



EEE 6765

**Advanced Embedded Systems Design and
Implementation for IoT Applications**

Section: RVC

Internet/Fully Online

Spring Term 2026

Course Time Zone: Eastern Time (ET). Course due dates and times are according to this time zone.

Professor Information

Ou Bai, Ph.D.

Roles: Primary Instructor

Email: obai@fiu.edu

Response Time: Within 48 hours

Phone: (305) 348-3704

Office Hours: By appointment with a Zoom meeting. Please send an email to the instructor to make an appointment. Please include your name, preferred time (give three if possible), how long is needed, what to discuss, and other necessary information.

Office Location: 10555 W. Flagler Street, Room EC3954

Website: hcps.fiu.edu

Department or Academic Unit: Department of Electrical and Computer Engineering

Course Prerequisites

Course prerequisites, if any, are listed below.

Course Description

This course provides a comprehensive introduction to designing and implementing hardware for Internet-of-Things (IoT) devices using industry-standard PCB software tools. Students will gain hands-on experience in schematic design, board layout, and custom component library creation using Autodesk Fusion 360 ECAD (previously known as Eagle PCB). The course progresses from fundamental microcontroller and sensor interfaces to industrial-level PCB design workflows. Students will also complete an IoT hardware design project involving the creation of schematics, PCB layout, component libraries, and system documentation for a real-world embedded IoT device for a specific industry domain, including sports, cities/transportation, home, retail, and healthcare.

Textbook and Course Materials

Fast and Effective Embedded Systems Design

Required/Recommended: Recommended

Authors: Tim Wilmshurst, Rob Toulson, Tom Spink

Publisher: Newnes

Publication Date: November 20, 2024

Copyright Date: November 20, 2024

ISBN 10: N/A

ISBN 13: 9780323951975

Description: Fast and Effective Embedded Systems Design, Third Edition is a fast-moving introduction to embedded systems design, applying the innovative Arm mbed “ecosystem,” including both hardware components and its web-based development environment.

Chapters/Pages: 560

Readings, Materials, and Open Educational Resources (OER)

Autodesk Fusion 360 (free Education version): <https://www.autodesk.com/education/edu-software/overview?sorting=featured&filters=individual#>

Student Learning Outcomes/Objectives

- Explain core principles of embedded systems, microcontrollers, and IoT hardware architectures.
- Design complete IoT hardware systems including subsystem partitioning and component selection.
- Create professional schematics, PCB layouts, and custom component libraries using ECAD tools.
- Evaluate hardware designs for correctness, manufacturability, signal integrity, and performance constraints.
- Integrate and optimize microcontrollers, sensors, RF modules, and power circuits into cohesive IoT devices.

- Produce and communicate professional engineering documentation for embedded hardware design.

Expectations of this Course

This is an online course, which means most (if not all) of the course work will be conducted online. Expectations for performance in an online course are the same as a traditional course. In fact, online courses require a degree of self-motivation, self-discipline, and technology skills which can make these courses more demanding for some students.

Students are expected to:

- **review the getting started** page located in the course modules;
- **introduce yourself to the class** during the first week by posting a self-introduction in the appropriate discussion;
- **take the practice quiz** to ensure that your computer is compatible with the learning management system, Canvas;
- **interact** online with instructor and peers;
- **review** and follow the course calendar and weekly outlines;
- **log in** to the course **3 times** per week;
- **respond** to discussions by the due date specified. **No late work will be accepted;**
- **respond to emails** within **2 days**;
- **submit** assignments by the corresponding deadline.

The instructor will:

- respond to **emails** within **24 hours**;

- grade assignments and/or provide feedback within 7 **days** of the assignment deadline.

Assignments & Assessments

University's Code of Academic Integrity

Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct that demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.

More information can be found at http://academic.fiu.edu/academic_misconduct.html

Department Regulations Concerning Incomplete Grades

To qualify for an Incomplete, a student:

- Must contact (e.g., by phone, email, etc.) the instructor or secretary before or during the missed portion of the class.
- Must pass the course before the part of the course that is not completed
- Must make up the incomplete work through the instructor of the course
- Must see the instructor. All missed work must be finished before the last two weeks of the following term.

University policies on sexual harassment, religious holidays, and information on services for students with disabilities

- Please visit the following websites: <http://academic.fiu.edu/> and <http://drc.fiu.edu>.

Course Policies:

- **Academic Misconduct:** For work submitted, it is expected that each student will submit their original work. Any evidence of duplication, cheating, or plagiarism will result in at least a failing grade for the course.
- **Deadlines:** Home and project assignments are due on the date specified. Students should check Canvas for the due dates for each assignment. Assignments submitted late (within 1 week) will receive half credit.
- **Assistance in Learning:** Students are encouraged to ask questions and discuss course topics with the instructor and with each other. To get assistance from the instructor, students can make an appointment via email.
- **Any work submitted should be signified as the students' work and that no unauthorized help was obtained.**
- **DO NOT** send assignments by email.
- The instructor reserves the right to change course materials or dates as necessary.

AI Use Policies:

Artificial intelligence (AI) tools, such as ChatGPT, Claude, and Perplexity, as well as other generative platforms, can be valuable resources when used appropriately. To support student learning while maintaining academic integrity, the following AI policies apply to this course:

Permitted Use for Learning and Preparation:

- Students are encouraged to use AI tools as learning aids when preparing for assignments or exams. This includes using AI to clarify concepts, work through textbook problems, and review the material.

- Use of AI in this context should supplement, but not replace, your own efforts to understand the material.

Prohibited Use of AI on Course Assessments:

- The use of AI tools is strictly prohibited during any graded assessments, including exams and home assignments, unless explicitly stated otherwise.
- Violations will be treated as academic misconduct and subject to university disciplinary procedures.

Assignment-Specific Use:

- AI tools may only be used for assignments when explicitly permitted. Any such assignments will include specific guidance on how AI may or may not be used.
- When AI use is permitted, students must clearly disclose how and where AI tools were used (e.g., “ChatGPT was used to generate initial outlines” or “AI was used to check grammar”).

Responsibility and Academic Integrity:

- Students remain fully responsible for the accuracy and integrity of all submitted work, regardless of AI involvement.
- Misuse of AI undermines the learning process and may result in academic penalties.

If you are uncertain whether a specific use of AI is permitted, please contact the instructor for clarification before using it.

Assessment Policy:

To mitigate any issues with your computer and online assessments, you must take the Assignments from a computer you will be using to take your graded

assignments. Assessments in this course are not compatible with mobile devices and should not be taken through a mobile phone or a tablet.

Exams:

N/A

Assignments:

- There are eleven (11) assignments (MCQs and Design Documents) in this course for learning enhancement, as well as review of the course materials.
- Check the Canvas schedule for dates.
- Assignments are open books and notes
- Assignments are individual work
- For MCQ assignments, each assignment has 15 MCQs, and there is no time limit to complete the assignments
- Students are encouraged to make multiple attempts for each assignment; each attempt might have a different set of MCQs
- Once an answer is chosen, the correct response is given

Project:

- There are two (2) assignments for the project
- Check the Canvas schedule for dates
- The project instructions are provided in Canvas Modules
- Submit your work (Report and Design Documents) using the submission form provided in each assignment
- Project is individual work

Grading

Course Grades Distribution Table

Course Requirements	Number of Items	Points for Each	Total Points Available	Weight
Assignments	11	100	1100	70%
Project	2	100	200	30%
Total	10	—	1,000	100%

Letter Grade Distribution Table

Letter Grade	Sample Range %
A	95 to 100
A-	90 to 94.99
B+	87 to 89.99
B	83 to 86.99
B-	80 to 82.99
C+	77 to 79.99
C	70 to 76.99
D	60 to 69.99
F	0 to 59.99

Schedule of Topics

This is a tentative schedule. Please refer to the updated schedule including assignment due dates in the Module.

Week	Topics and Tasks
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<p>1 01/05</p>	<p>Course Introduction Course Syllabus and Schedule Embedded Systems Design and Implementation for IoT Applications Assignment (1) - MCQs</p>
<p>2 01/12</p>	<p>Fundamentals of Embedded Systems and IoT Microprocessor and Microcontroller UART, I²C, and SPI Bus Assignment (2) - MCQs</p>
<p>3 01/19</p>	<p>Fundamentals of PCB Design Introduction to PCB Design PCB Algorithms Assignment (3) - MCQs</p>
<p>4 01/26</p>	<p>PCB Design Drill: Schematic Autodesk Fusion 360 ECAD Software Installation Tutorial for PCB Design using Autodesk Fusion 360 ECAD Software: PCB Schematic Design Assignment (4): PCB Design Drill Schematic and Bill of materials (BoM)</p>
<p>5 02/02</p>	<p>PCB Design Drill: Board Layout Tutorial for PCB Design using Autodesk Fusion 360 ECAD Software: Board Layout Design Assignment (5): PCB Design Drill Board Layout</p>
<p>6 02/09</p>	<p>PCB Design Drill: Component Library Tutorial for PCB Design using Eagle ECAD Software: Custom Component (FT230) Library Assignment (6): PCB Design Component (FT230) Library</p>
<p>7 02/16</p>	<p>PCB Design Practice: Component Library Industrial-Level PCB Design Practice: Custom Component Library for CC3200 Module (E103-W02) in the CyberSens-EDU Device Assignment (7): PCB Design Practice - Component (E103-W02 Module) Library</p>
<p>8, 9 02/23, 03/02</p>	<p>PCB Design Practice: Schematic Industrial-Level PCB Design Practice: Schematic Design for CyberSens-EDU Device Assignment (8): PCB Design Practice – CyberSens-EDU Schematic and Bill of materials (BoM)</p>
<p>10 03/09</p>	<p>PCB Design Practice: Board Layout (I) Industrial-Level PCB Design Practice: Board Layout Design for CyberSens-EDU Device Assignment (9): PCB Design Practice – CyberSens-EDU Board Layout (Original Board Size of 90x55mm²)</p>

<p>11 03/16</p>	<p>PCB Design Practice: Board Layout (II) Industrial-Level PCB Design Practice: Board Layout Design for CyberSens-EDU Device - Component placement and optimization on a board with a size at least 20% smaller one the current design Assignment (10): PCB Design Practice – CyberSens-EDU Board Layout (Reduced Board Size of 90x55mm²)</p>
<p>12 03/23</p>	<p>MCU-Embedded Device Design Microcontroller-Embedded IoT Device Hardware System Design: An example of SimpleLink™ Wi-Fi® CC3200 Smart Plug Design Assignment (11) - MCQs</p>
<p>13, 14 03/30, 04/06</p>	<p>Real-World Embedded Systems/IoT Device Design (I) System Description: Introduction and Featured Applications Device Features Block Diagram and Functional Block Diagram Subsystem (e.g., Power Supply) Architecture and Circuits Design Project (1): Report of Device Design (Word or PowerPoints) – System Description, Device Features, and Subsystem Architecture and Circuits</p>
<p>15, 16 04/13, 04/20</p>	<p>Real-World Embedded Systems/IoT Device Design (II) Device PCB Design Project (2): Schematic and BoM, Board Layout, and Custom Component Library (if available)</p>

Course Communication

Communication in this course will take place via **the Canvas Inbox**. Check out the [Canvas Conversations Tutorial](#) or [Canvas Guide](#) to learn how to communicate with your instructor and peers using Announcements, Discussions, and the Inbox.

I will respond to all correspondence within **2 days**.

Policies & Resources

Before starting this course, please review the Policies & Resources Page in Canvas, which includes comprehensive information on various University and Course Level Policies, such as:

- University Policies
- Accessibility and Accommodations
- Online Etiquette
- Technical Requirements and Skills
- Computer & Digital Literacy Skills
- Course Technology Accessibility Statements and Privacy Policies
- Academic Integrity
- Copyright Statement
- Nondiscrimination Statement
- Panthers Care & Counseling and Psychological Services (CAPS)
- Fair Use Policy

Zoom Video Conference

Zoom is a video conference tool that you can use to interact with your professor and fellow students by sharing screens, chatting, broadcasting live video/audio, and taking part in other interactive online activities.

Zoom meetings can be accessed via the Zoom link in the course navigation menu. Once you click on the Zoom link, it will route you to join the meeting for the respective class session. You will also be able to view upcoming meetings, previous meetings that you have already joined, and meeting recordings. Before joining an actual class session:

- Reference the [Zoom Student Tutorials](#) to learn about the tool, how to access your meeting room, and share your screen.

- Access the [Zoom Test Meeting Room](#) to test out the software before joining an actual session.

If you encounter any technical difficulties, please contact the [FIU Canvas Help Team](#). Please ensure you contact support immediately upon the issue occurring.

Nondiscrimination Statement

The **Office of Civil Rights Compliance and Accessibility** (CRCA) is responsible for ensuring that FIU maintains a workplace and learning environment free from discrimination, where current and prospective faculty, staff, and students are treated equitably. If any student, employee, or applicant has a sincere and reasonable belief that they have been discriminated against or harassed based on age, color, disability, marital status, ethnic or national origin, race, religion, retaliation, sex, or any other protected category, they can report their concerns to the CRCA team through report.fiu.edu.

