

University of Texas at El Paso
Department of Electrical and Computer Engineering

EE 4378 Microprocessor Systems II
Fall 2019 Syllabus

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Textbook: * Real-Time Systems Design and Analysis: Tools for the Practitioner
by Phillip A. Laplante, Seppo J. Ovaska, IEEE Press
* ESP32 Technical Reference Manual Espressif
* Kolban's Book on ESP32 by Neil Kolban
* The FreeRTOS Reference Manual (www.freertos.org)
Office hours: M,W 9:00 – 10:00 AM or by appointment

Co-requisite: EE 4178.

Pre-requisites: EE3176 and EE3376, each with a grade of "C" or better. Restricted to majors: EE, Comp Engr, CS.

Pre-requisites by topic: Assembly language programming, C programming, basic computer architecture, introductory embedded system design.

Course Description:

A study of a 16/32 bit microprocessor family and companion devices and various design aspects of microprocessor systems. EE4378 Lecture and EE4178 Laboratory provide an advanced treatment of the design of embedded microcomputer systems using a systems approach. Material includes a study of a modern reduced-instruction set processor for embedded applications, peripheral devices, high-level and assembly language software, and advanced topics such as real-time operating systems.

Course Outcomes:

Students completing this course and associated laboratory (EE4178) will be able to:

1. Design and implement embedded systems using an advanced microcontroller, a modular software system, I/O and other devices.
2. Understand major architectural features of advanced microcontrollers.
3. Apply concepts and principles of sensors, actuators, analog and digital signals, device interfaces, and communications to design systems
4. Understand and apply the principles of real-time processing to embedded system design

Topics:

- Introduction and Overview
- Embedded System Design Process
- Software Design
- I/O and Hardware-Software Synchronization
- Interrupt Synchronization
- Time Interfacing
- Analog Interfacing
- Data Acquisition Systems
- Communication Systems
- Real-Time Operating Systems

Grading:

- HW/Programs (10 %)
- Quizzes (10 %)
- Exam 1 & 2 (40 %)
- Project(s) (20 %)
- Final Exam (20 %)

Class Rules:

1. **Excused Absences.** If there is any medical or any other kind of emergency, please let the instructor know immediately.
2. **Academic Conduct.** It is expected that the students will conduct with integrity in all course areas. Do not attempt to engage in a dishonest activity such as copying, plagiarism, falsifying information, etc. The instructor will take measures to check such instances and will submit the case to the proper authorities. Website: <http://studentaffairs.utep.edu/Default.aspx?tabid=4386>
3. **Disability.** If you have a disability that requires accommodations, contact the Disabled Student Services Office at 747- 5148, or go to Room 106E Union. More information is available at: <http://studentaffairs.utep.edu/dsso>

Homework and Other Assignments:

- To obtain full credit, each assignment:
 - Must be turned in on time.
 - Must be properly documented
 - Hardware must function as required by the assignment
 - Software must compile and run without errors as required by the assignment
 - Must be turned in at the lab, with a hard copy, or via email as instructed
- You are encouraged to work in collaboration with classmates; however, each assignment must be done and turned in on an individual basis unless otherwise assigned.
- Graduate students will be assigned extra homework, and projects that require individual critical thinking and design.

Relationship to ECE Undergraduate Program Outcomes:

- b. Have an ability to design and conduct experiments and interpret data. Students have lab assignments to design various aspects of a system based on an embedded microprocessor.
- c. have an ability to design a system, component, or process to meet desired needs. There is a final project where each student designs and implements a system with an embedded microprocessor.
- e. Have an ability to identify, formulate, and solve engineering problems. In the final project, students will use laboratory equipment to test and debug their designs.
- g. Have an ability to communicate effectively. A final report for the final project is required.
- k. Have an ability to use techniques, skills, and modern engineering tools necessary for modern engineering practice. Assignments and test problems are given that are related to major architectural features of modern embedded processors.