Instructor

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Lab Hours

Mo 1:30 PM – 3:00 PM and We 1:30 PM – 4:45 PM, Room 502 in 14 E Jackson

Course Web Page

This syllabus, as well as the class lecture notes, homework assignments, and other links, are available on D2L. Please check the D2L news/discussion forum regularly.

Course Description

CSE 331 is the first in a three-course sequence that provides a comprehensive overview of core CPS topics in an application-driven context and with an emphasis on fundamental engineering design principles of modularity and abstraction. This first course focuses on developing the fundamental skills required to understand, analyze, design, test, and validate cyber-physical systems. The course introduces mathematical and software tools required to analyze various circuit elements and assemblies thereof. The class consists of two weekly lab sessions; 1.5 hours (online via ZOOM) of discussions covering the material and methods and 3 hours (onsite)of lab exercises to solidify the theory components covered in the class via hands of experiments in the context of designing, analyzing, managing, and testing hardware devices and building cyber-physical system prototypes.

Course Objectives

In this course, students will:

- Experience working in groups.
- Apply mathematical techniques to analyze and develop cyber-physical systems.
- Learn MATLAB and MATLAB Simulink to model and analyze cyber-physical systems.
- Work in and be familiar with elements of physical systems such as passive and active electronic components.
- Learn to use electronic measurement systems to test and debug physical systems.
- Utilize mathematical tools to design and predict cyber-physical system behavior.
- Describe cyber-physical systems based on system outputs.

Prerequisites

Students must also have taken MAT 262 and PHY 172 and CSC 374 (or Instructor approval). Also, students must have passed these courses or have been waived out of them. More to the point, students must already know how to solve simultaneous equations, matrix manipulation, and differential equations. Software tools will be used to solve and analyze mathematical relationships governing various cyber-physical systems. If you have any questions, refer to the Instructor.

Important:

- This is both lecture/discussion-based and hands-on class. Students are strongly advised to take part in all the sessions. Students are not permitted to enter 15 minutes after class has started. Use of portable electronic devices is prohibited.
- Labs are group activities. Each group has two/three members. Please find a group member by the end of the first lab. Let the Instructor know if you have difficulties getting into a group before the second meeting.
- You can change groups, but it is difficult if you are the only group that needs a change in the class.
- In group submissions, identify (percentage-wise) member contributions if the contribution is not even.
- Homework should be completed individually.
- Please use the electronic components distributed to you for lab assignments and electrical measurement instruments with care.
- The CPSE lab has three workstations and workbenches equipped with required software and hardware needed to complete homework, lab assignments. The lab will be kept open 20 hrs/week outside class hours.

Course Format

The course provides the material you will need to understand the fundamental concepts covered during course, including:

- Lectures (1.5 hrs/week) [online].
- Weekly lab (3 hrs/week) for hands-on analyzing assembling, testing, and validating physical systems.
- Weekly lab and homework assignments.
- Resources such as videos, notes, and code files via D2L.
- Self-Assessment resources on D2L, including lecture questions/answers, and unit quizzes/solutions, to assess your progress and understanding.
- Final exam to assess the understanding of the material covered in class.

Textbooks (Required)

Electronics Fundamentals: Circuits, Devices & Applications (8th Edition) by Thomas L. Floyd and David M. Buchla (https://www.amazon.com/dp/0135072956), 2009.

Getting started with MATLAB (Free) (https://www.mathworks.com/help/matlab/). Available as

a PDF (the link is on the upper right corner). You need to sign in to download.

Getting started with MATLAB Simulink (Free) (https://www.mathworks.com/help/simulink/index.html). Available as a PDF (the link is on the upper right corner). You need to sign in to download.

Grading

The course grade is apportioned as follows:

- Homework 25%
- Lab assignments and reports 45%
- Final Exam 25%
- Participation 5%

Homework: Homework (PDF version; no hard copies will be provided in class) will be available on D2L. Complete and submit by the deadline.

Labs Assignments: Lab exercises (PDF version, no hard copies will be provided in class) will be available on D2L. You will need to complete lab assignments, prepare a lab report based on material covered, and submit (via D2L) the weekly assignment before the next class meeting.

Final Exam: Instructions will be posted on D2L.

Participation: Your participation in the quizzes, labs, and the final project will be noted and graded out of 5% assigned for the final grade.

The grading rubric for normalized marks:

A	A-	B+	B	B-	C+
95-100	91-94	88-90	85-87	81-84	77-80
C	**C-**	**D+**	**D**	**F**	**I**
73-76	69-72	65-68	61-64	0-60	*

* Incomplete: An incomplete grade is given only for an exceptional reason such as a death in the family, a severe illness, etc. Any such reason must be documented. Any incomplete request must be made at least two weeks before the final and approved by the Dean of CDM. Any consequences resulting from a poor grade for the course will not be considered as valid reasons for such a request.

To do well in this course: To do well in this course, you should come to class regularly, participate in the discussion and lab activities, read the assigned readings each week as indicated in the homework assignments, and talk to the Instructor promptly if you have any problems.

Policies

Deadlines for adds, drops, and withdraws

See the deadlines in https://academics.depaul.edu/calendar/Pages/default.aspx

COVID Safety

More information regarding university policies and best practices at https://resources.depaul.edu/coronavirus/Pages/default.aspx

Changes to Syllabus

This syllabus is subject to change as necessary during the quarter. If a change occurs, it will be thoroughly addressed during class, posted under Announcements in D2L, and sent via email.

Online Course Evaluations

Evaluations are a way for students to provide valuable feedback regarding their Instructor and the course. Detailed feedback will enable the Instructor to continuously tailor teaching methods and course content to meet the learning goals of the course and the academic needs of the students. They are a requirement of the course and are critical to continue to provide students with the highest quality of teaching. The evaluations are anonymous; the Instructor and administration do not track who entered what responses. A program is used to check if the student completed the evaluations, but the evaluation is separate from the student's identity. Since 100% participation is our goal, students are sent periodic reminders over three weeks. Students do not receive reminders once they complete the evaluation. Students complete the evaluation online in CampusConnect.

Academic Integrity and Plagiarism

This course will be subject to the university's academic integrity policy; the following is an excerpt from the policy. More information is available at http://academicintegrity.depaul.edu/. If you have any questions, be sure to consult with the instructor.

Academic Policies

All students are required to manage their class schedules each term in accordance with the deadlines for enrolling and withdrawing, as indicated in the University Academic Calendar. Information on enrollment, withdrawal, grading, and incompletes can be found at http://www.cdm.depaul.edu/Current%20Students/Pages/PoliciesandProcedures.aspx

Students with Disabilities

Students who feel they may need an accommodation based on the impact of a disability should contact me in private as early as possible in the quarter (preferably within the first week of class), to discuss their specific needs, and make sure that you have contacted the Center for Students with Disabilities (CSD). All discussions will remain confidential.

Syllabus

1. Introduction
   Overview, Safety guidelines & protocols

2. MATLAB
   Introduction, Fundamentals, Vectors, Plots, Matrices, Differential equations

3. MATLAB Simulink
   Introduction, Simscape

4. Voltage sources
   DC/AC supplies, Characteristics

5. Passive circuit components
   Fundamentals of electricity, Ohm's law, Series/parallel circuits

6. Testing and Measurement Equipment
   Power supplies, Digital multimeters, Function generator, Digital oscilloscope

7. Nodal analysis
   Kirchhoff voltage, current law, Norton equivalence, Thevenin equivalence

8. AC circuit analysis
   Passive filters, RL/RLC circuits, Resonance, Time response, Frequency response

9. Diodes
   Biasing, Bridges, Zener diodes, Applications

10. Transistors
    Common biasing schemes, Amplifiers, Applications

11. Digital circuits
    Diode-Transistor logic, Transistor-Transistor Logic

12. Operational amplifiers
    Topologies, Special-purpose amplifiers