MEMS 1014 – DYNAMIC SYSTEMS

2023-2024 Spring

(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)

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).

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

Schedule
Lecture, Room 3-104 Monday 13:50 – 16:25

Instructor
S.C. Fok (Email: saicheong.fok@scupi.cn)
Office: Room 222 (Zone 4); or Room 505 (SCUPI new building).

Office Hours
Monday 12:00 – 13:00 Tuesday 12:00 – 17:00
For consultation outside office hours, please send an email to make an appointment.

Teaching Assistant
Ms. Nancy Li (Email: 2020141520081@stu.scu.edu.cn; Mobile: 17685592912)

Textbook & References
- Ramin S. Esfandiari and Bei Lu: Modeling and Analysis of Dynamic Systems, 3rd Edition, CRC Press, 2018.
- Additional references and supplementary materials will be posted on Blackboard.

Course Objectives

The course objectives are:

- Introduce students to the modeling of dynamic systems.
- Acquaint students with the analysis of dynamic systems in the time and frequency domains.
- Develop the students' skills in the utilization of computer tools to investigate the behaviors of dynamic systems.

Learning Outcomes

After the successful completion of this course students should be able to:

- 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,
- Analyze the system responses in the time and frequency domains,
- Utilize computer tools to analyze system responses.

Tentative Course Schedule (changes will be announced)

Week	Text	Topic
1	Ch. 1 & 3	Course introduction & revision of applied linear algebra
2	Ch. 2	Revision of ordinary differential equations
3	Ch. 4	System Model Representation
4	Ch. 4	System Model Representation
5	Ch. 4	System Model Representation
6		Midterm
7	Ch. 6	Electrical systems
8	Ch. 5	Mechanical systems
9	Ch. 5	Mixed mechanical systems
10	Ch. 5 & 6	Electromechanical systems
11		Midterm
12	Ch. 7	Fluid and thermal systems
13	Ch. 8	System response
14	Ch. 8	System response
15	Ch. 8	System response
16		Public holiday
17		Revision or Final exam

The course will cover the modeling and response analysis of mechanical, electrical, fluid, and thermal systems through guided learning, discussion, formative exercises, quizzes, class assignments, computer laboratory exercises and projects. Laboratory exercises will cover the use of computer tools for analytical and numerical investigations of systems' behaviors. Projects will enable students to apply the knowledge and computer skills in the modelling and analysis of linear dynamic systems. Quizzes, class assignments, and formative exercises will focus on fundamentals so that students can better understand basic concepts.

Grading Policy

Grade will be based on overall performance in all assessment items as follows (note: the assessment items and percentages may be subjected to change):

ACTIVITIES	PERCENTAGES
Quizzes and assignments	10%
Labs and Projects	20%
Midterms	40%
Final	30%

Submission requirements (including due dates) for all assessments will be announced to students in class or on Blackboard. Letter grades are based on SCUPI standard policy.

Class Policies

- Sichuan University attendance policy will be enforced. Attendance will be taken at the start and at the end of the class. Students who come to class more than 15 minutes late (without valid reasons) will be considered as absence. Students who leave class early (without valid reasons) will be considered as absence. Students who sign the attendance for another student will be considered as absence 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 as absence.
- Students with 3 unexcused absences (including lateness or leaving class early) will receive zero for all assessment items except examinations. These assessment items include assignments, quizzes, laboratory exercises, projects, etc.
- All assessment items have clearly stated submission requirements. No marks will be given if the submission requirements are not met. Late submissions will not be accepted. No makeup assignments, quizzes, laboratory exercises, and projects will be allowed.
- If a student cannot attend the midterm examinations, the student must contact the instructor immediately with a valid reason. If the reason stated is consistent with University Policy, arrangements can be made for alternate assessments. Otherwise, the student will get zero for the midterm examinations.
- If a student has a valid reason and cannot attend the final exam, the student must apply to the administration for a defer examination.
- Challenge to the grading must be made within 7 days after the returned of the assessment item or after the release of the solutions. No challenges to the grading will be entertained after the 7-day period.

Academic misconduct and non-academic misconduct will not be tolerated. All misconduct will be reported and dealt with by SCUPI.

ACADEMIC MISCONDUCT

All students in attendance at the Sichuan University are expected to be honorable and to observe standards of conduct appropriate to a community of scholars. The University expects from its students a higher standard of conduct than the minimum required to avoid discipline. Academic misconduct includes all acts of dishonesty in any academically related matter and any knowing or intentional help or attempt to help, or conspiracy to help, another student. The Academic Misconduct Disciplinary Policy will be followed in the event of academic misconduct.

NON-ACADEMIC MISCONDUCT

All cell phones, computers and mobile phones are to be turned off and put out of sight during lectures (mobile phones and computers can be turned on during online quizzes). All newspapers and other materials not related to the class are to be put away once class begins. Operating these devices and reading unrelated materials while in class is disrespectful of your instructor and fellow classmates. If you fail to abide by this rule, the instructor has the right to confiscate the device or materials and mark you as absence. If you have an emergency and need to have your phone turned on during class, ask your instructor for permission.