ELEC 2200 - DIGITAL LOGIC CIRCUITS
FALL SEMESTER - 2020

Bulletin Data: ELEC 2200. DIGITAL LOGIC CIRCUITS (3). Prereq. COMP 1200 or COMP 1210. Electronic devices and digital circuits; binary numbers; Boolean algebra and switching functions; gates and flip-flops; combinational and sequential logic circuits; hierarchical design of digital systems; computer-aided design tools for digital design, simulation, and testing.

Textbook: *Digital Logic Circuit Analysis and Design*, 2nd Edition (Pearson eText), V.P. Nelson, B.D. Carroll, H.T. Nagle & J.D. Irwin, Pearson Education, Inc.*,* 2021.
See page 4 of syllabus: Course eText via "All Access"

Web Site: Canvas (eText access, assignment submission, grades, uploaded documents, etc.)
Nelson web page: http://www.eng.auburn.edu/~nelsovp/courses/elec2200
(Copies of assignments, supplementary documents, etc.)

Instructor: Victor P. Nelson, Professor Emeritus of Electrical & Computer Engineering
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Diversity & Inclusion, Health & Safety:
The overall well-being of all students, staff and faculty is a top priority with particular emphases on promoting health (e.g. facial coverings & social distancing for in-person instruction) and supporting diversity & inclusion. Please refer to page 3 of the syllabus for statements regarding these priorities.

Course Objectives:
1. To be able to analyze and design combinational digital logic circuits
2. To be able to analyze and design sequential digital logic circuits
3. To be able to analyze and design modular, hierarchical digital systems

Prerequisites by topic:
Introductory computer programming in a high level language (COMP 1200 or 1210 or equivalent)

Topics:	**Textbook Sections:**
1. Introduction to digital systems	Chap. 0
2. Number systems and codes	1.1 - 1.5
3. Logic gates and circuits	2.1
4. Boolean and switching algebra	2.3.1
5. Switching functions and canonical forms	2.3.2 – 2.3.4
6. Circuit minimization via Karnaugh maps	2.4.1 – 2.4.3
7. Design and analysis of combinational circuits	3.1 – 3.2
8. Modular design, decoder/encoder modules, multiplexers/demultiplexers	3.3.1 – 3.3.3
9. Arithmetic circuits and ALUs	3.3.4
10. Combinational circuit design examples	3.4
11. Sequential circuit models	4.1
12. Latches and flip-flops	4.2
13. Registers, counters and shift registers	4.3 – 4.5
14. Synchronous sequential circuit analysis	5.1
15. Synchronous sequential circuit design	5.2 – 5.3
16. Sequential circuit design examples	5.4
17. Digital system design examples	8
18. Programmable logic devices (time permitting)	7
19. Exams and review	

Course Grades Will Be Determined As Follows:

Homework	50 points
Hour exams (two @ 100 points each)	200 points
Final exam **(Wednesday, Dec. 2, 4:00-6:30 p.m.)**	<u>150 points</u>
	TOTAL: 400 points

All exam and homework grades will be posted to Canvas.

Reading Assignments:

You are responsible for studying all textbook sections listed above, in addition to material presented in class.

Exams:

The two hour exams and the final exam will be closed book and closed notes. All students who are able to attend classes in person are to take the hour exams in the classroom. Online-only students are to take these exams during the scheduled class period, and be visible to the instructor via Zoom. Make-up exams will be given only in the case of university-approved activities or documented emergencies.

Homework:

The key to learning any engineering concept is to study it and understand how to apply it to solve problems. The role of the course instructor is to assist you in this endeavor by explaining concepts in class, providing meaningful reading assignments and homework to help you study and learn them, and reviewing homework problems after they have been graded and returned. The purpose of homework is to:

1. apply relevant engineering principles to specific applications, to improve mathematical, scientific, and analytical skills, and to identify technical points that need further clarification;
2. clarify concepts, improve communication skills, and develop technical writing skills; and
3. encourage class participation and to promote class involvement, responsibility, and professionalism.

Each student is expected to develop his/her own solution to each homework problem. Collaboration and discussion are acceptable; however, **each student must do and submit his/her own work.** To submit the work of others is an academic honesty policy violation (see below). Late homework (submitted after class convenes at 2:00 p.m.) will be accepted for credit only under extenuating circumstances.

Homework may be submitted on paper or uploaded to Canvas.

- Label the top of the first page of your assignment as follows. *(Please don't waste paper on a "cover page".)*

  > *Your Name*
  > *ELEC 2200, Assignment Number*
  > *Date submitted (August 31, 2020)*

- Paper submissions should be on 8.5" x 11" paper, with writing on one side only and with multiple pages stapled together, to help me keep your work together.
- Canvas submissions may be a single file or multiple files, in Word, pdf, or image format.

Homework will be graded on technical merit. Your presentation should be neat, easily legible, technically literate, technically correct, and well-organized (i.e. I need to be able to read what you've done.)

Class Attendance: Class attendance is strongly encouraged – either in person or online via Zoom. Online attendees are encouraged to participate in the live Zoom meeting, asking questions and participating in discussions. *For this semester, attendance will not be a factor in the course grade.* Recordings of class sessions will be posted on Canvas.

Academic Honesty Policy: All portions of the Auburn University student academic honesty code (Title XII) found in the Tiger Cub will apply to this class. All academic honesty violations or alleged violations of the SGA Code of Laws will be reported to the Office of the Provost, which will then refer the case to the Academic Honesty Committee.

Policy on Unannounced Quizzes: There will be no unannounced quizzes in this class.

Special Accommodations: Students who need special accommodations are asked to send me an email message to arrange a meeting (in person or via email/Zoom) during the first week of classes, or as soon as possible if accommodations are needed immediately. If you have made arrangements for accommodations through the Office of Accessibility, I should have received notification from them with recommended accommodations. If you have not made arrangements with that office, but need accommodations, please follow the procedure on the Office of Accessibility web page: https://accessibility.auburn.edu/

Diversity & Inclusion Statement: It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, religion, sexuality, disability, age, socioeconomic status, veteran status, ethnicity, race, and culture. All students in this course are expected to respect their fellow classmates and actively participate in fostering an inclusive learning environment. If you experience anything in this class that makes you feel uncomfortable, please bring it to my attention and we will formulate a response. If you would prefer to remain anonymous you may complete a Bias Incident Report which will maintain your confidentiality at:

      http://studentaffairs.auburn.edu/bert/submit-a-report-of-bias/

Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups.

Statement on Face Coverings & Social Distancing: This class will adhere to the guidelines documented in *A Healthier U – Comprehensive Health and Safety Plan*. All students should read, become familiar with, and follow the guidelines in this safety plan: http://ahealthieru.auburn.edu/.

While students, faculty and staff are expected to follow all the guidelines, the following items emphasize expectations for in-person instruction and interactions:
- Students, faculty, and staff will use the STAY SAFE TOGETHER™ platform.
- Students, faculty, and staff **will wear face coverings at all times** when inside classrooms, laboratories, and any university buildings when in the presence of others. Face coverings must also be worn outdoors on campus when appropriate physical distancing is impractical or impossible. Face coverings must be worn properly (i.e., completely covering nose and mouth) at all times. Anyone not adhering to proper face coverings will be required to leave the building immediately.
- Students, faculty, and staff will practice social distancing when meeting in person. Though *A Healthier U* states that social distancing will be achieved by limiting classrooms to 50% capacity, it will be maintained in this class with a minimum of 6 feet between people. Anyone not adhering to proper social distancing will be required to leave the building immediately.

Noncompliance with these policies will be considered a violation of the AU Policy on Classroom Behavior. The offending student(s) will be charged in accordance with the AU Code of Student Conduct. Please note that *A Healthier U* may be updated, or additional guidance developed, as conditions change. This class will adhere to the latest guidance as it becomes available.

Office Hours: After the semester gets underway, I will post times at which I will be available for questions and assistance in my office, and other times when I will be available via email or Zoom. This course builds on itself as it progresses, so it is important that you address and resolve problems as they arise, rather than waiting until the day before an exam.

Contribution of course to meeting the professional component:
    Engineering science: 1 credit or 33%
    Engineering design: 2 credits or 67%

Primary student outcomes related to this course:
Graduates will have achieved and demonstrated
    - an ability to apply knowledge of mathematics, science, and engineering to solve problems
    - an ability to design a system, component, or process to meet desired needs within realistic constraints

Course eText via "All Access"

Related information (accessing the eText, opt-out procedure) in the Files folder of Canvas)

What is All Access?

All Access is Auburn's program of delivering course materials to you digitally. Sometimes this will be a textbook, sometimes an access code. Your instructor has coordinated with the Bookstore to deliver this content for the course and help make sure you have what you need. All Access makes sure you are ready the first day of class, and the material is so much cheaper with this delivery that it's the best way we can help you succeed in your courses at Auburn….financially and academically.

What content am I getting?

For this course, ELEC 2200, you're getting access for the semester to Digital Logic Circuit Analysis and Design by Nelson. This comes as an enhanced etext, and is required content for the course.

How do I find it?

First, you'll retrieve your Pearson access code by using the RedShelf link on your Canvas course page. Once you have that code, copy and paste it into the Pearson link on Canvas, and you're all set. See attached instructions for more info. **Please use your @auburn.edu email to register for any All Access content.**

What does it cost?

For the first two weeks of class, everyone gets this content for free. All students in this course start as opted in to pay for the content for the course. The discounted price you'll be billed is $66.50. The print price used to be $230, so you're saving a chunk of money.

- If you want to opt out and not be charged, all you have to do is follow the instructions (see attached file with this email). You'll lose access at the end of the second week of class unless you've purchased it on your own.

How do I pay?

If you're still opted in on September 4, then we'll send the charge to your next ebill. This will be labeled as the course on your ebill so you'll know. You'll get an email on September 3 to remind you about the deadline.

What if I'm on scholarship?

We can charge All Access content to any scholarship that we charge at the Bookstore. Those will be done automatically when we bill. If you are a scholarship student and would prefer print, please mail MNH0016@auburn.edu and we will order one for you. These are done as requested, and take three to five business days to arrive. We will ship these out to you, or you can pick them up in store. Most scholarships will not pay for All Access and a print copy of the book.

What is the refund policy?

After the opt out deadline, we can only offer refunds to students who have dropped the course or withdrawn from the university. That's why the opt out deadline will be crucial for you to decide if you want to be charged or not.

An extra perk…you can get a print copy, too.

If you remain opted in to All Access, the publisher has made a low-cost print version available. Request a copy by email to MNH0016@auburn.edu with your course information included. These are usually available for purchase the second week of class.

What if I need help?

- Pearson customer service is always an option at support.pearson.com.
- RedShelf code support is available at solve.redshelf.com
- For most digital content in All Access, Google Chrome works best as a browser and you'll want to make sure it's up to date.
- I'm always happy to help as well, especially if you have a question about All Access or something doesn't look right.
  - **Russell Weldon books@auburn.edu or 844-1352**
- Also, http://aub.ie/allaccess has more info as well.