Date Prepared: August 22nd, 2020

Prepared by: Elias Kougianos

Instructor: Elias Kougianos
Office: Discovery Park F140 (1st floor)
Office Hours: (M & W) 11:30 am - 1:00 pm via Zoom
Phone: 940-891-6708
Email: elias.kougianos@unt.edu

Course web site: http://canvas.unt.edu
Time: (M & W) 1:00 pm – 2:20 pm
Meeting Place: Online (Zoom)

TA: Sravanthi Nandyala
Office: Online (Zoom)
Office Hours: TBD
Email: SravanthiNandyala@my.unt.edu

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
- Analysis and Design of synchronous 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: 20%
- Exam 1: 25%
- Exam 2: 25%
- Final: 30%

Grading scale (based on total course points):

- 90% - 100%  A
- 80% - 89.99%  B
- 70% - 79.99%  C
- 60% - 69.99%  D
- 00% - 59.99%  F

NOTES:

The exam schedule is as follows:
Test 1 is on Wednesday Sep. 30 (Week 6)
Test 2 is on Wednesday Nov. 11 (Week 12)
The final exam will take place on Saturday Dec. 7, 10:30AM-12:30PM
All tests, including the final, will be online and will include a combination of true/false, multiple choice, fill in the blanks, and essay questions. All tests will be open book, open notes.
Homework submission:

- **If you have access to a printer:** print out the homework and write the solutions in the space provided. Insert additional pages if needed but please make sure they clearly indicate which problem they belong to. Assemble all sheets, number them sequentially, scan them into a single pdf file using a scanner or your cell phone and submit the file via Canvas before the deadline.

- **If you do not have access to a printer:** Write out the answers to the final exam problems by hand, one problem per page. Make sure you clearly label which problem solution the sheet belongs to. Assemble all sheets, number them sequentially, scan them into a single pdf file using a scanner or your cell phone and submit the file via Canvas before the deadline.

**Grade-related policies:**

**Late Work**

I will not accept late work in this course. All work turned in after the deadline will receive a grade of zero unless the student has a university-excused absence and provides documentation with 48 hours of the missed deadline.

**Turnaround Time**

I aim to return graded work to you within one week of the due date. When this is not possible, I will send an announcement to the class.

**Grade Disputes**

You are required to wait 24 hours before contacting me to dispute a grade. Within that time, I expect that you will review the assignment details and reflect on the quality of the work you turned in. **You should then contact the grader and discuss the issue.** If you are not satisfied with the grader's response and you would still like to meet with me, email me to set up a zoom meeting (I cannot discuss grades over email). **In all email communications you should use your official UNT email account.** You should come to our scheduled meeting with specific examples that demonstrate that you earned a higher grade than you received. If you miss your scheduled meeting, you forfeit your right to a grade dispute. If you do not contact me to schedule a meeting within seven days of receiving your grade, you also forfeit your right to a grade dispute.

**Extra Credit**

There are no extra credit opportunities in this course.

**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
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)

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. Information and requests for supporting letters can be obtained from: [https://disability.unt.edu/](https://disability.unt.edu/)

Additional Policies and Procedures:

1. Attendance is mandatory. 3 unexcused absences will result in automatic course drop. If you know ahead of time that you will miss a class, contact me via email in advance. Attendance will be spot checked.
2. 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. Synchronous (live) sessions in this course will be recorded for students enrolled in this class section to refer to throughout the semester. Class recordings are the intellectual property of the university or instructor and are reserved for use only by students in this class and only for educational purposes. Students may not post or otherwise share the recordings outside the class, or outside the Canvas Learning Management System, in any form. Failing to follow this restriction is a violation of the UNT Code of Student Conduct and could lead to disciplinary action.
3. It is highly recommended that you turn your video (if using a webcam) and microphone off during the zoom meetings.
4. **Asking questions during the lecture**: it is highly recommended that you type your question in the chat window during the zoom meeting. You may also use your microphone to ask the question but understand that your voice will be recorded as part of the lecture recording.
5. This syllabus is subject to change at any time during the semester with changes to be announced in class.
6. An I (incomplete) grade is given only for extenuating circumstances and in accordance with University and Departmental Policies.
7. To comply with FERPA policies, I will communicate via email (email me at kougianos@unt.edu) but I will only respond to UNT email accounts.
8. Each student should retain graded lecture notes, pop quizzes, homework, tests, software-generated files, and laboratory reports to document errors in recorded grades.

9. 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

10. 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.

COVID-19 Impact on Attendance

While attendance is expected as outlined above, it is important for all of us to be mindful of the health and safety of everyone in our community, especially given concerns about COVID-19. Please contact me if you are unable to attend class because you are ill, or unable to attend class due to a related issue regarding COVID-19. It is important that you communicate with me prior to being absent so I may make a decision about accommodating your request to be excused from class.

If you are experiencing any symptoms of COVID-19 (https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html) please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to coming to campus. UNT also requires you to contact the UNT COVID Hotline at 844-366-5892 or COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure. While attendance is an important part of succeeding in this class, your own health, and those of others in the community, is more important.

Class Materials for Remote Instruction

The UNT fall schedule requires this course to have fully remote instruction beginning August 24. Students will need access to a webcam and microphone to participate in fully remote portions of the class. Information on how to be successful in a remote learning environment can be found at https://online.unt.edu/learn.

Technology Requirements

- Computer
- Reliable internet access
- Speakers
- Microphone (optional)
- Webcam (optional)
- Canvas Technical Requirements. (https://clear.unt.edu/supported-technologies/canvas/requirements)
- Microsoft Office Suite (available for free to all UNT students)
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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<tr>
<td>3.</td>
<td>Boolean Algebra, Switching functions and canonical forms</td>
<td>2 Weeks</td>
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<tr>
<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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<tr>
<td>7.</td>
<td>Modular Sequential Logic- Counters and shift registers</td>
<td>1.5 Weeks</td>
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<tr>
<td>8.</td>
<td>Analysis and Design of synchronous sequential circuits</td>
<td>2.5 Weeks</td>
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<tr>
<td>9.</td>
<td>Digital Logic Testing</td>
<td>1 Week</td>
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</tbody>
</table>

Note: The topics 1-9 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] Analysis and Design of asynchronous sequential circuits
[CLO-8] Analysis and Design of asynchronous sequential circuits
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>
<th>PO-3/3(c)</th>
<th>PO-4/3(d)</th>
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<th>PO-10/3(j)</th>
<th>PO-11/3(k)</th>
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**Table Note:**
- **x** indicates that the CLO maps onto the corresponding Program Outcome/ABET Outcome.