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COLLEGE OF ENGINEERING AND TECHNOLOGY

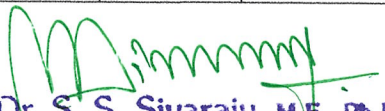
Kumaran Kottam Campus, Kannampalayam (PO), Coimbatore – 641 402
(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)
NAAC Accredited and ISO 21001:2018 Certified Institution



M.E - EMBEDDED SYSTEM TECHNOLOGIES

Regulation – 2021

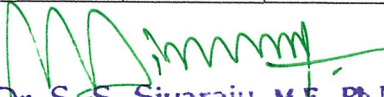
Course ID	Semester	Course Code	Course Name	Course Outcome	Course Outcome
C101	I	MA4103	Applied Mathematics for Embedded Systems Technologists	CO1	Apply Fourier transform techniques to solve PDE technology.
				CO2	Model the networks in embedded systems using graph theory.
				CO3	Use the ideas of probability and random variables in solving engineering problems.
				CO4	Address stochastic and dynamic behavior of data transfer using queuing theories in embedded systems technologies
				CO5	Fourier series analysis and its uses in representing the power signals.
C102	I	RM4151	Research Methodology and IPR	CO1	Analyze and design sequential digital circuits
				CO2	Design and use programming tools for implementing digital circuits of industry standards
				CO3	Identify the requirements and specifications of the system required for a given application
				CO4	Learners can acquire knowledge about HDL programming.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge upgradation on recent trends in digital design for embedded systems.
C103	I	ET4101	Design Embedded Systems of	CO1	Demonstrate the functionalities of processor internal blocks, with their requirement.
				CO2	Analyze that Bus standards are chosen based on interface overheads without sacrificing processor performance.


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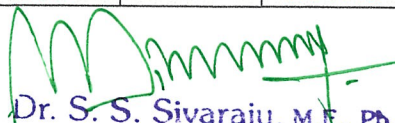
				CO3	Explain the role and features of RT operating system, that makes multitask execution possible by processors.
				CO4	Illustrate that using multiple CPU based on either hardcore or softcore helps data overhead management with processing- speed reduction for C execution.
				CO5	Recommend Embedded consumer product design based on phases of product development.
C104	I	ET4102	Software Embedded Systems for	CO1	Demonstrate C programming and its salient features for embedded systems.
				CO2	Deliver insight into various programming languages/software compatible to embedded process development with improved design & programming skills.
				CO3	Develop knowledge on C programming in Linux environment.
				CO4	Possess ability to write python programming for Embedded applications.
				CO5	Have improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded programming skills.
C105	I	ET4103	Microcontroller Based System Design	CO1	Understand the basics and requirement of processor functional blocks.
				CO2	Observe the specialty of RISC processor Architecture.
				CO3	Incorporate I/O hardware interface of a processor-based automation for consumer application with peripherals.
				CO4	Incorporate I/O software interface of a processor with peripherals.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in commercial embedded processors.
C106	I	ET4104	VLSI Design and Reconfigurable Architecture	CO1	Incorporate synchronous and asynchronous switching logics, with clocked circuits design.
				CO2	Deliver insight into developing CMOS design techniques and IC fabrication methods.
				CO3	Explain the need of reconfigurable computing, hardware-software co design and operation of SoC processor.
				CO4	Design and development of reprogrammable analog devices and its usage for Embedded applications.
				CO5	Illustrate and develop HDL computational processes with improved design strategies.


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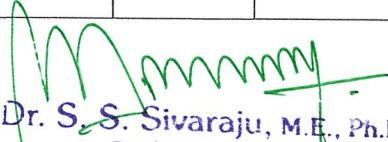
C107	I	ET4111	Embedded System Lab I	CO1	Experiment insight into various embedded processors of CISC and RISC architecture / computational processors with peripheral interface.
				CO2	Understand the fundamental concepts of how process can be controlled with C.
				CO3	Experimenting on programming logic of Processor based on software suites(simulators, emulators)
				CO4	Incorporate I/O software interface of a processor with peripherals.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in interfacing and use of commercial embedded processors.
C108	I	ET4112	Embedded Programming Laboratory – I	CO1	Developing Optimized code for embedded processor.
				CO2	Understanding the fundamental concepts of how process can be realized using Software Modules
				CO3	Circuit and System level simulators to develop solution for embedded based applications.
				CO4	Incorporate I/O software interface of a processor with peripherals.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on Embedded computing and algorithm development with programming concepts.
C109	II	ET4201	Real Time Operating System	CO1	Outline Operating System structures and types.
				CO2	Insight into scheduling, disciplining of various processes execution.
				CO3	Illustrate knowledge on various RTOS support modelling.
				CO4	Demonstrate commercial RTOS Suite features to work on real time processes design.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in RTOS and embedded automation design.
C110	II	ET4202	Embedded System Networking	CO1	Analyze the different bus communication protocols used for embedded networking.
				CO2	Explain the basic concepts of embedded networking.
				CO3	Apply the embedded networking concepts in wireless networks.
				CO4	Relate different data acquisition concepts.
				CO5	Build a system automation for different applications.
C111	II	ET4203	Embedded	CO1	Interpret the significance of embedded control of electrical drives.


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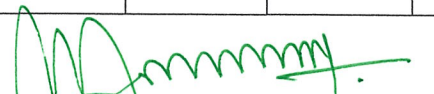
			Control for Electric Drives	CO2	Deliver insight into various control strategy for electrical drives.
				CO3	Developing knowledge on Machine learning and optimization techniques for motor control.
				CO4	Develop embedded system solution for real time application such as Electric vehicles and UAVs.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded system skills required for motor control strategy.
C112	II	ET4251	IOT for Smart Systems	CO1	Analyze the concepts of IoT and its present developments.
				CO2	Compare and contrast different platforms and infrastructures available for IoT.
				CO3	Explain different protocols and communication technologies used in IoT
				CO4	Analyze the big data analytic and programming of IoT.
				CO5	Implement IoT solutions for smart applications
C113	II	ET4211	Embedded System Laboratory - II	CO1	Experiment and demonstrate with simulators, in programming processor boards, processor interfacing/ designing digital controllers
				CO2	Design & simulate Arithmetic ,Logic programs, Filters, Signal analysis with simulators/experiments ,in programming processor boards, processor interfacing/ Tools
				CO3	Develop real time solution for embedded applications.
				CO4	Program and compile in various tools & software domains.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in commercial embedded processors and its programmable interfacing.
C114	II	ET4212	Embedded Programming Laboratory - II	CO1	Developing Optimized algorithms for embedded processor on IDE and compilers.
				CO2	Outline the concepts of how process can be realized using Software Modules.
				CO3	Compare and analyze device, Circuit and System level simulators/emulators to develop embedded applications.
				CO4	Incorporate I/O software interface using IDE and High level languages with processor.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on Embedded programming concepts.


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C115	III	ET4311	Project Work I	CO1	Any of the listed Domains their Design, Development capability in Building Automation for a process through Hardware & Software Tools.
				CO2	Interpreting Pre-Requisites insists choice of project title from the enlisted broad domain of research topics for Project work.
				CO3	Demonstrate project work to enhance students' capacity to work in Research Areas of the Department interests or of Industrial importance.
				CO4	Demonstrate the skill in Oral and Written Communication as presented in the Thesis Book via Viva-Voce Examination.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation with getting skilled up through learning & practicing in Design / development through simulation/ experimental analysis with project report submission (relevant to the candidates project area) by individuals.
C116	IV	ET4411	Project Work II	CO1	Any of the listed Domains their Design, Development capability in Building Automation for a process through Hardware & Software Tools.
				CO2	Interpreting Pre-Requisites insists choice of project title from the enlisted broad domain of research topics for Project work.
				CO3	Demonstrate project work to enhance students' capacity to work in Research Areas of the Department interests or of Industrial importance.
				CO4	Demonstrate the skill in Oral and Written Communication as presented in the Thesis book via Viva-Voce Examination.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation with getting skilled up through learning & practicing in Design / development through simulation/ experimental analysis with project report submission (relevant to the candidates project area) by individuals.
C117	II	ET4001	Wireless And Mobile Communication	CO1	Understand Cellular communication concepts.
				CO2	Explain the mobile radio propagation.
				CO3	Perceive the wireless network different type of MAC protocols
				CO4	Analyse the Equalization and Diversity.
				CO5	Build the Wireless multiple access and IP.
C118	II	ET4002	Virtual Instrumentation	CO1	Infer and Interpret the fundamentals of Virtual Instrumentation and data Acquisition.
				CO2	Explain the difference between the traditional and virtual


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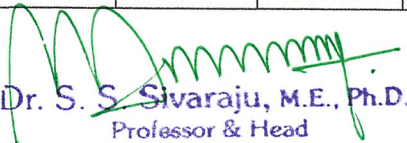
					instrumentation.
				CO3	Illustrate the theoretical concepts to realize practical systems.
				CO4	Analyze and evaluate the performance of Virtual Instrumentation Systems
				CO5	Build a VI system to solve real time problems using data acquisition.
C119	II	ET4003	Embedded Processor Development	CO1	Demonstrate about basic concepts of embedded system
				CO2	Build ARM architecture.
				CO3	Understand C language and assembly programming.
				CO4	Build and compile Object orientation for programming and C++
				CO5	Create software modelling
C120	II	ET4004	Automotive Embedded System	CO1	Insight into the significance of the role of embedded system for automotive applications.
				CO2	Illustrate the need, selection of sensors and actuators and interfacing with ECU
				CO3	Develop the Embedded concepts for vehicle management and control systems.
				CO4	Demonstrate the need of Electrical vehicle and able to apply the embedded system technology for various aspects of EVs
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded systems design and its application in automotive systems.
C121	II	ET4005	Intelligent Control and Automation	CO1	Demonstrate the basic architectures of NN and Fuzzy logics
				CO2	Design and implement GA algorithms and know their limitations.
				CO3	Explain and evaluate hybrid control schemes and PSO
				CO4	Interpret the significance of Automation concepts.
				CO5	Develop the intelligent controller for automation applications.
C122	II	ET4006	Unmanned Aerial Vehicle	CO1	Identify different hardware for UAV.
				CO2	Determine preliminary design requirements for an unmanned aerial vehicle.
				CO3	Design UAV system.
				CO4	Identify and Integrate various systems of unmanned aerial vehicle.
				CO5	Design micro aerial vehicle systems by considering practical limitations.


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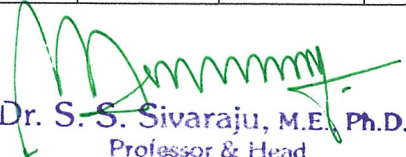
C123	II	ET4071	DSP based System Design	CO1	Evaluate the DSP system using various methods.
				CO2	Design algorithm suitable for different DSP applications.
				CO3	Explain various architectures of DSP system.
				CO4	Implement DSP system in programmable hardware.
				CO5	Build interfacing of DSP system with various peripherals.
C124	II	ET4072	Machine Learning and Deep Learning	CO1	Illustrate the categorization of machine learning algorithms.
				CO2	Compare and contrast the types of neural network architectures, activation functions
				CO3	Acquaint with the pattern association using neural networks
				CO4	Elaborate various terminologies related with pattern recognition and architectures of convolutional neural networks
				CO5	Construct different feature selection and classification techniques and advanced neural network architectures such as RNN, Autoencoders, and GANs
C125	III	ET4007	Computer Vision	CO1	Understand the major concepts and techniques in computer vision and image processing.
				CO2	Infer known principles of human visual system
				CO3	Demonstrate a thorough knowledge of Open CV
				CO4	Develop real-life Computer Visions Applications.
				CO5	Build design of a Computer Vision System for a specific problem.
C126	III	ET4008	Multimedia Communications	CO1	Deploy the right multimedia communication models
				CO2	Apply QoS to multimedia network applications with efficient routing techniques.
				CO3	Solve the security threats in the multimedia networks.
				CO4	Develop the real-time multimedia network applications.
				CO5	Improve to synchronize and manage the multimedia systems.
C127	III	ET4009	Embedded Networking and Automation of Electrical System	CO1	Demonstrate criteria of choice of sensors, components to build meters.
				CO2	Illustrate the demand for BUS communication protocols are introduced
				CO3	Analyse the need and standards in Substation automation
				CO4	Deployment of PAN for metering networked commercial applications
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded networked communications.


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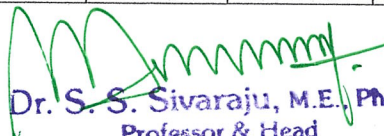
C128	III	ET4010	Smart System Design	CO1	Understand the concepts of smart system design and its present developments.
				CO2	Illustrate different embedded open-source and cost-effective techniques for developing solution for real time applications
				CO3	Acquire knowledge on different platforms and Infrastructure for Smart system design.
				CO4	Infer about smart appliances and energy management concepts.
				CO5	Apply and improve Employability and entrepreneurship capacity due to knowledge upgradation on embedded system technologies.
C129	III	ET4011	Embedded Computing	CO1	Deliver insight into involving JAVA concepts&internet based Communication to establish decentralized control mechanism of system.
				CO2	Interpret the software and hardware architecture for distributed computing
				CO3	Develop solution for smart card
				CO4	Develop Apps based on android SDK.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded system computing environment.
C130	III	ET4012	Embedded Systems Security	CO1	Explain the significance of Security.
				CO2	Understand the major concepts and techniques related to Cryptography.
				CO3	Demonstrate thorough knowledge about the aspects of Embedded System Security.
				CO4	Delivers insight onto role of Security Aspects during Data Transfer and Communication.
				CO5	Applying the Security Algorithms for Real-time Applications.
C131	III	ET4013	Robotics and Automation	CO1	Choose suitable embedded boards for robots.
				CO2	Demonstrate the concepts of robotics & automation and Working of Robot.
				CO3	Analyze the Function of Sensors and actuators In the Robot
				CO4	Develop Program to Use a Robot for a Typical Application
				CO5	Apply and improve Employability and entrepreneurship capacity due to knowledge upgradation on Embedded system based robot development
C132	III	ET4014	Reconfigurable	CO1	Illustrate the need of reconfigurable computing and hardware-software co


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			Processor and SoC Design		design.
				CO2	Demonstrate the significance of FPGA technology
				CO3	Apply the concept of FPGA technology and understand FPGA architectures.
				CO4	Interpret the operation of SoC processor.
				CO5	Relate and improve Employability and entrepreneurship capacity due to knowledge up-gradation on reconfigurable computing and SoC design.
C133	III	ET4015	MEMS and NEMS Technology	CO1	Explain the material properties and the significance of MEMS and NEMS for industrial automation.
				CO2	Demonstrate knowledge delivery on micromachining and micro fabrication.
				CO3	Apply the fabrication mechanism for MEMS sensor and actuators.
				CO4	Apply the concepts of MEMS and NEMS to models ,simulate and process the sensors and actuators.
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on MEMS and NEMS technology.
C134	III	ET4016	Entrepreneurship And Embedded Product Development	CO1	Analyze the internal/external factors affecting a business/organization to evaluate business opportunities.
				CO2	Demonstrate extemporaneous speaking skills developed through in-class discussion of text materials, case study analyses, and current entrepreneurship-related issues
				CO3	Apply and Relate Key concepts underpinning entrepreneurship and its application in the recognition and exploitation of product/ service/ process opportunities.
				CO4	Interpret various aspects of design such as industrial design, design of Consumer specific product , its Reverse Engineering manufacture ,economic analysis through
				CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded systems design.
C135	III	ET4017	Embedded System for Biomedical Applications	CO1	Demonstrate the fundamental art of biomedical engineering.
				CO2	Illustrate about wearable health devices and its importance.
				CO3	Implement image processing applications using software and hardware.
				CO4	Compare various embedded diagnostic applications.


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				CO5	Build and analyze of some biomedical equipment.
C136	III	PS4092	Renewable Energy and Grid Integration	CO1	Relate the power generation of different renewable energy sources to grid impact and grid codes
				CO2	Explain the design principles of solar energy management systems
				CO3	Understand the power conversion system of wind generators
				CO4	Analyze the different Maximum Power Point tracking Techniques
				CO5	Build grid connected and stand alone renewable energy management System.
C137	III	PX4291	Electric Vehicles and Power Management	CO1	Understand the concept of electric vehicle and energy storage systems
				CO2	Describe the working and components of Electric Vehicle and Hybrid Electric Vehicle
				CO3	Know the principles of power converters and electrical drives
				CO4	Illustrate the operation of storage systems such as battery and super capacitors
				CO5	Analyze the various energy storage systems based on fuel cells and hydrogen storage.
C138	III	ET4073	Python Programming for Machine Learning	CO1	Develop skill in system administration and network programming by learning Python.
				CO2	Demonstrating understanding in concepts of Machine Learning and its implementation using Python
				CO3	Relate to use Python's highly powerful processing capabilities for primitives, modelling etc
				CO4	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded systems design.
				CO5	Apply the concepts acquired over the advanced research/employability skills
C139	III	PS4093	Smart Grid	CO1	Relate with the smart resources, smart meters and other smart devices.
				CO2	Explain the function of Smart Grid.
				CO3	Experiment the issues of Power Quality in Smart Grid.
				CO4	Analyze the performance of Smart Grid.
				CO5	Recommend suitable communication networks for smart grid applications
C140	I	AX4091	English For	CO1	Understand that how to improve your writing skills and level of


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			Research Paper Writing	readability
				CO2 Learn about what to write in each section
				CO3 Understand the skills needed when writing a Title
				CO4 Understand the skills needed when writing the Conclusion
				CO5 Ensure the good quality of paper at very first-time submission
C141	I	AX4092	Disaster Management	CO1 Ability to summarize basics of disaster
				CO2 Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response
				CO3 Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
				CO4 Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
				CO5 Ability to develop the strengths and weaknesses of disaster management approaches
C142	II	AX4093	Constitution of India	CO1 Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
				CO2 Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
				CO3 Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru
				CO4 The eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
				CO5 Discuss the passage of the Hindu Code Bill of 1956.


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