ELEC 2210 - DIGITAL ELECTRONICS

2002 Catalog Data:  ELEC 2210. DIGITAL ELECTRONICS (3) LEC. 3. Prereq., ELEC 2110. Coreq., ELEC 2200. History of electronics; semiconductors; biasing and operation of PN junction diodes; field-effect transistors and bipolar junction transistors; logic families and logic technologies; flip-flops and memory circuitry.


Coordinators:  R.C. Jaeger, Distinguished University Professor

Goals:  This course introduces the student to the design of digital electronic circuits, both combinational and sequential, and provides students with the fundamental knowledge of semiconductor physics and device operation needed to understand the operation and design of digital circuits in MOS and bipolar logic technologies.

Prerequisites by topic:
1. Introductory computer programming in a high level language
2. Electric circuits (prerequisite)
3. Logic design (corequisite)

Topics:
1. History of electronics (1 class)
2. Introductory semiconductor physics (4 classes)
3. Diode current-voltage characteristics, Zener breakdown, biasing, load lines (3 classes)
4. Diode applications, half-wave and full-wave rectification, Zener regulation (2 classes)
5. Field-effect transistor (FET) characteristics and operating regions (2 classes)
6. Biasing of FETs (2 classes)
7. Characteristics of digital signals (1 class)
8. The FET as a switch, the NMOS logic family (4 class)
9. The CMOS-logic family (5 classes)
10. Memory circuits and sense amplifiers (2 classes)
11. Bipolar junction transistor (BJT) characteristics, Transport Model equations (2 classes)
12. Biasing of BJTs (2 classes)
13. The BJT as a saturated switch (1 class)
14. Transistor-transistor logic (TTL) (3 classes)
15. SPICE device models and circuit simulation (3 classes)
16. Homework solutions (4 classes)
17. Tests and review (4 classes)

Typical methods for evaluating student performance:

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Hour exams</td>
<td>40% (2 @ 20%)</td>
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<tr>
<td>Final exam</td>
<td>40%</td>
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</tbody>
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Computer usage:

Some problem assignments will require the use of a circuit simulator.
Some problems may require the student to program in a high-level language, spreadsheet, or MATLAB.
Laboratory projects (including major items of equipment and instrumentation used): None

Class attendance: Class attendance and its effect on course grade is the prerogative of the individual instructor and will be part of the course outline and announced the first day of class.

Policy on unannounced quizzes: Unannounced quizzes and their effect on course grade are the prerogative of the individual instructor and will be part of the course outline and announced the first day of class.

ABET category content as estimated by faculty member who prepared this course description:

   Engineering science:  2 credits or 67%
   Engineering design:   1 credit or 33%

Students who need special accommodations should make an appointment to discuss their needs as soon as possible.

Prepared by Richard C. Jaeger  Date: August 29, 2001