

Department of Electrical and Computer Engineering
520.372 Programmable Device Laboratory

- 2004-05 Catalog: The use of programmable memories (ROMs, EPROMs, and EEPROMs) as circuit elements (as opposed to storage of computer instructions) is covered, along with programmable logic devices (PALs and GALs). These parts permit condensing dozens of standard logic packages (TTL logic) into one or more off-the-shelf components. Students design and build circuits using these devices with the assistance of CAD software. Topics include programming EEPROMs; using PLDs as address decoders; synchronous sequential logic synthesis for PLDs; and PLD-based state machines. (3 credit hours/Elective)
- Prerequisite(s): 520.142 Digital System Fundamentals
520.345 ECE Laboratory or 520.349 Microprocessor Laboratory
- Textbook: John Wakerly, Digital Design Principles and Practices, 3rd ed., updated, Prentice Hall
- Course Objectives: This course is designed to give students the opportunity to apply digital design techniques covered in theory courses to practical real-world problems. The complexity of laboratory experiments is greater than that of random logic designs, permitting greater usage of synthesis skills. The use of simple CAD tools introduces the student to methods used in industry for state-of-the-art design.
- Topics Covered:
1. Random, programmable logic; ROM construction
 2. PROM; fusible links; EPROM; EEPROM
 3. PLA's, PALs;
 4. Hamming codes; sequential logic; flip-flops; 16R8, 16R6, 16R4; synchronous logic; asynchronous logic; 20RA10
 5. 4-bit binary counter; EQN2JED; 3-bit synchronous adder; clock problems; Schmitt triggers
 6. Adder; GAL16V8
 7. GAL22V10; PC bus
 8. Address decoding uses; bus control
 9. State machines; Moore and Mealy types; coded states
 10. Invalid states; one-hot encoding
 11. Part speed/power; complex PLDs; MACH131
 12. Gate arrays; FPGA's; Xilinx architecture; applications
- Class Schedule: One – one hour lecture/weekly
One – two hour and fifty minute of laboratory/weekly

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Contribution of Course to Meeting the Professional Component (credit hours):

Engineering Science	Engineering Science and Design
	3

Relationship of Course to Program Educational Outcomes (? those that apply):

	Apply mathematics, probability and statistics, basic science, and computer science
	Design and conduct experiments, analyze and interpret data
x	Identify, formulate and solve electrical engineering problems
	Use technical skills and modern engineering tools to design to meet needs
x	Communicate effectively and work on multidisciplinary teams
x	Contemporary issues, ethical responsibilities, environmental, health, safety issues
	Engage in life-long learning

Prepared June 9, 2005 by: Robert Glaser