Course Syllabus

MEC 450/550: Mechatronics

Fall 2024

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Office	165 Light Engineering, Stony Brook University
Office Hours	MoWe 3:30 – 4:30 PM (and, any other time by appointment)
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* All non-personal course-related questions should be posted on Brightspace Discussions Forum (see section Tools below). Email should be used only for strictly personal issues. I will respond to your emails as soon as possible, however, please allow up to 48 hours for a response. Please use your SBU email for all your communications.

Course Details

Title	MEC 450/550: Mechatronics
Credit	3
Lecture	Tu 3:30 – 6:20 PM, Frey Hall 317
Prerequisites	MEC 310; MEC 316
Corequisite	MEC 411

Course Description

An introduction to the design, modeling, analysis and control of mechatronic systems (smart systems comprising mechanical, electrical, and software components). Fundamentals of the basic components needed for the design and control of mechatronic systems, including sensors, actuators, data acquisition systems, microprocessors, programmable logic controllers, and I/O systems, are covered. Hands-on experience in designing and building practical mechatronic systems are provided through integrated lab activities.

Course Learning Objectives

1. Introduction to analog circuits and basic electrical elements
2. Introduction to semiconductor electronics (semiconductor physics, diodes, BJTs, FETs, ICs, regulators)
3. Introduction to sensor types (position, velocity, acceleration, light, vision, force, strain, pressure, temperature) and actuator types (mechanical, pneumatic, hydraulic, electric)
4. Review of basic circuits (RLC circuits, Wheatstone bridge, op-amps, filters)
5. Introduction to digital signals (Binary numbers, ADC, DAC, data acquisition)
6. Introduction to digital circuits (combinational logic and sequential logic)
7. Introduction to microcontrollers (microprocessor systems, programming, I/O, communications)
8. Introduction to the mechatronics system level approach

Recommended References

- David G. Alciatore, *Introduction to Mechatronics and Measurement Systems*, 5th Edition, McGraw-Hill Education, 2018 (ISBN: 9781259892349) [Publisher, Amazon].
- William Bolton, *Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering*, 7th Edition, Pearson, 2019 (ISBN: 9781292250977) [Publisher, Amazon].

Tools

Brightspace: It is required that you use the Brightspace for this course. Brightspace is used for the facilitation of communications between faculty and students, posting of course materials, important announcements, and grades, and submission of assignments. You need to check your SBU email or Brightspace announcements regularly [Android App, iOS App].

Brightspace Discussions Forum: By using the Discussions tool/forum in Brightspace, you can get help fast and efficiently from your classmates, the TA(s), and the instructor. All non-personal course-related questions that might be of interest to other students should be posted (either anonymously or identified) on the Brightspace Discussions forum and not emailed to the TA(s) or the instructor. Email should be used only for strictly personal problems or issues.

Note that this discussion forum is for additional learning and assistance. It is not the place for cyberbullying, memes, grade complaints, concerns/comments/criticisms about the course, or in general, anything unrelated to the course material and student learning. Improper behavior will result in reporting the individual's behavior to the Office of Student Conduct and Community Standards.

Calculator: Only NCEES Allowed Calculators will be permitted to be used on all quizzes, midterm, and final exams. Please see the Calculator Policy and Allowed Calculators on ME website.

Assignments

Lab Reports

– Students should form groups of 2-3 individuals at the beginning of the semester to perform all experiments. Be careful to select people that you will trust to do work reliably and on time; do not necessarily pick your "friends".

– There will be two laboratory reports that must be completed and submitted on Brightspace as a group. All students should contribute equally in performing all the experiments and writing the reports. It is each group member's responsibility to ensure that their reports are properly submitted before the deadline which is <u>one week</u> after completion of the lab. For each day your lab report is late, its grade will be reduced by 30%, regardless of who was the first author of the report.

– Participation in all lab sessions is required. Missing any lab session will result in a significant grade reduction.

Design Project and Report

– Each group must design, build, and test a mechatronic device that meets the project requirements. The device must be demonstrated in the class and a report must be submitted on Brightspace.

– Each group needs to initially submit a project proposal outlining the mechatronic device they intend to work on and secure approval from the instructor.

– Each group member should spend up to $100 to provide materials for the project (there will be no reimbursement for purchased materials, and the materials will remain the property of the students at the end of the semester unless they wish to donate their prototype/components to the laboratory). A cost report should be included in the project report.

– More details on the design project will be posted during the semester.

Examinations

Midterm Exam #1	Tuesday, Oct. 1, 2024 (in class)
Midterm Exam #2	Tuesday, Nov. 5, 2024 (in class)
Design Project (Demonstration & Report)	Tuesday, Dec. 17, 2024, 5:30 – 8:00 PM (in class)

(a) All the exams are closed books/notes, unless otherwise announced.

(b) Make-up exams are considered only for students who provide documentation of a compelling reason (e.g., medical emergency) before or within two days following the missing exam. There will be no make-up exams for reasons that can be within your control (e.g., pre-arranged travel or other engagements). An unexcused exam absence will be scored as a zero.

(c) The exam dates are subject to change. Students will be notified in a timely manner of any changes.

Grading Policy

Midterm Exam #1	15%
Midterm Exam #2	15%
Design Project (Proposal/Demonstration/Report)	50%
Lab Reports (Weighted Equally)	20%

(a) Any disagreement with exam grading must be settled within one week after posting the grades.

(b) No individual extra credit work or extra points will be offered to improve grades.

Grading Scale

A	[100, 90]%	**A$^-$**	(90, 85]%		
B$^+$	(85, 80]%	**B**	(80, 75]%	**B$^-$**	(75, 70]%
C$^+$	(70, 65]%	**C**	(65, 60]%	**C$^-$**	(60, 55]%
D$^+$	(55, 50]%	**D**	(50, 45]%	**F**	(45, 0]%

(a) For graduate students: **F**   (55, 0]%

Tentative Course Schedule

	Date	Topic
1	08/27	Introduction to Mechatronics, Analog Circuits & Basic Electric Components
2	09/03	Semiconductor Electronics
3	09/10	Semiconductor Electronics
4	09/17	Sensors
5	09/24	Sensors, **Group Formation Due**
6	10/01	**Midterm Exam #1**
7	10/08	Fall Break
8	10/15	Digital Circuits
9	10/22	Digital Circuits
10	10/29	Microprocessors & Microcontrollers, **Design Project Proposal Due**
11	11/05	**Midterm Exam #2**
12	11/12	Microprocessors & Microcontrollers
13	11/19	Actuators
14	11/26	Lab #1
15	12/03	Lab #2
16	12/17	**Design Project Demonstration and Report Due**

Syllabus Disclaimer

The instructor views the course syllabus as an educational understanding between the instructor and students. Every effort will be made to avoid changing the course schedule, materials, assignments, and deadlines, but the possibility exists that unforeseen events will make syllabus changes necessary. The instructor reserves the right to make changes to the syllabus as deemed necessary. Students will be notified in a timely manner of any syllabus changes via email or Brightspace announcements.

University Policies and Statements

Academic Integrity Statement

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html.

Student Accessibility Support Center (SASC) Statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the Student Accessibility Support Center (SASC). For procedures and information go to Evacuation Guide for People with Physical Disabilities and search Fire Safety and Evacuation and Disabilities.

Critical Incident Management Statement

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

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