NEHRU MEMORIAL COLLEGE (AUTONOMOUS)

NATIONALLY ACCREDITED WITH "A" GRADE BY NAAC

PUTHANAMPATTI,TRICHY – 621007

DEPARTMENT OF EMBEDDED SYSTEMS

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COURSE OUTCOME (COS)

Name of the Course	Course Outcomes
FUNDAMENTALS OF EMBEDDED SYSTEMS	**CO 1:** An ability to design a system, component, or process to meet desired needs within realistic constraints. **CO 2:** Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems. **CO 3:** Design real time embedded systems using the concepts of RTOS. **CO 4:** Foster ability to understand the role of embedded systems in industry.
ANALOG INTERFACING DEVICES FOR EMBEDDED SYSTEMS	**CO 1:** Discuss the op-amp's characteristics, parameter limitations, various configurations and countless applications of op-amp. **CO 2:** Create analytical design and development solutions for sensors and actuators. **CO 3:** Applications and selection of sensors for particular application.
PIC MICROCONTROLLER PROGRAMMING LAB	**CO 1:** Get experience with a set of tools for embedded systems programming and debugging. **CO 2:** Gain hands-on experience in interfacing peripherals to the PIC microcontrollers. **CO 3:** Configured the PIC18 analog-to-digital converter to measure physical quantities. **CO 4:** Implementation of several embedded systems with particular focus on the interaction between multiple devices. **CO 5:** Create an embedded system application.

EMBEDDEDC PROGRAMMING LAB	**CO 1:** Read, understand and trace the execution of programs written in Clanguage. **CO 2:** Write the C code for a givenalgorithm. **CO 3:** Implement Programs with pointers and arrays, perform pointer arithmetic, and use thepre-processor.
ENGINEERING MATHEMATICS	**CO 1:** Recognize the relationships between different areas of mathematics and the connections between mathematics and other disciplines. **CO 2:** Use computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, eigenvalues and eigenvectors. **CO 3:** Develop Fourier series for different types of functions. **CO 4:** Understanding of elementary probability theory and its applications.
MIXED SIGNAL PROCESSOR FOR EMBEDDED SYSTEMS	**CO 1:** Describe the MSP architectures and its feature. **CO 2:** Embedded C programming techniques for 16-bit platform. **CO 3:** Interface the advanced peripherals to MSP. **CO 4:** Embedded protocols and its interfacing techniques for mixed signal processors. **CO 5:** Design embedded system with available resources for simple applications using MSP.

AVR ARCHITECTURE AND PROGRAMMING	**CO 1:** Design and development the electronic systems based on AVR microcontrollers. **CO 2:** Know how to write code to interface to sensors/devices with various communication protocols. **CO 3:** Install the development software and program on AVR microcontroller. **CO 4:** Foster ability to understand the design concept of embedded systems.
MIXED SIGNAL PROCESSORS AND AVR PROGRAMMING LAB	**CO 1:** Familiarize with the assembly level and embedded C programming using AVR studio and Keil compiler. **CO 2:** Understand the concept of mixed signal processing and processor. **CO 3:** Develop system to transfer data to one device to another device. **CO 4:** Apply the concepts on real- time applications
REAL TIME OPERATING SYSTEMS WITH ARM MICROCONTROLLERS	**CO 1:** Describe the architecture of processors. **CO 2:** Develop program displaying digital logic and mathematics ARM instruction set. **CO 3:** Solve real time problem and construct a complete system as a solution. **CO 4:** Integrate and build a working model using the laboratory components and IDE tools.

PROGRAMMBLE SYSTEM ON CHIP	**CO 1:** Under the concept of PSoC systems. **CO 2:** Configured the hardware and software co-design. **CO 3:** Implementation of PSoC system to any applications.
ARM AND PSoC PROGRAMMING LAB	**CO 1:** Understand the Procedure to execute programs with a simulator by using an IDE **CO 2:** Develop simple and complex programs. **CO 3:** Interface external peripheral devices to ARM cortex M4 processor. **CO 4:** Understand the interfacing of I/O devices to tiva 123/129 launch pad. **CO 5:** Configured the analog and digital system of PSoC. **CO 6:** Develop real time embedded system applications
CIRCUIT DESIGN AND SIMULATION LAB	**CO 1:** Become familiar with the basic circuit components and know how to connect them to make a real electrical circuit. **CO 2:** Able to gain practical experience related to electrical circuits, stimulate more interest and motivation for further studies of electrical circuits. **CO 3:** Able to carefully and thoroughly document and analyze experimental work.

ROBOTICS	**CO 1:** Understand the components and basic terminology ofRobotics. **CO 2:** Ability to model the motion of Robots and analyze the workspace and trajectory panning of robots. **CO 3:** Develop application based Robots. **CO 4:** Formulate models for the control of mobile robots in various industrial applications.
EMBEDDED NETWORKING	**CO 1:** Understand the basic concept of network and types of communication protocol. **CO 2:** Understand the significance of embedded networks in real time applications and to use it for specific.
HARDWARE SOFTWARE CO-DESIGN	**CO 1:** Assess prototyping and emulation techniques. **CO 2:** Compare hardware / software co-synthesis. **CO 3:** Formulate the design verification and validate its functionality by simulation
PROGRAMMING IN JAVA	**CO 1:** Design problem solutions using Object Oriented techniques. **CO 2:** Apply the concepts of data abstraction, encapsulation, polymorphism, overloading, and inheritance for problem solutions. **CO 3:** Use the OOPs concepts of Java appropriately in problem solving.

EMBEDDED LINUX	CO 1: Understand the development of environment setup. CO 2: Learn about drivers and kernel development. CO 3: Learn to configure and build a customized Linux kernel. CO 4: Grasp the concept of modern Linux for embedded systems. CO 5: Create and test programs that perform I/O and networking application.
SOFT COMPUTING	**CO 1:** Learn the approaches to intelligent control, architecture for intelligent control. **CO 2:** Implement machine learning through neural networks. **CO 3:** Develop a Neuro fuzzy expert system. **CO 4:** Use the optimization techniques to solve the real world problems.
PYTHON WITH RASPBERRY PI	CO 1: Write their own code in python for a specific application. CO 2: Develop application programs in Python. CO 3: Implement applications on Raspberry Pi. CO 4: Develop and Implement Embedded/IOT applications using Python and Raspberry Pi.

WIRELESS SENSOR NETWORKS	CO 1: Describe the area of wireless sensor networks. CO 2: Describe the current research and development issues in wireless sensor networks. CO 3: Demonstrate deeper methodological knowledge in wireless sensor networks.
ADVANCED DIGITAL IMAGE PROCESSING	**CO 1:** Understand image formation and the role of human visual system plays in perception of gray. **CO 2:** Apply the appropriate image processing algorithm to process, enhance and either extract or impart information from the image. **CO 3:** Learn the signal processing algorithms and techniques in image enhancement and image restoration.
INTERNET OF THINGS	**CO 1:** Students will develop more understanding on the concepts of IOT and its present developments. **CO 2:** Study about different IOT technologies. **CO 3:** Acquire knowledge about different platforms and Infrastructure for IOT. **CO 4:** Learn the art of implementing IOT for smart applications and control.
ADVANCED ARM MICROCONTROLLER	**CO 1:** Understand the architecture and programming of ARM processors. **CO 2:** Develop programming to real world applications. **CO 3:** Acquire knowledge to get data from the external devices for data processing. **CO 4:** Develop their employability and entrepreneurship skills.

NETWORK ON CHIP	**CO 1:** Understand the need for 3D NOC. **CO 2:** The concepts used in testing and reduction of power in NOC. **CO 3:** Ability to learn the architecture and working of routers in 3D NOC.
THE 8051 MICROCON TROLLER ARCHITECTUR E AND PROGRAMMING	**CO 1:** Understand the basic working of 8051, which is the basic of all microcontrollers. **CO 2:** Know the working nature of different peripherals, and programming techniques. **CO 3:** Implementation of the programming sequence using Keil C and loading the same to some application oriented boards.
ADVANCED MICROCON TROLLER	**CO 1:** Provide an overview of the microcontroller architecture and programming. **CO 2:** Use an integrated development environment to program. **CO 3:** Understand and use analog to digital converters, digital to analog converters and other peripherals.
ONLINE COURSE	**CO 1:** An Online Course is aimed at unlimited participation and open access via the web. Online course is a model for delivering learning content online to any person who takes a course, with no limit on attendance. **CO 2:** A student shall undergo an online course for award of the degree besides other requirements. A student is offered this Online Course at the beginning of their II Semester of study and the course has to be completed at the end of II Semester.

	CO 3: The student fails to complete the course by the end of II Semester, it shall be treated as a backlog and needs to be completed before completion of the program for the award of the degree. A student has a choice of registering for only one online courses with the recommendation of Course coordinator. **CO 4:** The student shall undergo online course without disturbing the normal schedule of regular class work. One faculty member assigned by the Coordinator shall be responsible for the periodic monitoring of the course implementation. **CO 5:** If any student wants to change the online course already registered, he will be given choice to register a new online course in II Semester only. Finally, the performance of the student in the course will be evaluated as stipulated by the course provider. **CO 6:** A certificate will be issued on successful completion of the course by the course provider. The performance in the online course will not be considered for the calculation CGPA of the student. The online course will be listed in the grade sheets of the student.