

- C03009 -

- Microprocessor and Microcontroller -



Course Introduction

- Instructor
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 - Course materials: **BKeL**



What will you learn in this class?

- Understand microcontroller basics including all common interfaces.
- How to write an efficient firmware for embedded systems using the C programming language.

Why do you study this class?

- It is the implementation basic of all embedded, real time systems.
- This course is part of Computer Engineering program.

Learning Outcome

- **L.O.1 Understanding of the model of systems using Microprocessors - Microcontrollers**
 - L.O.1.1 – Fetching and executing an instruction from the system memory.
 - L.O.1.2 – Program counter, instruction decode and arithmetic and logic unit (ALU).
 - L.O.1.3 – The program memory and data memory, the busses.
 - L.O.1.4 – Methods of memory addressing.
 - L.O.1.5 – Conceptions of RISC and CISC.
 - L.O.1.6 – Conceptions of Microprocessors - Microcontrollers
- **L.O.2 Understanding of the Microprocessors - Microcontrollers architecture**
 - L.O.2.1 – Oscillator configuration.
 - L.O.2.2 – Reset.
 - L.O.2.3 – Memory organization.
 - L.O.2.4 – Reading operands from program memory.
 - L.O.2.5 – Program instruction sequencing.
 - L.O.2.6 – The CPU and its status bits.
 - L.O.2.7 – The special function registers.

Learning Outcome (cont)

- L.O.3 Understanding of the interrupt and its mechanism
 - L.O.3.1 – Analyze and demonstrate the operation of hardware interrupts.
 - L.O.3.2 – Understand the interrupt service routines (ISRs).
 - L.O.3.3 – Interrupt operations.
- L.O.4 Programming to parallel and serial peripheral interfaces
 - L.O.4.1 – Design basic parallel interface for I/Os.
 - L.O.4.2 – SPI, I2C, UART peripheral interfaces.
- L.O.5 Understand the timer operation and its usages.
 - L.O.5.1 – The timers are used for interval timing and event counting.
 - L.O.5.2 – The timer interrupts.
 - L.O.5.3 – Using timer to implement an embedded operating system.
 - L.O.5.4 – Using timer to implement a co-operative scheduler.

Learning Outcome (cont)

- L.O.6 Special features of Microprocessors - Microcontrollers
 - L.O.6.1 – Analog-to-Digital conversion (ADC).
 - L.O.6.2 – Capture, compare, and pulse width modulation (PWM) functions.
 - L.O.6.3 – Watchdog Timer (WDT).
- L.O.7 Understand a multi-stage system for Microprocessors - Microcontrollers.
 - L.O.7.1 – Design and implement a timed multi-stage system
 - L.O.7.2 – Design and implement a timed/input multi-stage system
- L.O.8 How to choose the right microcontroller?

Tentative Contents

- Microcontroller Basic
- Embedded Software Architectures
- Embedded C Programming
- Adding Structure To Your Code
- Multi-state Systems and Function Sequences
- Creating an Embedded Operating System
- A co-operative scheduler
- Special Functions
- How Do I Choose the Right MCU?

Grading Policy

- Grading
 - Lab: 30%
 - Midterm: 20%
 - Final Exam: 50%

- Presentation
 - Journal Articles
 - Related Topics



<https://www.hackster.io/projects?ref=topnav>
<http://www.electronicshub.org/iot-project-ideas>

Textbooks

- Michael J. Pont, Patterns for time-triggered embedded systems, 2001, Addison-Wesley / ACM Press
- Internet

QnA