

UEI719: EMBEDDED CONTROL SYSTEMS

L T P Cr
3 1 2 4.5

Course Objectives: This course is intended to explain the various concepts used in embedded control systems. Students will also familiarize with real time operating systems.

Introduction: Introduction to Embedded Systems, Its Architecture and system Model, Introduction to the HCS12/S12X series Microcontrollers, Embedded Hardware Building Block.

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 Input /Output Interfacing Concepts: Input Devices, Output Devices and their Programming, Switch Debouncing, Interfacing to Motor, LCDs, Transducer, The RS-232 Interface and their Examples.

Development tools and Programming: Hardware and Software development tools, C language programming, Codewarrior tools- Project IDE, Compiler, Assembler and Debugger, JTAG and Hardware Debuggers, Interfacing Real Time Clock and Temperature Sensors with I2C and SPI bus.

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

Laboratory Work:

Programming of HCS12 with Code warrior for Interrupts, Clock Functions, TIM, RTI, SPI, LCD interfacing, Use of JTAG and Hardware Debuggers, Interfacing Keypad, ADC, DAC, LCD, Real Time Clock and Temperature Sensors with I2C and SPI bus.

COURSE LEARNING OUTCOME (CLO): The student will be able to

1. Explain the concept of embedded Systems and its architecture
2. Elucidate the concept of programming for different interfacing devices
3. Analyze various software and hardware tools
4. Explain real-time operating systems

Text Books:

1. Barrett, S.F. and Pack, J.D., *Embedded Systems*, Pearson Education (2008).
2. Haung, H.W., *The HCS12 / 9S12: An Introduction to Software and Hardware Interfacing*, Delmar Learning (2007).

Reference Books:

1. Fredrick, M.C., *Assembly and C programming for HCS12 Microcontrollers*, Oxford University Press (2005).
2. Ray, A.K., *Advance Microprocessors and Peripherals – Architecture, Programming and Interfacing*, Tata McGraw–Hill (2007).

Evaluation Scheme:

Sr. No.	Evaluation Elements	Weightage (%)
1	MST	25
2	EST	35
3	Sessionals (May include Assignments/Projects/Tutorials/Quizzes/Lab Evaluations)	40