Department of Electrical and Computer Engineering
ECE 1175 Embedded Systems Design

Course Objectives:

This course introduces the challenges, methodologies, techniques, and issues for designing embedded computing systems. Examples of these systems include sensors, PDAs, automobile components, home appliances, and the recently popularized smartphones. The recommended background of this course is basic understanding of computer architecture and distributed systems. There will be programming assignments and projects in this course, so basic programming skills are also required.

Upon completion of this course, every student should have gained:
1. An understanding of the generic design, analysis, and implementation of embedded systems.
2. A broad familiarity of the system-level design on both hardware and software aspects.
3. A basic mastery of system programming skills over embedded computing platforms, such as embedded sensors and Raspberry Pi devices. The students will also gain experiences of developing realistic embedded system applications under embedded OSes such as embedded Linux through team projects.

Textbooks and/or Other Material:
Suggested Textbook:
Computers as Components: Principles of Embedded Computing System Design. Marilyn Wolf, 3rd edition, Morgan Kaufmann, 2012.
Available online at: https://pitt.primo.exlibrisgroup.com/permalink/01PITT_INST/g3767l/alma9998575204906236

References:
Introduction to Embedded Systems: A Cyber-Physical System Approach. Edward Ashford Lee and Sanjit Seshia, ISBN 978-0-557-70857-4, 2011. Download available at: http://leeseshia.org/releases/LeeSeshia_DigitalV1_06.pdf

Embedded Systems: A Contemporary Design Tool. James Peckol, Wiley, 2011.

Topics Covered:
Microprocessors
CPUs, I/O, caches, performance and power
Devices, memory and busses
Embedded computing platform
Embedded program design and analysis
Program representations, compilation and testing
Power management, power-aware computing
Operating System basics
Embedded and real-time operating systems
Real-time scheduling
Embedded system programming

Grading Policy:
Homework Assignments (4): 15%. HW1: 3%, HW2 – HW4: 4% each
Lab Assignments (5): 30% - 6% each
Midterm exam: 25%
Final Exam: 25%
Participation: 5%

Academic Integrity:
All programs turned in for credit must be each student's own work. Students **must** write their own programs and problem solutions from scratch independently. **No collaboration** is allowed for lab assignments. **Closed-book** exams. **No discussion** is allowed during exams. Any violations will result in a ***minimum penalty of a zero*** on the given assignment or exam.

Disability Statement:
Any student who feels s/he may need an accommodation based on the impact of a disability should contact the Office of Disability Services at 412-648-7910 to coordinate reasonable accommodations for students with documented disabilities.

ABET Evaluation:

This course is designed to meet ABET accreditation requirements and contribute to student attainment of the following ABET outcomes:

- Outcome 1: identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics: Complex engineering problems include one or more of the following characteristics: involving wide-ranging or conflicting technical issues, having no obvious solution, addressing problems not encompassed by current standards and codes, involving diverse groups of stakeholders, including many component parts or sub-problems, involving multiple disciplines, or having significant consequences in a range of contexts.
- Outcome 2: apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- Outcome 3: communicate effectively with a range of audiences
- Outcome 6: develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions