

Subject Code: 1ET2030108	Subject Title: Embedded Systems (Elective – I)
Pre-requisite :	None

Course Objective:

The objective of this course is to introduce students to learn introduction of embedded systems and discuss the important features of commercial embedded systems. This course is intended to explain the network for embedded systems, to study different issue with embedded systems. Students are expected to learn about the Introductory and Fundamental issues of Real Time Systems.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	-	2	4	60	40	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Introduction to Embedded Systems Definition of Embedded System, Embedded Systems Vs General Computing Systems, Embedded Hardware Units and Devices in a System, Embedded Software in a System, Examples of Embedded Systems, Design Process in Embedded System, Classification of Embedded Systems	3	10	
2	AVR Assembly Programming Language AVR Microcontroller Architecture, Register, AVR status register, ROM space and other hardware module, ATmega32 pin configuration & function of each pin, Branch, Call, and Time Delay Loop, AVR I/O Port Programming, AVR Timer Programming	6	25	
3	Programming the Embedded Systems Introduction to Assembly and Embedded C Language, Introduction to KEIL IDE and MPLAB IDE, Basics of Embedded C --Data types, Looping, Functions, Array, String, Pointers, I/O Programming in C, Arithmetic & Logical Operations in C, Data Serialization in C, Data Conversion in C	7	25	
4	Embedded System Design – Case Study : Interfacing LCD Display, Keypad Interfacing, ADC, DAC and Sensor Interfacing, DC Motor Control with PWM Generation, UART Interfacing, RTC interfacing, I2C Bus Interfacing	5	20	
5	Fundamentals of Operating Systems : Overview of OS Services and Goals, Various types of Real Time Operating Systems, Real Time Vs Conventional Operating Systems, Introduction to Embedded Operating Systems	3	10	
6	Basics of ARM Processor Introduction, ARM Architecture, ARM Assembly Language Programming, Instruction Set	2	10	

Review Presentation: The student is expected to spend minimum 2 hours per week (as mentioned in the teaching and evaluation scheme) to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (E.g. NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same.

Recommended sites for journal papers are (1) dl.acm.org (2) springer.com (3) sciencedirect.com (4) elsevier.com (5) ieeexplore.ieee.org (6) scholar.google.co.in (7) scopus.com or others of similar repute.

Course Outcome:

At the end of this course, the student would be able to:

- Understand how the Embedded Systems require most of the knowledge acquired during their study.
- Develop a firm and enlightened grasp of concepts of different issues related with network and database.
- Apply the ideas, the techniques, and the knowledge acquired for the purpose of Research on area of real time system.
- Working skills in theory and application of Embedded Systems.

List of References:

1. Kamal, Raj. Embedded systems 2E. Tata McGraw-Hill Education, 2008.
2. Wolf, Marilyn. Computers as components: principles of embedded computing system design. Elsevier, 2012.
3. Fursin, Grigori, et al. "Milepost gcc: Machine learning enabled self-tuning compiler." International Journal of Parallel Programming 39.3 (2011): 296-327.
4. Mazidi, Muhammad Ali, Sarmad Naimi, and Sepehr Naimi. AVR microcontroller and embedded systems: using assembly and C. Prentice Hall Press, 2010
5. Furber, Steve B. ARM system Architecture. Addison-Wesley Longman Publishing Co., Inc., 1996.

List of Experiments:

(Note: The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.)

1. Introduction of AVR kit with reference to embedded system.
2. Perform LED ON without Delay using AVR.
3. Perform Blinking LED using AVR (Control LEDs).
4. Driving a 7-Segment numerical Display.
5. Generate pattern by running LEDs using PWM.
6. Display a Text on LCD Display.
7. Introducing a Sensor – Flex Sensor.
8. Perform experiment on Humidity and Temperature Sensor.
9. Controlling a Stepper motor by switch according to reading from switch.
10. Controlling a Servo motor using AVR.
11. Introducing GSM Interfacing Board.
12. Introducing GPS Interfacing Board.
13. Introducing Wi-Fi Interfacing Board.