Spring
2026

SCUPI
Sichuan University - Pittsburgh Institute

MEMS 1014 Dynamic Systems

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

Instructor:	Qi (Michael) Lu, Ph.D.
Office:	SCUPI Building 506
Email:	qi.lu@scupi.cn
Lecture Time/Location:	Tuesday 1:50 - 4:25 PM/ SCUPI Building 212
Office Hours:	Mon 9:00AM-12:00PM, 2:00-5:30PM Thu 9:00AM-12:00PM
Grader:	Mingze Li (2023141520007@stu.scu.edu.cn)

Note:

- For consultation outside office hours, please send an email to make an appointment
- For email, please
  - Include the course number, your name and your student number in the subject field of your message;
  - Use your university email account.

Credit hours: 3

Catalog Description:

This course is designed to introduce students to the modeling and analysis of dynamic systems. Topics covered include Laplace transformation; modeling and analysis of physical systems; time and frequency domain analysis; transient and steady state system responses to various excitations; transfer function formulation; and state space model representations. MATLAB and Simulink will be used in this course (3 credit hours).

Course Objective:

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

- Understand the modeling of dynamic systems.
- Conduct analysis of dynamic systems in the time and frequency domains
- Utilize computer tools to investigate the behaviors of dynamic systems.
- Formulate equations of motions for linear mechanical, electrical, fluid, & thermal systems
- Represent the system model in different forms,
- Solve the system model to get the responses for different inputs,
- Analyze the system response characteristics in the time and frequency domains,
- Utilize computer tools to analyze system responses.

Applicable ABET Learning Outcomes:

- An ability to identify, formulate, and solve complex engineering problems by

applying principles of engineering, science, and mathematics.
- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Prerequisites:

MATH 0280 Matrices & Linear Algebra, MATH 290 Differential Equation, ENGR 0012 Engineering Computing, MEMS 0031 Electrical Circuits, MEMS 1015 Rigid-Body Dynamics

Textbook:

Ramin S. Esfandiari and Bei Lu: Modeling and Analysis of Dynamic Systems, 3rd Edition, CRC Press, 2018.

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

Course Gradings:

- Attendance 10 %
- Studio 10 %
- Labs & Projects 20%
- Midterm exam I 20 %
- Midterm exam II 20 %
- Final exam 20 %

While grades may be curved, there is no guarantee of any curve. However, in order to receive a grade of D or better and to be eligible to take Make-Up exam, a student will have to reach 50 % of the total possible points. If any student fails this course and takes Make-Up exam, the highest grade that student can receive is D.

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.
- Students who are late for more than 15 minutes or leave class early (without valid reasons) will be considered absent.
- Students who sign the attendance for another student will be considered as absent and will be reported to the University as a misconduct.
- Students performing activities NOT associated with the course while in class (e.g., sleeping, watching video, playing games, doing other course assignments or personal work) will be considered absent.
- **NOTE:** Sichuan University attendance policy will be enforced. Students with **three unexcused absences** (including lateness or early departure) can be given a **zero** for their regular course grade. Students missing **a third of total class hours** in a semester (including all types of leaves) will lose the right to be assessed in that course, receiving a **zero** for the course grade.
- In general, no late assignment or make up exams will 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.
- **Late submissions** for studio, lab reports or assignment are calculated based on the following equation

  $$\textbf{Late submission full mark} = 100\% \times r^n$$

  $r = 0.8$: discounted return coefficient; n : number of late weeks and n is an integer number which will be round up, e.g. $n = 1$ for the late submission within a week
- Any questions regarding the grading discrepancy should be brought up **within a week** after returning the homework, report 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.

Tentative Course Schedule:

Week	Textbook	Topic
1	Ch. 1 & 3	Course Introduction Linear Algebra
2	Ch. 2	Linear Ordinary Differential Equations
3	Ch. 4	Linear Systems State-Space Equations
4	Ch. 4	Input-Output Equations Transfer Function
5	Ch. 4	Block Diagram
6	Midterm Exam I	
7	Ch. 6	Electrical Systems
8	Ch. 5	Mechanical Systems
9	Ch. 5	Mixed Mechanical Systems
10	Ch. 5 & 6	Electromechanical Systems
11	Ch. 7	Fluid and Thermal Systems
12	Midterm Exam II	
13	Ch. 8	First Order System Responses
14	Ch. 8	Second Order System Time Responses
15	Ch. 8	Frequency Response Analysist
16	Final Exam	