Spring
2021

SCUPI
Sichuan University - Pittsburgh Institute

MEMS 1049 Mechatronics

(Modifications to this syllabus may be required during the semester. Any changes to the syllabus will be announced in class or posted on the course website.)

Instructor: Qi (Michael) Lu, Ph.D.
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Grading Teaching Assistant:
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Lab Teaching Assistants:
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Office Hours: Wednesday 12:00 - 2:00 PM
Thursday 1:00 - 2:00 PM

Note: when emailing the instructor, lab engineer or the teaching assistants, please

- Include the course number, your name and your student number in the subject field of your message;
- Use your university email account.

Lecture time/location: Thursday 10:15 - 11:55 AM/Zone 3-311

Laboratory location: Zone 3-116

Laboratory times: Tuesday 1:50 PM– 3:20 PM
Tuesday 3:30 PM– 5:00 PM

Catalog Description:

3 Credits; An introduction to mechatronics, or the interfacing of mechanical and electrical systems. Focus is on embedded controllers and their programming, actuators, sensors, and integration of these components to create a complete functional automated mechatronic system. Gain hands-on experience with mechatronic system modelling, control algorithm design and implementation.

Course Objective:

At the completion of this course, students will be able to

- Develop an understanding of a laboratory environment and safe practice techniques.
- Become familiar with mechatronic systems, feedback control principle, the integration of the electronics with the mechanical system.
- Learn how to use data acquisition hardware, software and their interfacing.
- Learn how to use the high-level graphical programming tools to implement real-time computation tasks.
- Design and implement a mechatronics system.

Preferred Prerequisites:

ME 1045 Automatic Controls, ME 1041 Mechanical Measurements 1

Website: https://learn.scupi.cn/

Topics Covered:

Topic 1: Graphical Programming Tools
Graphical Programming Tools Environment
Application Programming
Using Loops
Data Structure
Modularity

Topic 2: Sensors
Angular Displacement
Distance and Proximity
Pressure
Contact
Inertial Measurement

Topic 3: Actuators
DC Motor Modelling
DC Motor Position Control

Topic 4: Control System
Inverted Pendulum Modelling
Pole Placement
Optimal Control-Linear Quadratic Regulator
Swing-Up Hybrid Control

Course Schedule:

Week	Lecture	Lab
1	March 4 Course Introduction	March 9 Lab Safety
2	March 11 Graphical Programming Tools	March 16 No Lab
3	March 18 Graphical Programming Tools	March 23 No Lab

4	March 25 Graphical Programming Tools	March 30 No Lab
5	April 1 Angular Displacement	April 6 Lab 1
6	April 8 Distance and Proximity	April 13 Lab 2
7	April 15 Pressure	April 20 Lab 3
8	April 22 Contact	April 27 Lab 4
9	April 29 Inertial Measurement	May 4 Lab 5
10	May 6 DC Motor Control	May 11 Lab 6
11	May 13 Inverted Pendulum Modelling	May 18 Lab 7
12	May 20 Pole Placement	May 25 Lab 8
13	May 27 Optimal Control	June 1 Lab 9
14	June 3 Swing-Up Hybrid Control	June 8 Lab 10
15	June 10 Project	June 15 Project
16	June 17 Project	June 22 Project
17	June 24 Project	June 29 Project
18	July 1 Project Demo	

Course Gradings:

- Studio work 20 %
- Lab reports 40 %
- Final project 40%
  - Demonstration
    - Peer review 10 %
    - Instructor/TA grading 10 %
  - Report
    - Peer review 10 %
    - Instructor/TA grading 10 %

Note: 4-student group for studio, lab reports and project submission, every group member receive the same score

Grading Scale:

Letter	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Percentage (%)	100~90	89~85	84~80	79~76	75~73	72~70	69~66	65~63	62~61	60	<60

Class Policies:

- On-time attendance at all class activities is expected. Student is responsible for any material that was covered, and any changes to the exam dates and homework assignments announced in class.
- In general, no late assignment or make up exams will not be accepted. If you have a serious conflict with an exam schedule, you must discuss it with the instructor and **take the exam early**. Failure to contact the instructor prior to the exam or assignment due date will result in **a zero** on that exam/assignment. Exams missed due to a serious illness or a family emergency (these must be documented) will be dealt with on a case-by-case basis according to the University Policy.
- Any questions regarding the grading discrepancy should be brought up within a week of returning the homework or exam.
- Violations of academic integrity include, but are not limited to, cheating, plagiarism, or misrepresentation in oral or written form. Such violations will be dealt with severely, in accordance with University policy.

Laboratory Policies:

- **Students must attend all scheduled labs**. Absence will result in a zero on that lab report. Exceptions will be made for a valid excuse consistent with University Policy. If you cannot attend a laboratory, you must contact the instructor prior to the lab session to reschedule. While in the laboratory, all safety guidelines and procedures must be followed. Failure to comply with safe laboratory practices will result in removal from the course.