The University of Kansas
Electrical Engineering and Computer Science

EECS 140/141 Introduction To Digital Logic Design
Spring Semester 2020

1. General Information

Place, Times, Credits:	2 Eaton (Spahr Classroom), TR 4:00-5:20 pm, 4 credit hours
Discussion Section:	2 Eaton, M 4:00-6:00 pm
Required Text:	*Fundamentals of Digital Logic with VHDL Design, 3rd Edition* Stephen Brown and Zvonko Vranesic, McGraw Hill, 2009 (custom looseleaf edition)
Optional Text:	*The Student's Guide to VHDL, 2nd Edition*, Peter J. Ashenden, 2008
Required Materials:	Half-size logic design template (ANSI Y32.14, IEEE 91a, or MIL-STD-806C compliant)
Co-requisite:	Math 104
Professor, Email, Phone:	David W. Petr, dwp@ku.edu, 2001C Eaton Hall, 864-8823
Office Hours:	2001C Eaton: T 11:30-12:30, W 1:30-2:30, R 11:30-12:30 or by appointment
Labs:	2010 Eaton, various days and times
Lab GTAs:	Kishan Kaje, Amin Shojaei, Sharmila Raisa, Pramil Paudel, Lazarus Sandhagala Francis
Supplemental Instructor:	Anushka Bhattacharya

2. Catalog Description

An introductory course in digital logic circuits covering number representation, digital codes, Boolean Algebra, combinational logic design, sequential logic design, and programmable logic devices.

3. Course Objectives

To introduce the students to the description, design, and implementation of digital systems. Upon successful completion, students should be able to represent numbers in several number representation systems, manipulate Boolean algebra expressions, translate Boolean algebra expressions into digital logic, design simple digital logic systems, and build simple finite state machines. The students should also be able to write VHDL code in designing simple digital circuits.

4. Honors Section

EECS 141 is the Honors section of EECS 140. You may enroll in 141 if you are in the University Honors program or with the permission of your EECS 140 instructor. EECS 141 will have some additional reading assignments from the textbook and some more challenging homework and lab exercises. Discuss with your instructor and/or advisor if you want to switch from EECS 140 to EECS 141.

5. Course Schedule (tentative)

Topic	Meetings (75 min)
Course Intro	0.5
Boolean Algebra and Basic Logic Circuits	3.5
NMOS/CMOS Logic Gates	2.0
Simplified Implementations	4.5
EXAM 1	1
Binary Arithmetic Circuits	6.5
Common Combinational Circuits	2.0
EXAM 2	1
Flip-Flops, Registers, and Counters	3.5
Finite State Machines	5
FINAL EXAM	Tuesday 12 May 1:30 am - 4:00 pm

6. ABET Course Outcomes

Students should be capable of:

- Representing a combinational logic function as a truth table, Boolean expressions including various canonical forms, and logic circuits, and translating between these representations.
- Translating a simple logic problem expressed in prose to a combinational logic function.
- Simplifying a combinational logic function using K-maps and other techniques.
- Converting numbers between decimal and binary (and related) forms and designing simple digital circuits to perform numerical arithmetic functions.
- Designing combinational circuits using common building blocks.
- Designing flip-flop, register, and counter circuits.
- Implementing simple finite state machines from written specifications.
- Writing VHDL code for simple digital circuits.

7. Course Web Site

The website for this course (http://www.ittc.ku.edu/EECS/EECS_140) will contain important and interesting information and resources for this course. It will be updated from time to time as the course progresses.

8. Policies

8.1 Grade Composition and Letter Grades

Homework	10 Course Points
Quizzes	12 Course Points
Exam 1	18 Course Points
Exam 2	18 Course Points
Lab	20 Course Points
Final Exam	24 Course Points
Total	102 Course Points

The mapping from your final course score to your grade for the course will be based *to a first approximation* on the thresholds of 93 Course Points for an A, 90 Course Points for an A-, 87 for a B+, 83 for a B, 80 for a B-, etc. Note that the Course Points total to 102 instead of 100, giving you a 2 point "bonus" built into the grading scheme. This is how I handle variations in student performance due to personal circumstances, etc., rather than dropping the lowest test score or some other policy.

However, I reserve the right to adjust the letter grade thresholds based on the final distribution of course scores. As an example of what I mean by this, if there are several students with scores from 94 to 99 Course Points, several more with scores from 87 to 90 Course Points, and none in between, the entire second group of students would likely get the same grade, which would likely be a B+. The thresholds could also be moved down, e.g., under other circumstances I may assign an A- to a student with a score of 89 Course Points. *The following additional rule also applies:* You will receive a failing grade (F) for the class if your weighted exam average is less than 60% or if your lab average is less than 60%.

As an example of the calculation of grades, suppose that a student scored 66 out of 85 (77.6%) on Exam 1, 73 out of 85 (85.9%) on Exam 2, 104 out of 130 (80.0%) on the Final Exam, had a homework average of 70%, a quiz average of 65%, and a Lab average of 93%. The student's course score would be 82.04 Course Points and the student would probably receive a grade of B- for the course.

8.2 Exams

All semester exams will be given on Mondays during the 2-hour discussion time period. The regular class period on the prior Thursday will be a review/problem session (see "Discussion Sessions" below). All exams are closed book. I will provide any reference information (tables, etc.) I think you may need. You will also be allowed one 8.5 x 11 sheet of notes (one side) for each of Exams 1 and 2. All exams are cumulative (since course material tends to build on previous material), but Exams 1 and 2 will concentrate on material most recently covered.

8.3 Final Exam

The final exam is comprehensive, but there will be some emphasis on later course material not covered by the two mid-term exams. The final is not optional. You will be allowed three sides (8.5 x 11) of notes for the final exam; this means you could bring the note sheets that you used on the first two exams plus one more side of notes.

8.4 Quizzes

We will have a short (5-10 min) quiz every week on Thursday at the end of class. We will use an audience response system (ARS) for these quizzes. The quizzes will cover recent material and are intended to give you extra incentive to keep current in your studies.

8.5 Make-Ups

Make-up exams will be considered only if: 1) I am informed in **ADVANCE** of the exam (this notification can be via voice mail, email, message left with a department secretary, etc.), and 2) I deem the reason to be sufficiently meritorious (sorry, but job interviews are not). If the reason is illness, I **REQUIRE** documentation of the illness from a health-care professional. This documentation can be provided after the exam. There will be no make-up quizzes.

8.6 Homework

There will be one homework assignment each week (typically), usually given on Tuesday and due the following Tuesday. Homework will be turned in during class. Late homework is NOT accepted (no exceptions). Problems must be stapled together and include student name, KUID, course number and date due. *Logic diagrams must be drawn with template and straightedge.* Generally only a subset of the problems will be graded, but you are responsible for all problems assigned. We will strive to have the graded papers returned to you one week after they are turned in. Problem solutions (for all the problems assigned) will be made available through some combination of posting on the course website, Supplemental Instructor help sessions (see below), working the problem out in class, or some other means.

8.7 Discussion Sessions

As part of this class, you have enrolled in a required Discussion section on Monday afternoons from 4:00-6:00 pm. Except for exam days (see "Exams" above), the discussion sessions on Monday afternoons will be review/problem sessions that will usually be conducted by the Supplemental Instructor for the class. These are opportunities for you to ask questions about course material, examples, homework problems, etc. and get some problem solving practice in an informal group setting. Supplementary course material may also be presented. Attendance at these help sessions is not strictly required (just as class attendance is not strictly required), but will be beneficial for most, if not all, students. I will inform you of special presentations that may be given during some of the discussion sessions. These help sessions will begin at the appointed time and typically will continue until there are no more student questions. Experience has shown that these often last no more than one hour.

8.8 Classroom Behavior

Students are expected to behave in a respectful and courteous manner during classes. Talking during lectures is distracting to other students and to the instructor. If you have a question about the lecture, please raise your hand or ask another student during a classroom break. Talking is strictly prohibited during exams and quizzes.

9. Responsibilities and Available Assistance

9.1 Reading

You will be held responsible for all reading material assigned, even if it is not explicitly covered in

lecture.

9.2 Supplemental Instructor

There will be a "Supplemental Instructor" (or SI) for my lecture section of EECS 140/141. This is an undergraduate EECS student who has completed the course and done well. The SI's role is to help you to learn the course material. The SI's assistance will come in two forms. First, he/she will have office hours that will be announced in class and posted on the website. This is a form of one-to-one assistance (although occasionally several students may decide to visit the Supplemental Instructor at the same time). Anyone in this class is welcome to come visit the Supplemental Instructor during his/her office hours to ask questions about lecture material, reading assignments, homework assignments, or other class-related material. Questions that are specific to the Lab component of the course should be directed to the Lab TA's. Second, he/she will conduct a help session each week (see "Discussion Sessions" above). This is a form of group assistance. Again, anyone in this class is welcome to attend these help sessions, which will focus on reinforcing lecture material, reading assignments, homework assignments, and other class-related material.

9.3 Academic Misconduct

Although I encourage students to *study* together, *cheating* will be dealt with severely, with penalties up to and including a grade of F in the class and referral to the Dean. Cheating is essentially representing someone else's work as your own. Cheating includes, but is not limited to, copying solutions/answers from another student or from a solution manual, having another student do your work for you, falsifying (or using another group's) data or misrepresenting procedures used during labs, etc. If you are ever in doubt about what level of collaboration is acceptable, contact me.

10. Dates of Interest

27 January	Monday	Last day to add a class or change sections on-line
27 January	Monday	Last day to drop with 100% refund
10 February	Monday	Last day to drop with no transcript record
11 February	Tuesday	First day of withdraw period (W on transcript)
17 February	Monday	Last day to withdraw with 50% refund
2 March	Monday	Exam 1 (firm date)
9 March	Monday	First day of Spring Break
15 March	Sunday	Last day of Spring Break
13 April	Monday	Exam 2 (firm date)
20 April	Monday	Last day to withdraw (W on transcript)
7 May	Thursday	Last day of classes
12 May	Tuesday	Final Exam: 1:30 pm - 4:00 pm

NOTICES

Student Access Services: The Academic Achievement & Access Center (AAAC) coordinates accommodations and services for all KU students who are eligible. If you wish to request accommodations and have not contacted AAAC, please do so as soon as possible. Their office is located in 22 Strong Hall; their phone number is 785-864-4064 (V/TTY). Information about their services can be found at http://achievement.ku.edu/. Please contact me privately in regard to your needs in this course.

Concealed Carry: Individuals who choose to carry concealed handguns are solely responsible to do so in a safe and secure manner in strict conformity with state and federal laws and KU weapons policy. Safety measures outlined in the KU weapons policy specify that a concealed handgun:

- Must be under the constant control of the carrier.
- Must be out of view, concealed either on the body of the carrier, or backpack, purse, or bag that remains under the carrier's custody and control.
- Must be in a holster that covers the trigger area and secures any external hammer in an un-cocked position.
- Must have the safety on, and have no round in the chamber.

Individuals who violate the KU weapons policy may be asked to leave campus with the weapon and may face disciplinary action under the appropriate university code of conduct.

Course Materials: Course materials prepared by the instructor, together with the content of all lectures and review sessions presented by the instructor are the property of the instructor. Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. On request, the instructor will usually grant permission for students to make audio recordings of lectures, on the condition that these audio recordings are only used as a study aid by the individual making the recording. Unless explicit permission is obtained from the instructor, recordings of lectures and review sessions may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

Commercial Note-Taking Pursuant to the University of Kansas' Policy on Commercial Note-Taking Ventures, commercial note-taking is not permitted in EECS 140. Lecture notes and course materials may be taken for personal use, for the purpose of mastering the course material, and may not be sold to any person or entity in any form. Any student engaged in or contributing to the commercial exchange of notes or course materials will be subject to discipline, including academic misconduct charges, in accordance with University policy. Please note: note-taking provided by a student volunteer for a student with a disability, as a reasonable accommodation under the ADA, is not the same as commercial note-taking and is not covered under this policy.

Dropping/Withdrawing from Class: An engineering course can be dropped between the start of classes and [the date shown above] with no record of the enrollment appearing on the student's transcript. After that date, a student may withdraw from a class and receive a "W" on the transcript until [the date shown above]. This is the last opportunity to withdraw from a class.

Also, any student on probation will violate the probation agreement if he or she drops or withdraws from a course without obtaining prior permission from the associate dean.

