SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited "A" Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

Department of Electrical and Electronics

Number of programmes where syllabus revision was carried out

SL. NO.	COURSE CODE	COURSE OFFERED
1	SECA1706	PRINCIPLES OF EMBEDDED SYSTEM DESIGN
2	: SECA2703	EMBEDDED AND DSP LAB

		L	**T**	**P**	**Credits**	**Total Marks**
SECA1706	**PRINCIPLES OF EMBEDDED SYSTEM DESIGN**	**3**	**0**	**0**	**3**	**100**

COURSE OBJECTIVES :
➢8 bit RISC microcontroller.
➢ARDUINO
➢ARM Processor
➢Real time operating system.

UNIT 1   RISC EMBEDDED CONTROLLER   9 Hrs.
Comparison of CISC and RISC controllers - PIC 16F877 architecture - Memory organization - Addressing modes - Assembly language instructions.

UNIT 2   ARDUINO   9 Hrs.
Introduction to ARDUINO, Architecture, overview of its I/O Ports, Serial Ports, PWM, ADC, Interfacing with different type of Sensors and Communication modules, Hardware timers, watchdogs and interrupt handling in Arduino. Controlling embedded system based devices using Arduino.

UNIT 3   ARM PROCESSOR BASED SoC and SoM   9 Hrs.
Overview of ARM 7 Architecture- Overview of Intel ARM based hard processor System on Chip (SoC) with an on chip FPGA - Overview of System on Module (SoM) using ARM based SoC.

UNIT 4   EMBEDDED NETWORKING   9 Hrs.
Embedded networking -RS 232 - RS485 - Inter-Integrated Circuit (I2C) - Serial Peripheral Interface (SPI) - Universal Serial Bus (USB) - Controller Area Network (CAN)- Ethernet- Distributed Embedded system

UNIT 5 EMBEDDED SOFTWARE DEVELOPMENT TOOLS and REAL TIME OPERATING SYSTEM   9Hrs.
Introduction to assembler - Compiler -Cross compilers -Linker/ Locators - Simulators - RToS - Desktop OS versus RTOs - Software architectures - Round Robin, Round-Robin with Interrupts, Function Queue Scheduling architecture - ISRs and Scheduling -Task management - Task scheduling - Race conditions - Priority Inversion -– Inter task Communication.

Max. 45 Hrs.

COURSE OUTCOMES :
On completion of the course, student will be able to
CO1 - Analyze the architecture, functionalities of PIC 16F877A Microcontroller and apply for addressing the Engineering problems.
CO2 – Develop knowledge and skills required to develop an real time embedded system using ARDUINO for addressing Engineering problems
CO3 – Analyze the architecture of ARM processor and concepts of SoC and SoM.
CO4 - Analyse the various standards and protocols used for embedded interfaces.
CO5 - Analyze various embedded software development tools.
CO6 - Evaluate the concept of RTOS in real time embedded system.

TEXT / REFERENCE BOOKS
1. Muhammed Ali Mazidi, Rolin D.Mckinlay, Dannycauscy, "PIC microcontrollers and embedded systems using assembly and C", 1st edition, Pearson, 2007.
2. Rajesh Singh, Anita Gehlot, Bhupendra Singh, and Sushabhan Choudhury," Arduino-Based Embedded Systems, CRC Press; 1 edition, November 2017.
3. Ashwin Pajankar, ARDUINO MADE SIMPLE: With Interactive Projects, BPB Publications, 2018.
4. Raj Kamal, "Embedded system-Architecture, Programming, Design", Tata McGraw Hill, 2011.
2. Sriram. V. Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", 2004 Tata McGraw Hill Publishing Company Limited, 2006.
3. Frank Vahid, Tony Givargis, 'Embedded system Design - A unified Hardware / software Introduction', John Wiley and Sons, 2002.
4. Todd D Morton, 'Embedded Microcontrollers', Reprint by 2005, Low Price Edition.
5. Muhammed Ali Mazidi, Janice Gillispie Mazidi, 'The 8051 Microcontroller and Embedded Systems', Low Price Edition, Second Impression 2006.
6.https://www.intel.com/content/dam/www/programmable/us/en/pdfs/literature/wp/wp-01167-custom-arm-soc.pdf
7. https://www.arm.com/resources/guide/designing-soc-with-cortex-m
8. https://www.microchip.com/design-centers/32-bit-mpus/sip-som/system-on-module

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100   Exam Duration: 3 Hrs.
PART A: 10 Question of 2 marks each – No choice   20 Marks
PART B: 2 Questions from each unit of internal choice; each carrying 16 marks   80 Marks

SECA2703	EMBEDDED AND DSP LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES
- To impart knowledge in basic of embedded programming using PIC16F877.
- To analyze the various application of embedded systems.
- To implement filters using MATLAB.

SUGGESTED LIST OF EXPERIMENTS
EMBEDDED LAB

Using PICF877

1. Basic illustration programs for arithmetic operations using PIC16F877.

2. Basic illustration programs for logical operations using PIC16F877.

3. Interfacing LED.

4. Illustration of TIMER.

5. Interfacing of LDR .

Using Arduino

6. Interfacing LCD for display.

7. Interfacing of sensors.

8. Interfacing with the wireless communication modules

9. Design of Stepper Motor Control System

10. Design of Temperature Monitoring System Using RF Modem

DSP LAB
Programs using MATLAB

1. Generation of Standard Signals.

2. Design of FIR filters using Windowing technique.

3. Design of IIR Filters using Butterworth filters.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Familiarize with the various basic operations using PIC16F877.

CO2 – Interface sensors and display units with microcontroller.

CO3 - Analyze the performance of TIMER and Interrupts.

CO4 - Design of microcontroller-based embedded systems.

CO5 - Explain the various signals using MATLAB.

CO6 - Design infinite and finite impulse response filter.