

PEI306: EMBEDDED SYSTEM FUNDAMENTALS AND PROGRAMMING

L	T	P	Cr
2	1	2	3.5

Course Objectives: To understand the concepts of embedded systems, to enable design and programming of embedded systems.

Introduction: Review of some 8-bit Microcontrollers, Introduction to Embedded Systems, Its Architecture and system Model, Introduction to the HCS12/S12X series Microcontrollers, Embedded Hardware Building Blocks.

HCS12 System Description and Programming: The HCS12 Hardware System, Modes of Operation, The B32 Memory System, The HCS12 DP256 Memory System, Exception Processing– Resets and Interrupts, Clock Functions, TIM, RTI, Serial Communications, SPI–Serial Peripheral Interface, I2C, HCS12 Analog-to-Digital Conversion System.

Basic Interfacing Concepts: Interfacing to Keypad, Motors, Graphic LCDs, The RS–232 Interface and their Examples.

Networking and Connectivity: Introduction to various networking techniques like I2C, Controller Area Network (CAN), IrDA, Bluetooth, Zigbee, Description of their protocols and applications in Sensor–Networking and Peripheral networking.

Development and Programming Tools: Hardware and Software development tools, C language programming, Dedicated Tools like Code-warrior tools: Project IDE, Compiler, Assembler and Debugger, JTAG and Hardware Debuggers, Interfacing Real Time Clock and its applications.

Real-time Operating Systems: Basic concepts of RTOS and its types, Concurrency, Reentrancy, Intertask communication, Implementation of RTOS with some case studies.

Laboratory Work: Various programming examples on HCS12 core, Interfacing of LCD, Motor, Keypad, ADC, RS232, USB, SPI, I2C.

Course learning outcome (CLO): After the completion of the course the students will be able to:

1. Implement basic hardware of HCS12/S12X series Microcontrollers.
2. Handle HCS12 System Programming and Serial Peripheral Interface Interfacing to Keypad, Motors, Graphic lcds.
3. Implement the Networking and Connectivity
4. Handle Development and Programming Tools, Hardware and Software development tools, C language
5. Implement Real-time Operating Systems

Recommended Books:

1. *Barrett, S.F. and Pack, J.D., Embedded Systems, Dorling Kingsley (2008).*
2. *Fredrick, M.C., Assembly and C programming for HCS12 Microcontrollers, Oxford University Press (2007) 2nd ed.*
3. *Haug, H.W., The HCS12 / 9S12: An Introduction to Software and Hardware Interfacing, Cengage Learning (2008).*

4. Ray, A.K., *Advance Microprocessors and Peripherals – Architecture, Programming and Interfacing*, Tata McGraw–Hill Publishing Company (2009) 2nd ed.
5. Di Paolo Emilio, Maurizio, *Embedded Systems Design for High-Speed Data Acquisition and Control*, Springer, (2014)

Evaluation Scheme:

Evaluation Elements	Weightage (%)
MST	20
EST	40
Sessionals (May include Assignments/ Projects/ Tutorials/ Quizes/ Lab Evaluations)	40