# Philadelphia University

## Faculty of Engineering - Department of Computer Engineering

## Course Details:

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| **Title:** | Microprocessors and Microcontrollers (640328) |
| **Prerequisite:** | Logic Circuits (610220) |
| **Credit Hours:** | 3 credit hours (16 weeks per semester, approximately 44 contact hours) |
| **Textbook:** | "Designing Embedded Systems with PIC Microcontrollers: Principles and Applications", Second Edition, By: Tim Wilmshurst |
| **References:** | "Embedded Systems: Architecture, Programming & Design", by: R. Kamal, 1st edition, McGraw Hill, USA 2007.<br>"PIC Microcontroller and Embedded systems using assembly and C" by M. Mazidi, R. Mckinlay, D. Causey, Pearson Education 2008 |
| **Course Description:** | The course is an introduction to microcontroller-based embedded systems design, development and implementation. It includes embedded system types, microcontroller architecture, programming, I/O interfacing, interrupt management and other related topics. |

## Course Outline:

| Week | Topic |
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| 1 | Course Introduction<br>Review of Computer Basics |
| 2, 3 | PIC microcontroller:<br> - Architecture and Operation<br> - Instruction Set<br> - I/O Ports |
| 4, 5, 6 | PIC Programming, examples and simulation |
| 7, 8, 9 | Interfacing PIC with external Devices<br>(LEDs, Motors, LCDs...) |
| 10, 11, 12 | A/D conversion |
| 13 | I/O hardware |
| 14, 15 | Interrupts and timers |
| 16 | Review, and final exam |

## Course Learning Outcomes with reference to ABET Outcomes:

Upon successful completion of this course, the student should:

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| 1. | Identify an embedded system, and the components of the system | [1,7] |
| 2. | Be able to design and implement an embedded system | [1,2,6] |
| 3. | Understand the basic components of an embedded system | [1,7] |
| 4. | Understand the operation of PIC microcontroller | [1] |
| 5. | Interface various input/output devices to the PIC microcontroller | [2,7] |
| 6. | Have the ability to troubleshoot and fix a problem in an embedded system | [2,7] |

## Assessment Guidelines:

Evaluation of the student performance during the semester (total final mark) will be conducted according to the following activities:

**Sub-Exams:** The students will take a scheduled midterm written exam during the semester. The midterm will cover material given in lectures in the previous 6-7 weeks.

**Quizzes:** Quizzes of (10-15) minutes will be conducted during the semester.

**Course project:** The project is an implementation of a simple embedded system. It is divided into three graded phases, Design, Simulation, and Implementation. Each student should work individually on the project and it should be submitted before or on a set agreed date.
**Cheating by copying homework or project from others is strictly forbidden and punishable by awarding the work with zero mark.**

**Course Participation:** Discussions will be carried out during lectures. Individual students will be assessed accordingly.

**Final Exam:** The students will undergo a scheduled final exam at the end of the semester covering the whole materials taught in the course.

## Grading Policy:

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| Midterm | 30% |
| Course work activities<br> - Quizzes<br> - Project<br> - Class Discussions | 30% |
| Final Exam | 40% |
| Total: | 100% |

## Attendance Regulation:

The semester has in total 45 credit hours. Total absence hours from classes and tutorials must not exceed 15% of the total credit hours. Exceeding this limit without a medical or emergency excuse approved by the deanship will prohibit the student from sitting the final exam and a zero mark will be recorded for the course. If the excuse is approved by the deanship the student will be considered withdrawn from the course.