CAEDMI
Central Asia Engineering Dentistry Medicine Institute

Alpha Institute of Technology

Course Syllabus

Course Title:	MeRo 5041: Mechatronics and Robotic Systems, and Applications
Lead Instructor:	David H. Lim, Office) AIT # 30x, Dean's office
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Office hours:	2:00-4:00 pm, Wednesday and Friday

1. Course Description

This course provides a comprehensive introduction to the fundamentals of mechatronics and robotic systems. It is designed to expose students to the theoretical knowledge and practical skills necessary to design, analyze, and implement advanced mechatronic and robotic systems. The course includes a wide range of topics, from in-class lessons to a project, covering sensors and actuators, control systems, microcontrollers, and the integration of mechanical, electrical, and computer engineering principles.

2. Basic Information

Course Academic Level:	Master-level
MSc program:	Mechatronics and Robotics
Course Semester:	1st Semester
Number of ECTS credits:	5
Type of Assessment:	Graded
Mode of Study:	Full-Time

Course Prerequisites: This course requires students to know the basics knowledge of the following courses:

1) MeRo 5011: Linear Control Systems / MeRo 5020: Embedded Control Systems
2) Understanding of hardware and software (firmware) components
3) Tools: Familiarity with C/C++, electrical circuit and PCB design tool, computer simulation tools, such as MATLAB or Octave

Grading: Attendance (10%), Term project participation (30%), Project presentation (20%), a final project (40%: 20% project report; oral presentation 20%).

Mapping from grades to percentage:

Letter Grade	Numeric Value (GPA)	100-point Scale
A	4.0	93-100
A-	3.7	90-92
B+	3.3	87-89
B	3.0	83-86
B-	2.7	80-82
C+	2.3	77-79
C	2.0	73-76
C-	1.7	70-72
D+	1.3	67-69
D	1.0	63-66
D-	0.7	60-62
F	0.0	<60

3. Course Content

Includes lesson topics and the corresponding chapters from the textbooks for each week

№ of week	Topic	Key Dates
Wk. 1-2	- Introduction to Mechatronic system components - Design process and measurement system - Control systems - Examples of Mechatronic systems - Introduction to tools: Mechanical and electrical tools, including simulation tools	Reference book 1: Chapter 1
Wk. 3-4	- Electrical Circuit Dynamic Simulation - Library creation and import -Examples of circuit simulations	Tool: Micro-Cap 12
Wk. 5-6	- Term project: to propose a project -Introduction to the project and its scope of work	Term project prep. Team: work assignment
Wk. 7-8	- (P1 *) Design concept of the cleaner: -Electrical and mechanical design concept	Tool: CAD program Ex: Fusion 360
Wk. 9-10	- (P2) Embedded control unit + peripheral system design -Electrical circuit design using a schematic program -PCB design (design concept)	Tool: Micro-Cap 12 PCB: Kicad, Fusion 360, or any other PCB design tool
Wk. 11-12	- (P3) Control unit program (flow chart)	Tool: C/C++ or Python
Wk. 13-14	- (Review) Prototype final design (sizing including PCB)	
Wk.15-16	- (P4) Prototype final design demonstration -Mechanical design (packaging) -Electrical design (control systems) -Control algorithm design (Arduino or TI CPU) -Prototype roadmap	Term project presentation
	P * = presentation by each project team member	

4. Learning Outcomes

1) Understand the core principles of mechatronics and robotics.
2) Develop knowledge in the use of sensors and actuators.
3) Gain hands-on experience with microcontrollers and embedded systems.
4) Learn control systems for robotic applications.
5) Explore the integration of mechanical, electrical, and software components in mechatronic systems.
6) Participate in the development of mechatronic and robotic systems.

6. Assessment Criteria

1) Term project participation (30%): Students are to participate in the project proposed by the instructor.
2) Term project presentation (P1-3:20%): Each student is to make a presentation at least one time on each part of the given term project.
3) The final design presentation and report (40%): Team of students is to make the final presentation and report based on each student's work on the final design of the term project.
4) The Honor system must be strictly adhered to. Interaction among the students is encouraged to broaden the understanding of the subject. All the work and presentation in the term project must come entirely from your own efforts and pledged so by you on the first page

7. References:

1) William Bolton, "Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering", Pearson, 6 th or latest Edition
2) Eugenio Brusa, "Mechatronics Principles, Technologies and Applications", Nova
3) Sabri Cetinkunt, "Mechatronics with Experiments", Wiley, 2nd Edition

8.Required Course Materials:

1) MATLAB/Simulink, or Octave, and Micro-Cap 12, Embedded controller, CAD, and PCB design software
2) Optional: Additional notes and articles from the instructor.

9. Additional Notes

10. Notice: All upcoming announcements will be posted through Google Classroom.