

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 have 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 Topics

Week 1	Course Introduction and Robot Classification; Basic components, Current, voltage
Week 2	Energy, Power; AC sources
Week 3	DC regulation; Pulses Generation
Week 4	PWM Control, Transistor and Diode
Week 5	Transistor and H-bridge; KVL, KCL (1)
Week 6	KVL, KCL (2); Sensor
Week 7	Logic; K-map
Week 8	Adders
Week 9	Adders; Comb Logic
Week 10	Sequential Logic; D-Flip Flop
Week 11	Finite State Machine; FSM Example
Week 12	Project Period
Week 13	Project Period

Lab Topics

1. Equipment
2. Regulator
3. Pulse generation
4. PWM control
5. Transistor
6. Sensor
7. Logic
8. Final Project demo

Statement of Objectives/Outcomes:

Through hands-on labs and term project, complemented 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, combinatorial and sequential logic circuits, and design and implement simple feedback control strategies.

CO3 - build a real engineering system following a hierarchical design principle.

CO4 - work in a team environment: learn and practice effective project and time management.

CO5 - execute a complete project from problem formulation, design/implementation, up to verification and documentation.

Textbook(s):

Lecture notes

Reference Books:

- 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

Relationship of Course to Program Outcomes:

Please refer to the Report Section 4.3.2 (iii).

Grading Scheme:

Quiz	8%
Labs	22%
Project	35%
Exams	35%