Course Information

- **ECE 56800, Embedded Systems**
- **CRNs:**
  - On-campus: 17687-WNG
  - On-campus online: 15293-003
  - Fully online: 69834-EPE
- **Meeting day(s) and time(s)**: Tuesdays and Thursdays, 3-4:15 PM in WANG 2599
- **Instructional Modality:** This course is offered to both on-campus and online students.
  - On-campus students: You should attend class as specified above.
  - Online students: There are no in-person meetings for online students. All course materials will be available in Brightspace.
- **Course credit hours: 3**
- **Prerequisites:** ECE 43700, Computer Design and Prototyping or similar knowledge and skills.

Instructor Contact Information

- **Name of the instructor:** Younghyun Kim
- **Office Location:** BHEE 313A
- **Office Phone Number:** To be updated
- **Purdue Email Address:** yhkim1@purdue.edu
- **Student consultation hours, times, and location**: See Brightspace

Course Description

This course provides an introduction to the design of embedded and ubiquitous computing systems including their hardware and software architectures, design methodologies and tools, and communication protocols. The lectures are organized into three parts namely, (a) basic design principles including specification and modeling, hardware components and platforms, software organization, embedded and real-time operating systems, interfacing with external environments using sensors and actuators, and communication in distributed embedded systems, (b) advanced topics such as energy management, safety and reliability, and security, and (c) case-studies of real-world systems from a variety of embedded application domains such as biomedical devices, smart cards and RFID, networked sensors, personal computing devices, home appliances and electronics, mobile robotics, etc. In addition to hands-on programming assignments using off-the-shelf embedded system development kits, the course will feature a comprehensive project where students will design, implement, and evaluate a prototype embedded system.

Learning Resources, Technology & Texts

- **Textbook:** None
  - Reading material on course topics will be provided.
- **Hardware requirements:** Lab assignments will require an off-the-shelf embedded development kit. Additional details will be provided.

Learning Outcomes

- To learn about the fundamental technology enablers and trends that have led to the proliferation of embedded systems and the rise of the Internet of Things
- To review how embedded platforms are designed, how their hardware components work and interface to each other
- To learn about various software architectures used in embedded systems and when each of these should be considered for use
- To learn advanced design techniques for optimizing performance, power consumption, reliability, and security in embedded systems
- To gain hands-on knowledge and experience with programming and debugging embedded platforms
- To design and implement distributed applications for networked embedded systems
- To gain experience in reading embedded systems technical literature such as component data-sheets and product manuals

Assignments

Assessments in this course include the following; note that this information is subject to change:

Type	Description	Grade Component
Lab assignments & project	Three to five lab assignments using off-the-shelf embedded development kits	50%
Paper summaries and review article	Write short reviews/critiques of selected papers and an overview of a specific topic	25%
Exam	One midterm in April	25%
Bonus credit	To be determined	

Attendance Policy

This course follows the University Academic Regulations regarding class attendance, which state that students are expected to be present for every meeting of the classes in which they are enrolled. When conflicts or absences can be anticipated, such as for many University-sponsored activities and religious observations, you should inform me of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification to is not possible, contact me as soon as possible by email or phone. For absences that do not fall under excused absence regulations (see below), please notify me by email.

For cases that fall under **excused absence regulations**, you or your representative should contact or go to the Office of the Dean of Students (ODOS) website to complete appropriate forms for instructor notification. Under academic regulations, excused absences may be granted by ODOS for cases of grief/bereavement, military service, jury duty, parenting leave, or emergent medical care. The processes are detailed, so plan ahead.

Academic Integrity

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information is

submitted the greater the opportunity for the university to investigate the concern. More details are available on our course Brightspace under University Policies and Statements.

Copyright

See the University Policies and Statements section of Brightspace for guidance on Use of Copyrighted Materials. Effective learning environments provide opportunities for students to reflect, explore new ideas, post opinions openly, and have the freedom to change those opinions over time. Students and instructors are the authors of the works they create in the learning environment. As authors, they own the copyright in their works subject only to the university's right to use those works for educational purposes Students may not copy, reproduce, or post to any other outlet (e.g., YouTube, Facebook, or other open media sources or websites) any work in which they are not the sole or joint author or have not obtained the permission of the author(s).

Nondiscrimination Statement

Purdue University is committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. A hyperlink to Purdue's full Nondiscrimination Policy Statement is included in our course Brightspace under University Policies and Statements.

Mental Health/Wellness Statement

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try Therapy Assistance Online (TAO), a new web and app-based mental health resource available courtesy of Purdue Counseling and Psychological Services (CAPS)**.** TAO is available to students, faculty, and staff at any time.

If you need support and information about options and resources, please contact or see the Office of the Dean of Students. Call 765-494-1747. Hours of operation are M-F, 8 a.m.- 5 p.m.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc., sign up for free one-on-one virtual or in-person sessions with a Purdue Wellness Coach at RecWell. Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is free and can be done on BoilerConnect.

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

Basic Needs Security

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed and Student Support Services is available to serve students 8 a.m.-5 p.m. Monday through Friday.

Emergency Preparation

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

A link to Purdue's Information on Emergency Preparation and Planning is located on our Brightspace under "University Policies and Statements." This website covers topics such as Severe Weather Guidance, Emergency Plans, and a place to sign up for the Emergency Warning Notification System. I encourage you to download and review the *Emergency Preparedness for Classrooms document (PDF) or (Word)*.

The first day of class, I will review the **Emergency Preparedness plan for our specific classroom**, following Purdue's required Emergency Preparedness Briefing. Please make note of items like:

- The location to where we will proceed after evacuating the building if we hear a fire alarm.
- The location of our Shelter in Place in the event of a tornado warning.
- The location of our Shelter in Place in the event of an active threat such as a shooting.

Accessibility

Ensuring that Purdue students have access to equitable learning experiences is a University-level commitment and is the responsibility of all members of the Purdue community. The Disability Resource Center (DRC) is a key partner in this work and is a resource for students and instructors.

The Student Services widget in Brightspace links to the DRC. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247