ECE 218 - Digital Systems
Fall Semester 2011

Catalog Data: ECE 218: Digital Systems. Prerequisites: Sophomore standing, Credit 3.
Number systems and conversions, binary codes, and Boolean algebra. Switching devices,
discrete and integrated digital circuits, analysis and design of combinational logic
circuits. Karnaugh maps and minimization techniques. Counters and registers. Analysis
and design of synchronous sequential circuits. Concurrent registration in ECE 211 is
strongly encouraged.
(3-0-3)

Enrollment: Required course for CPE and EE majors.


Coordinator: S.R.Borkar, Senior Lecturer of ECE

Course objectives:
After completing this course, the student should be able to do the following:
1. Perform arithmetic in bases 2, 8, and 16.
2. Demonstrate the ability to apply Boolean algebra to digital logic problems.
3. Implement Boolean functions using Karnaugh maps.
4. Simplify Boolean functions using Karnaugh maps.
5. Design logic circuits from verbal problem descriptions
6. Describe situations where medium-scale integration circuits are useful.
7. Analyze and design logic circuits containing flip-flops.
8. Design and analyze synchronous sequential circuits.
9. List various types of memories and programmable logic devices.
10. Design for Datapath and control circuits based on Algorithmic State Machine Approach

Prerequisites by topic: None.

Lecture schedule: Two 75-minute sessions per week.
Laboratory schedule: None.

Topics:
1. Number Bases, Conversion (0.5 week)
2. Signed Numbers, Complements, Codes (0.5 week)
3. Boolean Algebra (1 week)
4. Logic Gates (0.5 week)
5. Karnaugh Map Method (0.5 week)
6. Don't-Care Terms (0.5 week)
7. Two-Level Logic Implementations (0.5 week)
8. Don't-Care Terms (0.5 week)
9. Exclusive OR (0.5 week)
10. Design and Analysis Procedures (1 week)
11. MSI Circuits: Adders, Comparators, Decoders, Encoders, Multiplexers (2 weeks)
12. Flip-Flops, Triggering (1 week)
13. Clocked Sequential Circuits (1 week)
14. State Reduction (0.5 week)
15. Excitation Tables (0.5 week)
16. Design of Registers and Counters (1 week)
17. Random Access Memory (1 week)
18. Programmable Logic: ROMs, PLAs, PALs (1 week)
19. Algorithmic State Machines, Multiplier designs (1 week)
20. Tests (1 week)

Computer usage: None
Laboratory topics: None.

Professional components as estimated by faculty member who prepared this course description:
  Engineering Science: 1.5 credits or 50%
  Engineering Design: 1.5 credits or 50%

Relationship of ECE 218 Course to ABET Outcomes:

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<tr>
<th>OUTCOME:</th>
<th>Course Objective (s)</th>
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<tbody>
<tr>
<td>3a Apply knowledge of math, engineering, science</td>
<td>1,2,3,4,5,6,7,8,9</td>
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<td>3b Design and conduct experiments /Analyze and Interpret Data</td>
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<td>3c Design system, component, or process to meet needs</td>
<td>3,4,5,6,7,8,9</td>
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<td>3d Function on multi-disciplinary teams</td>
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<tr>
<td>3e Identify, formulate, and solve engineering problems</td>
<td>2,4,7,8</td>
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<td>3f Understand professional and ethical responsibility</td>
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<td>3g Communicate effectively</td>
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<td>3h Broad education</td>
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<td>3i Recognize need for life-long learning</td>
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<td>3j Knowledge of contemporary issues</td>
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<td>3k Use techniques, skills, and tools in engineering practice</td>
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<td>4 Major design experience</td>
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Prepared by: S. R. Borkar Date: Mar 01, 2011