EENG 2710 Digital Logic Design – Course Syllabus

Fall 2019

University of North Texas
Electrical Engineering

Date Prepared: August 20, 2019

Prepared by: Elias Kougianos

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Course Number, Title, Credit Hours: EENG2710.003 Digital Logic Design, 3 Credit Hours

Course Description:
History and overview; switching theory; combinational logic circuits; modular design of combinational circuits; memory elements; sequential logic circuits; digital system design; fault models and testing.

Prerequisite(s): Engineering or engineering technology majors.

Corequisite(s): EENG 2711 (which must be completed with a grade of C or better) for Electrical Engineering majors

Course Topics:

- Digital and Analog Systems: Basic Concepts and Historical Perspective
- Number Systems and Digital Logic Gates
- Boolean Algebra, Switching Functions and Canonical Forms
- Combinational Circuit Minimization, Analysis, and Synthesis
- Sequential circuits elements and sequential logic circuits
- Modular Sequential Logic- Counters and shift registers
- Minimal Design of Synchronous Sequential Circuits
- Analysis and Design of asynchronous sequential circuits
- Digital Logic Testing
Textbook(s) and/or required material:


Additional material, as required, will be provided on Canvas.

Course Objectives:

The main objectives of the course are to facilitate the students to achieve the highest levels in the Bloom's 6-level Learning Taxonomy so that they, at the end of the course, will be able to:

1. Know what digital systems are, how they differ from analog systems and why it is advantageous to use the digital systems in many applications.
2. Comprehend different number systems including the binary system and Boolean algebraic principles.
3. Apply Boolean algebra to switching logic design and simplification.
4. Analyze a given digital system and decompose it into logical blocks involving both combinational and sequential circuit elements.
5. Synthesize a given system starting with problem requirements, identifying and designing the building blocks, and then integrating these blocks into a complete system.
6. Validate the system functionality and evaluate the relative merits of different designs.

Grading:

- Homework: 15%
- Exam 1: 25%
- Exam 2: 25%
- Final: 35%

Grading scale (based on total course points):

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>90% - 100%</td>
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<tr>
<td>B</td>
<td>80% - 89.99%</td>
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<tr>
<td>C</td>
<td>70% - 79.99%</td>
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<td>D</td>
<td>60% - 69.99%</td>
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<tr>
<td>F</td>
<td>00% - 59.99%</td>
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</tbody>
</table>

NOTES:

The exam schedule is as follows:
- Test 1 is on Wednesday October 2nd (Week 6)
- Test 2 is on Wednesday November 13th (Week 12)
- The final exam will take place on Saturday December 7th 10:30AM – 12:30PM in NTDP D201

During each test (including the final exam) you can consult the textbook (open book tests) ONLY. No notes or other material. During tests the use of electronic devices such as cell phones, smartphones, smart watches, pagers, photographic devices and/or other electronic or communication
devices, with the exception of calculators, is strictly prohibited. Such devices must be turned off during the tests. You will also be asked to leave you backpacks by the classroom door.

**Missed Exams:**

You will be allowed to make up a missed exam only if you have a documented university excused absence and received prior approval. For more details visit the UNT Dean of Students’ web page: [https://deanofstudents.unt.edu/resources](https://deanofstudents.unt.edu/resources)

**Assignments:**

Homework must be submitted on the due date either at the beginning or the end of the class. Late homework WILL NOT be accepted.

**Academic Dishonesty:**

Cheating will not be tolerated. Anyone found guilty of cheating on a test or assignment will be awarded an F grade for the course. Discussions of problems and assignment with your classmates is welcome and encouraged, however, sharing of solutions is not. If you need help, you should ask the instructor. Cheating includes, but is not limited to, all forms of plagiarism and misrepresentation. For your rights and responsibilities please refer to [http://www.unt.edu/csrr](http://www.unt.edu/csrr)

**Course Evaluation:**

The Student Perceptions of Teaching (SPOT) is a requirement for all organized classes at UNT. This short survey will be made available to you at the end of the semester, providing you a chance to comment on how this class is taught. I am very interested in the feedback I get from students, as I work to continually improve my teaching. I consider SPOT to be an important part of your participation in this class.

**Disabilities Accommodation:**

The University of North Texas complies with Section 504 of the 1973 Rehabilitation Act and with the Americans with Disabilities Act of 1990. The University of North Texas provides academic adjustments and auxiliary aids to individuals with disabilities, as defined under the law. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please see the instructor and/or contact the Office of Disability Access at 940-565-4323 [during the first week of class](https://disability.unt.edu/). Information and requests for supporting letters can be obtained from: [https://disability.unt.edu/](https://disability.unt.edu/)

**Additional Policies and Procedures:**

1. State common law and federal copyright laws protect my lectures. They are my own original expression. Whereas you are authorized to take notes in class thereby creating a derivative work from my lecture, the authorization extends only to making one set of notes for your own personal
use and no other use. You are not authorized to record my lectures, to provide your notes to anyone else or to make any commercial use of them without expressed prior permission from me.
2. This syllabus is subject to change at any time during the semester with changes to be announced in class.
3. Cell Phones: Please remember to turn off phones prior to class.
4. An I (incomplete) grade is given only for extenuating circumstances and in accordance with University and Departmental Policies.
5. To comply with FERPA policies, I will communicate via email (email me at elias.kougianos@unt.edu) but I will only respond to UNT email accounts.
6. Each student should retain graded lecture notes, pop quizzes, homework, tests, software-generated files, and laboratory reports to document errors in recorded grades.
7. Requests for review of graded work must be submitted during the lecture in which such work is returned to the students. The request should be accompanied by a written justification of the request including any supporting data.
8. Challenges to the course grade must be presented within 60 days of receipt of grade notices mailed by the university. This will ensure that instructor’s records are still available to allow a review of the assigned grade. You should first discuss your complaint with the instructor. If you wish to carry it further, contact the Program Coordinator by calling (940) 891-6872. To further pursue your complaint, contact the Department Chair, but ONLY after first discussing your concern with the previous two individuals.

Course Outline and Tentative Schedule:

<table>
<thead>
<tr>
<th>Topic No.</th>
<th>Topics</th>
<th>Time Allocated</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Digital and analog systems- an introduction, historical perspective</td>
<td>1 Week</td>
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<tr>
<td>2.</td>
<td>Number systems and codes</td>
<td>1 Week</td>
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<td>3.</td>
<td>Boolean Algebra, Switching functions and canonical forms</td>
<td>2 Weeks</td>
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<td>4.</td>
<td>Circuit minimization, Analysis of combinational circuits, and Timing issues</td>
<td>1.5 Weeks</td>
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<td>5.</td>
<td>Top-down Modular Design of Combinational Logic</td>
<td>1.5 Weeks</td>
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<td>6.</td>
<td>Sequential Circuit Elements- Latches and flip-flops</td>
<td>1 Week</td>
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<td>7.</td>
<td>Modular Sequential Logic- Counters and shift registers</td>
<td>1 Week</td>
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<td>8.</td>
<td>Analysis and Design of synchronous sequential circuits</td>
<td>1 Week</td>
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<td>9.</td>
<td>Analysis and Design of asynchronous sequential circuits</td>
<td>3 Weeks</td>
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<tr>
<td>10.</td>
<td>Digital Logic Testing</td>
<td>1 Week</td>
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Note: The topics 1-10 listed above correspond to the chapters of the recommended reference book.
Reading Requirements:

The students are required to come prepared to every class with the material discussed in the previous class.

Course Learning Outcomes (CLOs)

Course Learning Outcomes (CLOs), that is, the areas for student learning in this course are:
[CLO-1] Digital and Analog Systems: Basic Concepts and Historical Perspective
[CLO-2] Number Systems and Digital Logic Gates
[CLO-3] Boolean Algebra, Switching Functions and Canonical Forms
[CLO-5] Sequential circuits elements and sequential logic circuits
[CLO-6] Modular Sequential Logic- Counters and shift registers
[CLO-7] Minimal Design of Synchronous Sequential Circuits
[CLO-8] Analysis and Design of asynchronous sequential circuits
[CLO-9] Digital Logic Testing

Our EE Program Outcomes (POs)

Upon completion of our BSEE program, the students will be able to:
[PO-1] Apply knowledge of mathematics, engineering and science.

[PO-2] Design and conduct experiments to verify and validate the design projects developed by them, and analyze and interpret data.

[PO-3] Develop project-based learning skills through design and implementation of a system, component, or process that meets the needs within realistic constraints.

[PO-4] Function on multidisciplinary teams.

[PO-5] Identify, formulate, and solve engineering problems.

[PO-6] Have an understanding of professional and ethical responsibility.

[PO-7] Communicate effectively.

[PO-8] Achieve broad education necessary to understand the impact of electrical engineering solutions in a global and societal context.

[PO-9] Understand learning processes, concepts of learning to learn, and engage in lifelong learning.

[PO-10] Achieve knowledge of contemporary issues.

[PO-11] Use techniques, skills, and computer-based tools for conducting experiments and carrying out designs.

[PO-12] Develop an appreciation for principles of business practices and entrepreneurship.
**ABET Outcomes**

3a- an ability to apply knowledge of mathematics, science, and engineering  
3b- an ability to design and conduct experiments, as well as to analyze and interpret data  
3c- an ability to design a system, component, or process to meet desired needs  
3d- an ability to function on multi-disciplinary teams  
3e- an ability to identify, formulate, and solve engineering problems  
3f- an understanding of professional and ethical responsibility  
3g- an ability to communicate effectively  
3h- the broad education necessary to understand the impact of engineering solutions in a global and societal context  
3i- a recognition of the need for, and an ability to engage in life-long learning  
3j- a knowledge of contemporary issues  
3k- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Relationship between the Course Learning Outcomes and Program/ABET Outcomes**

The course learning outcomes map onto the program and ABET outcomes as depicted in the table below.

<table>
<thead>
<tr>
<th>CLO</th>
<th>PO-1/3(a)</th>
<th>PO-2/3(b)</th>
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