Spring
2022

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.)

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Grading Teaching Assistant:
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Lab Teaching Assistants:
Huayuan Guo 1837601251@qq.com

Office Hours: Mon, Wed 2:00 - 5:00 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: Tuesday 15:40-18:25 PM/Zone 4-204

Laboratory location: Zone 3-116

Laboratory times: Thursday 08:15-09:55 AM
Thursday 10:15-11:55 AM

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 1041 Mechanical Measurements 1, ME 1045 Automatic Controls

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Website: https://pibb.scu.edu.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
Inertial Measurement

Topic 3: Actuators
DC Motor Modelling
DC Motor Speed Control
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	Feb 22 Course Introduction	Feb 24 Lab Safety Introduction
2	Mar 1 Graphical Programming Tools	Mar 3 No Lab
3	Mar 8 Graphical Programming Tools	Mar 10 No Lab
4	Mar 15 Angular Displacement Distance and Proximity	Mar 17 Lab 1/Lab 2
5	Mar 22 Inertial Measurement DC Motor Modelling	Mar 24 Lab 3/Lab 4

6	Mar 29 Midterm Exam	Mar 31 No Lab
7	Apr 5 National Holiday	Apr 7 No Lab
8	Apr 12 DC Motor Speed Control	Apr 14 Lab 5
9	Apr 19 DC Motor Position Control	Apr 21 Lab 6
10	Apr 26 Inverted Pendulum Control	Apr 28 Lab 7
11	May 3 Project Introduction	May 5 Project
12	May 9 Final Exam	June 1 Project Demo

Course Gradings:

- Studio 10 %
- Lab reports 40 %
- Final project 20%
- Midterm Exam 15%
- Final Exam 15%

Note: 3-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.