

**MAR BASELIOS CHRISTIAN COLLEGE OF ENGINEERING, PEERMADE**

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**Course Outcome- KTU**

	Course Cod	Course	Course Outcomes	
<b>S1 &amp; S2</b>	MA101	Calculus	CO1	series.
			CO2	variable.
			CO3	vector functions.
			CO4	Find areas and volumes using integrals.
			CO5	Analyse the application of vector valued functions in physical applications.
			CO6	functions.
	PH100	Engineerin Physics	CO1	systems
			CO2	Differentiate interference, diffraction and polarisation and apply knowledge in daily life situations.
			CO3	Distinguish between different types of superconductors.
			CO4	Explain the principles of physics using theories of quantum mechanics statistical mechanics and optics.
			CO5	Apply the knowledge of acoustics in the construction of buildings.
			CO6	applications.
	CY100	Engineering. Chemistry	CO1	spectral data.
			CO2	Electrochemistry
			CO3	analytical chemistry.
			CO4	engineering materials.
			CO5	Students will be able to compute the property of fuels and lubricating oils.
			CO6	Students will be able to make technology choice to deal with water quality issues
			CO7	The student will be equipped to take up chemistry related topics as a part of their project works during higher semester of the course.

	BE100	Engineering Mechanics	CO1	diagrams.
			CO2	Compute the reactions necessary to ensure static equilibrium
			CO3	Compute Centre of Gravity and Moment of Inertia.
			CO4	Solve mechanics problems associated with friction forces.
			CO5	acceleration in different frames of reference and to define the forces causing the motion of a particle.
			CO6	Explain the concept of mechanical vibrations.
	BE110	Engineering Graphics	CO1	Able to prepare the orthographic projections of points and straight lines placed in various quadrants
			CO2	Demonstrate the ability to draw orthographic projections of various solids.
			CO3	Ability to draw and interpret the sectioned views of solids.
			CO4	Ability to draw the developments of various solids.
			CO5	solids.
			CO6	sketching.
	BE-101-01	Introduction to Civil Engineering	CO1	Illustrate various types, uses and properties of various building materials.
			CO2	Explain the method of construction of different components of a building.
	BE-101-04	Introduction to Electronics Engineering	CO1	Identify active and pasive electronic components.
			CO2	Design and setup simple circuits using diodes and transistors.
			CO3	instruments.
	BE-101-05	Introduction to Computing and Problem Solving	CO1	Students can design algorithmic solution to problems.
			CO2	Students can convert algorithms to Python programs
			CO3	Able to design modular Python programs using functions
			CO4	Can design programs with Interactive Input and Output, utilizing arithmetic expression repetitions, decision making, arrays.
			CO5	Can design programs using file Input and Output.
			CO6	Able to develop recursive solutions

	BE103	Introduction to Sustainable Engineering	CO1	The student will be able to understand the different types of environmental pollution problems and their sustainable solutions.
			CO2	The student will be able to acquire attitudes of care and concern for ecologically sustainable development.
			CO3	provide one self.
			CO4	environment.
			CO5	education.
			CO6	practices by utilizing the engineering knowledge and principles gained from this course.
	CE100	Basics of Civil Engineering	CO1	Discuss the fundamental aspects of civil engineering.
			CO2	Discuss the fundamentals for planning and setting out a building.
			CO3	measurements.
			CO4	Discuss the uses of various building materials.
			CO5	Explain the method of construction of different components of a building.
			CO6	Discuss about various services in a building.
	ME 100	Basics of Mechanical Engineering	CO1	Describe fundamentals of Thermodynamics and air standard cycle.
			CO2	Explain the working of various energy conservation devices.
			CO3	Distinguish different refrigeration and air conditioning system.
			CO4	: Identify various parts of an automobile.
			CO5	Select the appropriate manufacturing process.
			CO6	Describe elements and functions of various machine tools.
	EE100	Basics of Electrical Engineering	CO1	Define the fundamental laws of electrical and magnetic circuit
			CO2	Design a circuit to suit the need and apply nodal and mesh analysis
			CO3	Analyze simple Ac circuits with sources and passive elements
			CO4	Explain the generation, transmission and distribution of electrical energy and about different renewable energy sources
			CO5	Analyze the performance of different type of Dc motors
			CO6	Describe the principle of operation of different type of AC motors

EC100	Basics of Electronics Engineering	CO1	Understand the types, specification and standard values and applications of various passive and active components.
		CO2	Get an idea about the working and applications of different types of semiconductors, diodes and transistors.
		CO3	Understand the working of rectifiers, amplifiers and oscillators.
		CO4	instruments.
		CO5	Understand the concepts of radiocommunication and satellite communication.
		CO6	entertainment electronics.
MA102	Differntial Equations	CO1	Identify and solve homogeneous differential equations.
		CO2	Solve non-homogeneous differential equations.
		CO3	Evaluation of Fourier series.
		CO4	Identify and solve problems in partial differential equations.
		CO5	Apply one dimensional wave equation to solve problems in different domain.
		CO6	Apply one dimensional heat equation to solve problems in different domain.
BE102	Design Engineering	CO1	practice.
		CO2	success
		CO3	Think of innovative designs incorporating different segments of knowledge gained in the course.
		CO4	A boarder perspective of design covering function, cost, environmental sensitivity, safety and other factors other than engineering analysis.
		CO5	Gain an ability to design a system, component or process to meet desired needs within realistic constraints.
		CO6	Capable to apply knowledge of mathematics, science and engineering.
CS100	Computer Programming	C01	Ability to deal with different parts of a program and I/O methods,Understand C language constructs and analyse problem using control statements
		CO2	and union
		CO3	Develop and solve problems using pointers.
		CO4	Analyse problems, identify subtasks and implement them as functions.
		CO5	Apply sorting and searching techniques, to solve application programs.
		CO6	solving problems.

	PY100	Engineering Physics Lab	CO1	circuits.
			CO2	Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.
			CO3	Apply and demonstrate the theoretical concepts of Engineering Physics and develop scientific attitude.
			CO4	Design new experiments / instruments with practical knowledge.
			CO5	Develop skills to impart practical knowledge in real time solutions.
			CO6	Apply theoretical concepts of LASER and Grating.
	CY 110	Engineering Chemistry Lab	CO1	spectral data.
			CO2	Electrochemistry.
			CO3	analytical chemistry.
			CO4	engineering materials.
			CO5	Students will be able to compute the property of fuels and lubricating oils.
			CO6	issues.
			CO7	The student will be equipped to take up chemistry related topics as a part of their project works during higher semester of the course.
	CE110	Civil Engineering Workshop	CO1	Student should be able to set out a building using tape and cross staff
			CO2	Student should be able to determine area and mass moment of inertia
			CO3	English bond
			CO4	building
			CO5	Student should be able to determine and vertical distance between points
			CO6	Student should be able to determine areas of irregular shapes.
	EE110	Electrical Engineering Workshop	CO1	Understand the different supply arrangements and their limitations, standard voltages and their tolerances.
			CO2	Familiarize with safety aspects of electrical systems and importance of protective measures in wiring systems.
			CO3	Select the suitable wires, cables and other accessories used in wiring.
			CO4	systems.
			CO5	Wire up simple lighting circuits for domestic buildings, distinguish between light and power circuits.

			CO6	Measure electrical circuit parameters and current, voltage and power in a circuit.
	EC110	Electronics Engineering Workshop	CO1	Identify different electronic components like resistors, capacitors, inductors, transformers diodes,transister etc.
			CO2	Familiarize testing and measuring instruments like the multimeter, function generator, power supply & CRO.
			CO3	Assemble and connect different circuits on a breadboard.
			CO4	interconnections.
			CO5	Familiarize EDA tool and public addressing electronic systems
			CO6	Assemble electronic circuits/systems on general purpose PCB.
	CS110		Computer Science Workshop	CO1
		CO2		problem solving.
		CO3		To learn the implementation of control structures,iterations and recursive function,Lists,Tuples and dictionaries.
		CO4		To implement operations on file.
		CO5		To implement a micro Project using Python.
	CS120	Computer Programming Lab	CO1	Analyze a problem
			CO2	Find appropriate programming language construct should be us
			CO3	Implement C Program using conditions and loop
			CO4	Implement C Program using arrays, structures
			CO5	Implement C Program using functions
			CO6	Implement C Program using pointers and files

S3	MA201	Linear Algebra & Complex Analysis	CO1	equations.
			CO2	Find the eigen values of a matrix and how to diagonalise a matrix.
			CO3	Identify analytic functions and harmonic functions.
			CO4	Evaluate real definite integrals as application of residue theorem.
			CO5	Identify conformal mappings
			CO6	Find regions that are mapped under certain transformation.
	EC201	Network Theory	CO1	network.
			CO2	analysis.
			CO3	To study the transient response of networks subject to test signals.
			CO4	To develop understanding of the concept of resonance, coupled circuits and two port networks.
	EC203	Solid State Devices	CO1	To provide an insight into the basic semiconductor concepts
			CO2	technology to appreciate its applications to electronics circuits and systems
	EC205	Electronics Circuits	CO1	To develop the skill of analysis and design of various analog circuits using discrete electronic devices as per the specifications.
	EC207	Logic Circuits Design	CO1	To work with a positional number systems and numeric representations
			CO2	To introduce basic postulates of Boolean algebra and show the correlation between Boolean expression
			CO3	To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
			CO4	To study the fundamentals of HDL
			CO5	blocks
			CO6	To design and implement synchronous sequential circuits

	HS210	Life Skills	CO1	The students will be able to Communicate effectively
			CO2	Make effective presentations
			CO3	Write different types of reports.
			CO4	Face interview & group discussion.
			CO5	Critically think on a particular problem.
			CO6	Solve problems.
			CO7	Work in Group & Teams
	HS200	Business Economics	CO1	To familiarize the prospective engineers with elementary Principles of Economics and Business Economics.
			CO2	To acquaint the students with tools and techniques that are useful in their profession in Business Decision Making which will enhance their employability;
			CO3	To apply business analysis to the “firm” under different market conditions;
			CO4	To apply economic models to examine current economic scenario and evaluate policy options for addressing economic issues
			CO5	To gain understanding of some Macroeconomic concepts to improve their ability to understand the business climate;
			CO6	To prepare and analyse various business tools like balance sheet, cost benefit analysis and rate of returns at an elementary level
	EC231	Electronic Devices & Circuits Lab	CO1	To study the working of analog electronic circuits.
			CO2	To design and implement analog circuits as per the specifications using discrete electronic components.
	EC233	Electronics Design Automation lab	CO1	simulate the electronics/digital circuits, signals and systems using the soft-wares which are available for the modern design methodologies for the rapid design



S4	MA202	Probability Distributions, Transforms and Numerical Methods	CO1	Acquire the concept of random variable ,discrete probability distributions with practical applications in various engineering and social life situation
			CO2	Acquire the concept of continuous probability distributions with practical applications in various engineering and social life situation.
			CO3	courses.
			CO4	courses
			CO5	Solve various engineering problems using interpolation and iteration.
			CO6	Solve various engineering problems using numeric integration
	EC202	Signal and Systems	CO1	both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing, image processing, communication theory and control systems.
			CO2	To study continuous and discrete-time signals and systems, their properties and representations and methods those are necessary for the analysis of continuous and discrete- time signals and systems.
			CO3	To familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems.
			CO4	relate to differential equations, difference equations, impulse response and convolution, etc.
			CO5	analysis tools, Laplace Transform and Z-transform. To study concepts of the sampling process, reconstruction of signals and interpolation.
	EC204	Analog Integrated Circuits	CO1	To equip the students with a sound understanding of fundamental concepts of operational amplifiers
			CO2	To understand the wide range of applications of operational amplifiers
			CO3	To introduce special function integrated circuits
			CO4	To introduce the basic concepts and types of data converters.
	EC206	Computer Organisation	CO1	To study the concepts and types of modulation schemes.
			CO2	To impart knowledge in machine language programming.
			CO3	To develop understanding on I/O accessing techniques and memory structures.

	EC208	Analog Communication Engineering	CO1	To study the concepts and types of modulation schemes.
			CO2	To study different types of radio transmitters and receivers.
			CO3	Develop queries for relational database in the context of practical applications
			CO4	To study the effects of noise in analog communication systems.
			CO5	To impart basic knowledge on public telephone systems.
	EC230	Logic Circuits Design Lab	CO1	To study the working of standard digital ICs and basic building blocks
			CO2	To design and implement combinational circuits
			CO3	To design and implement sequential circuits
	EC232	Analog Integrated Circuit Lab	CO1	circuits.
			CO2	Design and implement different kinds of digital circuits.

S5	EC301	Digital Signal Processing	CO1	To provide an understanding of Digital Signal Processing principles and algorithms and applications.
			CO2	To study the design techniques for digital filters
			CO3	To give an understanding of Multi-rate Signal Processing and its application
			CO4	To introduce the architecture of DSP processors.
	EC303	Applied Electromagnetic Theory	CO1	fields.
			CO2	To impart knowledge on the basic concepts of electric and magnetic field.
			CO3	To develop a solid foundation in the analysis and application of electromagnetic fields, Maxwell's equations and Poynting theorem
			CO4	waveguides.
	EC305	Microprocessors and Microcontrollers	CO1	microcontroller.
			CO2	Design and develop 8086 assembly language programs using software interrupts and various assembler directives.
			CO3	Interface microprocessors with various external devices.
			CO4	Analyze and compare the features of microprocessors and microcontrollers
			CO5	Design and develop assembly language programs using 8051 microcontroller.
	EC307	Power Electronics & instrumentation	CO1	instruments.
			CO2	and inverters.
			CO3	To develop understanding of the concept of Transducers and Digital instruments.
	HS300	Principles of Management	CO1	Manage people and organisations
			CO2	Critically analyse and evaluate management theories and practices
			CO3	Plan and make decisions for organisations
			CO4	Do staffing and related HRD functions
	EC361	Digital System Design(Elective 1)	CO1	To study synthesis and design of CSSN
			CO2	To study synthesis and design of ASC
			CO3	To study hazards and design hazards free circuits.
			CO4	To study PLA folding
			CO5	To study architecture of one CPLDs and FPGA family.

	EC341	Design Project	CO1	Think innovatively on the development of components,products, processes or technologies in the engineering field.
			CO2	Analyze the problem requirements and arrive workable design solutions.
			CO3	To communicate about their innovations and research findings effectively.
			CO4	To introduce students to various modern tools and techniques.
			CO5	Understand the engineering and management principles.
	EC333	Digital Signal Processing Lab	CO1	implementation of various systems using MATLAB/SciLab/OCTAVE and DSP kit
	EC335	Power Electronics and Instrumentation Lab	CO1	To design and implement basic power electronic circuits
			CO2	Apply stored programming concepts (PL-SQL) using Cursors and Triggers.
			CO3	concept
			CO4	Apply the concepts views
			CO5	Use graphical user interface, Event Handling and Database connectivity to develop and deploy applications and appl
			CO6	Develop medium-sized project in a team

S6	EC302	Digital Communication	CO1	Illustrate the digital representation of analog source and compare the performance of various Digital Pulse Modulation Schemes
			CO2	criteria for zero ISI and analyse the need for introducing ISI in Digital Communication in a controlled manner
			CO3	procedure
			CO4	Understand the error probability for different digital modulation schemes like BPSK, BFSK, QPSK etc.
			CO5	Describe the principle of spread spectrum communication and to illustrate the concept of FHSS and DSSS
			CO6	Understand various Diversity Techniques
			CO7	To classify computational problems into P, NP, NP-Hard and NP-complete.
	EC304	VLSI	CO1	Enables students to understand the basic concepts which will form the foundation for fabrication various monolithic components on an IC.
			CO2	Enables students aware about the vastness and application range CMOS technology and how to choose the appropriate logic family for their application.
			CO3	Enables the students to plan the layout before the actual chip manufacturing process.
			CO4	Enables the students gain an insight into design flow.
			CO5	Enables the students to gain an insight into new fabrication techniques.
	EC306	Antenna and Wave Propagation	CO1	radiation and will be able to deduce the electric fields and magnetic fields radiated by a hertzian dipole
			CO2	The students will have a sound understanding of the various parameters used for characterizing antenna: their optimum values and their measurements.
			CO3	The students will have a sound understanding of the concept of antenna arrays, its analysis and their different types
			CO4	applications
			CO5	The students will be able to understand the various modes of radio propagation and relate it to real communication instances MW-FM Radio, Mobile phones, GPS etc
			CO6	The students will have the capability to understand advanced topics in antennas and propagation, develop novel antenna designs and write/present technical reports

	EC308	Embedded Systems	CO1	product.
			CO2	Ability to understand the different standards and protocols used for communication with I/O devices.
			CO3	Ability to distinguish different ways of communication with I/O devices.
			CO4	Ability to understand basic programming concepts of Embedded Systems.
			CO5	Ability to understand about inter-process communication.
			CO6	Ability to design real time embedded systems using the concepts of RTOS.
	EC312	Object Oriented Programme(Elective1)	CO1	Students will have a thorough understanding of the features of OOP
			CO2	Students will have an understanding of advanced features of C++ such as operator overloading and inheritance.
			CO3	Students will understand the concepts of virtual functions, pointers and polymorphism.
			CO4	Students will have knowledge of advanced features of Java such as multithreading, packages and error management.
			CO5	Students will have skills in designing android application development.
			CO6	Students will have skills in debugging, deploying and testing mobile applications.
	EC368	Robotics(Elective 2)	CO1	Students will be able to understand basics of robots – history, specifications, areas of application, components & structure.
			CO2	Students will be able to identify robotic sensors, drives and actuators.
			CO3	Students will be able to understand basics of robotic vision.
			CO4	Students will have an understanding of forward and inverse kinematics.
			CO5	Students will have an understanding of velocity kinematics & manipulator dynamics.
			CO6	robots.
	EC370	Digital Image Processing	CO1	The students will be able to explain the fundamentals of digital image processing.
			CO2	The students will be able to distinguish analyse the various concepts and mathematical transforms necessary for image processing.
			CO3	The students will be able to differentiate and interpret the various image enhancement techniques.
			CO4	The students will be able to describe about image restoration using various filters
			CO5	The students will be able to illustrate image segmentation algorithm.

	EC334	Microcontroller Lab	CO1	The student should be able to understand fundamental programming concepts of microcontrollers.
			CO2	The student should be able to interface various devices with controller.
			CO3	The student should be able to design a microcontroller based system with the help of the interfacing devices.
	EC352	Comprehensive Exam	CO1	The students will be confident in discussing the fundamental aspects of any engineering problem/situation and give answers in dealing with them
	EC332	Communication Engg Lab (Analog & Digital)	CO1	To understand the AM and FM generation circuits.
			CO2	To understand the analog communication system
			CO3	To learn more about digital communication systems.
			CO4	To learn more about analog signal sampling and reconstruction.
			CO5	To learn about the testing of communication circuits
			CO6	To understand the design of communication circuits.

S7	EC401	Information theory and coding	CO1	The course will enable the students to apply the basics of information theory for the calculation of channel capacity and efficiency.
			CO2	The course will enable the students to distinguish between different types of error correcting codes and learns how to tailor known error control codes to be used in a particular scenario.
			CO3	The course will enable the students to understand the importance of Shannon's and Channel coding theorem for designing an efficient communication link.
			CO4	The course will enable the students to compute source entropy and channel capacity and apply Huffman coding technique.
			CO5	The course will enable the students to design of optimum decoder for various coding methodologies.
			CO6	The course will enable the students to formulate source coding schemes for the improving the efficiency of information transmission
			EC403	Microwave & Radar Engineering
CO2	Microwave tubes such as reflex klystrons and magnetron oscillators are studied.			
CO3	Will have an idea about TWT, various measurement techniques for MW parameters such as power, impedance and frequency.			
CO4	Students will be able to understand the basics of various hybrid circuits ,Directional couplers and scattering parameters with S matrix formulation.			
CO5	Students will be able to understand the basics of various hybrid circuits ,Directional couplers and scattering parameters with S matrix formulation.			
CO6	Knows the basic theory of operation of microwave transistor, Tunnel Diodes and Gunn Diodes.			
EC405	Optical Communication	CO1		
		CO2	Analyze the advanced processor technologies	
		CO3	Interpret memory hierarchy	
		CO4	Compare different multiprocessor system interconnecting mechanisms	
		CO5	Interpret the mechanisms for enforcing cache coherence	
		CO6	Analyze different message passing mechanisms	
		CO7	Analyze different pipe lining techniques	
		CO8	Appraise concepts of multithreaded and data flow architectures	



EC407	Computer Communication	CO1	To give the basic concepts of computer network.
		CO2	To give the basic concepts of working of layers, protocols and interfaces in a computer network.
		CO3	To give the basic concepts of Routing and Routing Protocols.
		CO4	To give the basic concepts of transport layer.
		CO5	To introduce the fundamental techniques used in implementing secure network communications and give them an understanding of common threats and its defences
EC409	Control System	CO1	To introduce the elements of control system and its modelling.
		CO2	To introduce methods for analyzing the time response, the frequency response and the stability of systems.
		CO3	To design control systems with compensating techniques.
		CO4	To introduce the state variable analysis method.
		CO5	To introduce basic concepts of digital control systems.
EC465	MEMS	CO1	Understand the fundamentals of microsystems and its applications
		CO2	Understand the working principles of micro sensors and actuators
		CO3	Understand the application of scaling loss in the design of microsystems
		CO4	Understand the typical materials used for fabrication of microsystems
		CO5	Understand the principles of standard micro fabrication techniques
		CO6	Appreciate the challenges in the design and fabrication of microsystems
EC451	Seminar and Project Priliminary	CO1	On completion of the course the students show a basic ability to do literature survey on current/emerging technology topics
		CO2	On completion of the course the students do presentations to an audience of students and teachers
		CO3	On completion of the course the students will plan and work in a team
		CO4	On completion of the course the students function effectively as an individual and as a member or leader of a diverse team
EC431	Communication Systems Lab (Optical & Microwave)	CO1	Understand digital Communication and Shift Keying techniques performed on signals
		CO2	Learn MATLAB software
		CO3	Implement QAM, Huffman coding Mean square error estimation in Matlab
		CO4	Understand the basics of Microwave Engineering
		CO5	Understand the basics of Antenna Measurements and Radiation Pattern

<b>S8</b>	EC402	Nanoelctronics	CO1	Learn the new trends in microelectronics and nanoelectronics.
			CO2	Explain the various methods of fabrication of nano-layers and nano particle.
			CO3	Learn the characterization of nanostructures and the tools used for this.
			CO4	Recognize two dimensional behavior of electronic system.
			CO5	Explicate transport of charge in nanostructures.
			CO6	Unravel the new nanoelectronic devices.
	EC404	Advanced Communication Systems	CO1	Communications
			CO2	The course enables student to have a thorough understanding of Digital TV
			CO3	The course enables student to have understanding of Satellite systems
			CO4	Systems
			CO5	The course enables student to have idea of Cellular concept
			CO6	The course enables student to have basic idea of different Multiple Access and networking technologies
	EC468	Secure Communications	CO1	The students will be able to aware about the different security attacks and techniques to prevent and tackle such attacks
			CO2	The students will be able to study the fundamentals of abstract algebra and its application in the field of secure communication
			CO3	techniques
			CO4	The students will be able to aware about transposition techniques and DES
			CO5	The students will be able to learn about public key cryptosystem and key management
			CO6	The students will be able to know different intrusion detection techniques and how to generate and protect passwords
	EC492	PROJECT	CO1	On completion of the course the students show a basic ability to do literature survey on current/emerging technology topics
			CO2	On completion of the course the students do presentations to an audience of students and teachers
			CO3	On completion of the course the students will plan and work in a team
			CO4	On completion of the course the students function effectively as an individual and as a member or leader of a diverse team
			CO5	Prepare documentation and thus explain how the selected concept is relevant in current scenario.