

[ELEC 1100] [Introduction to Electro-Robot Design] [Spring 2024] [Credits: 4]

Course Description

The course introduces the fundamental knowledge on the design, implementation and evaluation of a robot and its sub-systems. It covers the basic principles of analog and digital circuits as well as robot sensing and control mechanisms. Students will need to apply the knowledge and principles learned to design and build a functional robot by the end of the course. Students who have completed ELEC 2200, ELEC 2350, ELEC 2400, ELEC 2420, or ELEC 3310, must obtain instructor's approval to take this course.

List of Topics

Lecture Outline

Week 1	Course Introduction and Robot Classification
Week 2	Basic Components, Energy and Power
Week 3	KVL & KCL, DC Regulation
Week 4	Transistors and H-bridge
Week 5	DC Motors and PWM Signal
Week 6	Sensors and Boolean Algebra
Week 7	Logic Control and MCU
Week 8	Arduino Programming
Week 9	Exam Review and Project
Week 10	Project Period
Week 11	Project Period
Week 12	Early Demo
Week 13	Final Demo

Laboratory Outline

1. Equipment
2. KCL & KVL
3. Diodes & DC Regulation
4. Transistors & H-bridge
5. Sensors and MCU
6. Assembly of the Car

Intended Learning Outcomes

Through hands-on labs and term project, completed with lectures and tutorials, students will be able to:

- CO1 – recognize the history and development of major ECE fields.
CO2 – analyze, design, and debug simple analog circuits, and design and program for simple digital control strategies.
CO3 – build a real engineering system following a hierarchical design principle.
CO4 – work in a team environment, learn and practice effective project management.
CO5 – execute a complete project from problem formulation, design/implementation, up to verification and documentation.

TextBook(s)

No major text, mainly use hand-outs provided by the instructors.

Reference Books/Materials

- L. Richard Carley and Pradeep Khosla, “Introduction to Electrical and Computer Engineering – taught in Context”, The McGraw-Hill Companies, Inc.
- G. Rizzoni, “Principles and Applications of Electrical Engineering,” 5th edition, McGraw Hill, 2007
- D. V. Kerns and J. D. Irwin, “Essentials of Electrical and Computer Engineering”, Pearson, 2004
- M. M. Mano, C. R. Kime, “Logic and Computer Design Fundamentals”, 3rd edition, Prentice-hall, 2004

Grading Scheme

- **Lab:** 6 Lab Assignments (30% total).
- **Quiz:** Pop-up in **Lecture** and **Tutorial** Quizzes (open book, 10% total), online submission in iPRS (20 questions in total, only the top 70% answers will be counted).
- **Exam:** Lab Exam (close book, 15%) and Written Exam (close book, 20%).
- **Project:** Project Demo (20%) and Report (5%).