMENT SYSTEM		
Course Code	ECCDLO6014		
Faculty Name:	Ms. Madhavi Pednekar		
Year	3	Sem	VI

CO Number	Course Outcome
ECCDLO6014.1	Students will be able to understand, define and explain the fundamentals of database management systems.
ECCDLO6014.2	Students will be able to understand the concept of Relational Algebra, Views, Triggers & Transaction Management
ECCDLO6014.3	Students will be able to apply and formulate SQL queries to manage the database system.
ECCDLO6014.4	Students will be able to convert conceptual model to relational model and formulate relational algebra queries.
ECCDLO6014.5	Students will be able to analyze and design a relational database design using transcations, management and recovery.
ECCDLO6014.6	Students will be able to to design the conceptual model of database used as real life applications.

Course Name:	Electromagnetics and Antenna Lab		
Course Code	ECL601		
Faculty Name:	Dr. Ashwini Kotrashetti		
Year	3		VI

CO Number	Course Outcome
ECL601.1	Students will be able to explain and define various antenna parameters and also explain propagation effects.
ECL601.2	Students will have basic knowledge and skills related to Antenna system and it's testing methods, they will be able to measure various antenna parameters
ECL601.3	Students will be able to apply their theoretical knowledge and demonstrate proficiency to operate various instruments like directional coupler, VNA and software like ANSYS HFSS
ECL601.4	Student will be able to analyse radiation pattern and S11 parameters to compare antennas with respect to certain defined antenna parameters
ECL601.5	Students will be able to investigate inorder to assess the need of adaptation for technological change in the field of antennas
ECL601.6	Student will be able to evaluate given specifications to arrive at appropriate theoretical design of antennas and validate through simulation

Course Name:	CCN LAB		
Course Code	ECL602		
Faculty Name:	Prof. Poonam Chakraborty		
Year	3	Sem	VI

CO Number	Course Outcome
ECL602.1	Students will be able to explain the various network devices and protocols used at each layer.
ECL602.2	Students will be able to understand and perform various network commands on Linux.
ECL602.3	Students will be able to apply error detection and correction techniques.
ECL602.4	Students will be able to analyze the traffic flow and protocol frames
ECL602.5	Students will be able to simulate and evaluate the performance of a computer network.
ECL602.6	Students will be able to design a computer network as per specific need.

Course Name:	Image Processing and Machine Vision Laboratory (IPMV LAB)		
Course Code	ECL603		
Faculty Name:	Prof. Hemlata Mote, Prof Pratibha Dumane		
Year	3	Sem	VI

CO Number	Course Outcome
ECL603.1	Students will be able to understand programming constructs for image processing and machine vision.
ECL603.2	Students will be able to read, modify, display and create images.
ECL603.3	Students will be able to improve the subjective quality of images in spatial domain and frequency domain.
ECL603.4	Students will be able to analyze and interpret the images for machine vision.
ECL603.5	Students will be able to choose appropriate filter to remove the noise.
ECL603.6	Students will be able to design filters for image processing and machine vison.

Course Name:	Skill Lab: Linux and Networking and Server Configuration		
Course Code	ECL604		
Faculty Name:	Prof. Aparna Telgote		
Year	3	Sem	VI

CO Number	Course Outcome
ECL603.1	Students will be able to install Linux using different platform and execute standard Linux commands
ECL603.2	Students will be able to describe the basic knowledge of Linux Operating System
ECL603.3	Students will be able to deploy the system administrative functionality
ECL603.4	Students will be able to solve the problems using shell script programming
ECL603.5	Students will be able to develop network based applications
ECL603.6	Students will be able to Apply the Linux commands using programming skill to deploy different servers like ftp, telnet etc.

Course Name:	Mini Project 2B- FPGA based Project		
Course Code	ECM601		
Faculty Name:	Dr. Sudhakar Mande		
Year	3	Sem	VI

CO Number	Course Outcome
ECM601.1	Understand various FPGA families and method of FPGA synthesis and implementation
ECM601.2	Learn the working of basic EDA tools like Xilinx, Modelsim cadence , etc
ECM601.3	Able to program, simulate and synthesize circuits in Verilog HDL
ECM601.4	Learn the technique of interfacing of LED, switches and seven segment with FPGA.
ECM601.5	Learn the project documentation, designing and handling techniques
ECM601.6	Analysis of FPAG fault detection and verification principles

Course Name:	OCN		
Course Code	ECC801		
Faculty Name:	Prof. Poonam Chakraborty		
Year	4	Sem	VIII

CO Number	Course Outcome
ECC801.1	The students should be able to describe various theories and principles used in fiber optics communication, fiber sources and detectors, network components and network management.
ECC801.2	The students should be able to explain various methods involved in fiber fabrication, various types of components, various losses, network architectures and concept of network design
ECC801.3	The students should be able to apply various theories of fiber optics for selecting the right component in the fiber optics network design for improving the receiver performance, fault management and protection.
ECC801.4	The students should be able to analyze various types of fibers based on their transmission characteristics, fiber losses, optical network system components, types of optical networks, various multiplexing and de-multiplexing schemes, power penalty based on the given application.
ECC801.5	The students should be able to evaluate various fiber parameters, number of modes, losses, quantum efficiency, bit error rate, non linearity and the link power budget and rise time budget for any given fiber link.(
ECC801.6	The students should be able to design a optical fiber communication links using appropriate components for any topographical scenario.

Course Name:	OCN LAB		
Course Code	ECL801		
Faculty Name:	Prof. Poonam Chakraborty, Prof Madhavi Pednekar		
Year	4	Sem	VIII

CO Number	Course Outcome
ECL801.1	Students will have comprehensive knowledge and skills relating to Fiber components and fiber transmissions
ECL801.2	The students will have the understanding of the principle of Rays Optics (for fiber optics communication) and using these principles will be able to transmit and receive an analog and digital signal using fiber optics communication.
ECL801.3	Students will be able to apply various measuring techniques for finding attenuation coefficient, numerical aperture a, responsivity of the fiber.
ECL801.4	The students will be able to evaluate various parameters of the fiber cable like bending loss , attenuation loss and Numerical Aperture for the given fiber cable
ECL801.5	The students will be able to analyze and plot various characteristic of the fiber source(LED's) and Photodetector
ECL801.6	The students will be able to design a fiber point to point link for a given scenario. They will be able to propose solution for sustainable technology related to fiber optics

Course Name:	WN Elective		
Course Code	ECCDLOC8013		
Faculty Name:	Prof Aparna Telgote		
Year	4	Sem	VIII

CO Number	Course Outcome
ECCDLOC8013.1	Students will be able to explain the fundamentals, architecture, design issues and standards of wireless networks
ECCDLOC8013.2	Students will be able to classify the Wireless Network as per the coverage and list the various technologies associate with it.
ECCDLOC8013.3	Student will be able to compare Body area network (BAN) and personal area network (PAN) technologies such as Zigbee, Bluetooth, UWB, RFID, NFC etc., WLAN and WMAN.
ECCDLOC8013.4	Students will be able to give details of sensor network architecture, traffic related protocols , transmission technology etc
ECCDLOC8013.5	Students will be able to calculate the coverage of 2G 3G cellular system
ECCDLOC8013.6	Students will be able to design uplink and downlink budget for GSM, CDMA, WCDMA,HSDPA Technologies

Course Name:	NMT elective		
Course Code	ECCDLO8023		
Faculty Name:	Poonam Chakraborty		
Year	4	Sem	VIII

CO Number	Course Outcome
ECCDLO8023.1	The students will be able to define the fundamental principles and technical underlying standards in : Telecommunication, Networking and Information Technologies.
ECCDLO8023.2	The students will be able to explain Communications Network Management Systems and their strengths and limitations.
ECCDLO8023.3	The students will be able to model networked informative systems and continuously improve their technological knowledge and communication skills.
ECCDLO8023.4	The students will be able to analyze operation and management of modern data communications networks.
ECCDLO8023.5	The students will be able to compare the way technological change and emerging technologies might alter the assumptions for the underlying architectures systems and management tools.
ECCDLO8023.6	The students will be able to propose the design of Network management model based on the case study.

Course Name:	Satellite and Nano-satellite Communication (Elective)		
Course Code	ECCDLO8022		
Faculty Name:	Prof. Madhavi Pednekar		
Year	4	Sem	VIII

CO Number	Course Outcome
ECCDLO8022.1	Student will be able to understand the basic concepts of satellite and Nano satellite communication system and orbital parameters.
ECCDLO8022.2	Student will be able to explain the various satellite sub-systems, earth station technologies and launching mechanisms.
ECCDLO8022.3	Student will be able to design link budget based on various performance parameters of satellite signal for proper communication.
ECCDLO8022.4	Student will be able to analyze Satellite Losses and Link Budget.
ECCDLO8022.5	Student will be able to evaluate the performance of various parameters of satellite signal for proper communication.
ECCDLO8022.6	Student will be able to write a technical report based on Nano satellite's structure design, payloads, Thermal control system and space segment.

Course Name:	PROJECT STAGE-II		
Course Code	ECP801		
Faculty Name:	Prof. Mdhavi Pednekar		
Year	4	Sem	VIII

CO Number	Course Outcome
ECP801.1	Students will be able to convert the design into a Product/Model/Prototype and validate the results.
ECP801.2	Students will be able to execute the project plan by working as a team to meet deadlines by maintaining ethics and professional responsibilities.
ECP801.3	Students will be able to present their work effectively through technical presentations, conference/journal publications and technical reports following ethical practices.