

The University of Texas at Tyler
Department of Electrical Engineering

EENG 3302: Digital Systems Design (required)

Syllabus

Catalog Description:

EENG 3302: Digital Systems Design
Boolean algebra, logic gates; number systems and codes; combinational logic; sequential logic; design of logic circuits; analog-digital interface; memory devices. Two hours of lecture and one three-hour lab per week.

Prerequisites: MATH 2413 Calculus I

Credits: 3 (2 hours lecture, 1 hours laboratory per week)

Text(s): Thomas L. Floyd, **Digital Fundamentals, 11th ed.** Prentice Hall, 2015
ISBN-10: 0132737965 ISBN-13: 9780132737968

Additional Material: NI Multisim Software

Course Coordinator: Mukul V. Shirvaikar, Professor

Topics Covered: (paragraph of topics separated by semicolons)

Introductory Digital Concepts; Number Systems, Operations, and Codes; Logic Gates; Boolean Algebra and Logic Simplification; Karnaugh Maps; Combinational Logic; Functions of Combinational Logic; Flip-Flops and Related Devices; Counters; Shift Registers; Sequential Logic; Memory and Storage;.

Evaluation Methods: (only items in dark print apply):

1. Examinations / Quizzes
2. Homework
3. Report
4. Computer Programming
5. Project
6. Presentation
7. Course Participation
8. Peer Review

Course Learning Outcomes¹: By the end of this course students will be able to:

1. Explain basic digital concepts including digital vs. analog, bits, logic levels, logic operations, functions and digital waveforms [1]
2. Solve problems involving conversions between decimal, binary, octal and hexadecimal number systems, signed numbers, arithmetic operations, digital codes such as BCD, ASCII, parity and error detection/correction [1]
3. Understand the operation of basic logic gates (NOT, AND, OR, ex-OR, NAND, NOR) using truth tables, logic circuit elements, timing diagrams and implementation using fixed-function integrated circuits [3]
4. Formulate and solve problems using Boolean Algebra including laws, rules, DeMorgan's theorem and boolean analysis of logic circuits [1]
5. Construct simplified logic circuits using boolean algebra, standard forms of boolean expressions, boolean expressions from truth tables and Karnaugh maps for minimization [1]
6. Apply combinational logic analysis to digital systems including realization techniques, the universal property of NAND/NOR gates, implementation and testing with pulse waveform inputs [1]
7. Analyze the operation of combinational logic circuits including adders, comparators, decoders, encoders, code converters, multiplexers, demultiplexers, parity generators/checkers [1]
8. Design combinational logic circuits including look-ahead carry adders, comparators, priority encoders, I/O drivers, parity generators/checkers [3]
9. Demonstrate knowledge of sequential logic circuit elements like flip-flops, latches, timers and their applications [1]
10. Design counter circuits to meet specifications including specified number sequences [1]

11. Outline the types of shift register circuits including various I/O configurations, Ring and Johnson counters [1]
12. Demonstrate knowledge of memory and storage including operation, types and circuits [1]
13. Explain a contemporary issue in the field of computer engineering [3]
14. Use modern engineering tools including modeling and simulation software and virtual instruments [3]
15. Perform laboratory experiments utilizing digital system analysis, design and implementation techniques [3]
16. Prepare laboratory reports that clearly communicate experimental information in a logical and scientific manner [3]

¹Numbers in brackets refer to method(s) used to evaluate the course learning outcome.

Relationship to Program Outcomes (only items in dark print apply)²: This course supports the following Electrical Engineering Program Outcomes, which state that our students will:

1. have the ability to apply knowledge of the fundamentals of mathematics, science, and engineering; [1-4, 12]
2. have the ability to use modern engineering tools and techniques in the practice of electrical engineering; [14]
3. have the ability to analyze electrical circuits, devices, and systems; [6, 7, 9, 11]
4. have the ability to design electrical circuits, devices, and systems to meet application requirements; [8, 10]
5. have the ability to design and conduct experiments, and analyze and interpret experimental results; [5, 15]
6. have the ability to identify, formulate, and solve problems in the practice of electrical engineering using appropriate theoretical and experimental methods; [1-3]
7. have effective written, visual, and oral communication skills; [16]
8. possess an educational background to understand the global context in which engineering is practiced, including:
 - a. knowledge of contemporary issues related to science and engineering; [13]
 - b. the impact of engineering on society;
 - c. the role of ethics in the practice of engineering;
9. have the ability to contribute effectively as members of multi-disciplinary engineering teams;
10. have a recognition of the need for and ability to pursue continued learning throughout their professional careers.

²Numbers in brackets refer to course learning outcome(s) that address the Program Outcome.

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:		hours
Engineering Sciences and Design:	3	hours
General Education Component:		hours

Grade Replacement:

If you are repeating this course for a grade replacement, you must file an intent to receive grade forgiveness with the registrar by the 12th day of class. Failure to file an intent to use grade forgiveness will result in both the original and repeated grade being used to calculate your overall grape point average. A student will receive grade forgiveness (grade replacement) for only three (undergraduate student) or two (graduate student) course repeats during his/her career at UT Tyler. (2006-08 Catalog, p. 35)

Prepared By:

Janet Barger, Assistant Professor
 David Beams, Associate Professor
 Mukul Shirvaikar, Associate Professor
 Mukul Shirvaikar, Associate Professor
 Mukul Shirvaikar, Professor

Date:

5 January 2002
 28 June 2002
 8 January 2004
 6 January 2005
 9 January 2006
 21 December 2006
 13 January 2008
 12 January 2009
 20 August 2010
 17 August 2012
 29 July 2013
 20 July 2015
 21 August 2018
 18 August 2019

The University of Texas at Tyler
Department of Electrical Engineering

EENG 3302: Digital Systems Design
2019 Fall Semester

COURSE OUTLINE

Course Coordinator: Dr. Mukul V. Shirvaikar, Electrical Engineering
 Office: RBN 2014
 Phone: 903-565-5620
 E-mail: mshirvaikar@uttyler.edu
 Website: <http://www.uttyler.edu/ee>

Class Location/Time: RBN 2012 / 11:00AM-11:55AM T R
 Laboratory RBN 2021 / 2:00-4:45PM W

Grading Policy:

Quizzes	25%
Mid-Term Examination	25%
Laboratory Projects	25%
Final Examination	25%

Note: Students are required to submit all lab reports to obtain a passing grade in the class. Instructor reserves the right to modify the above grading policy including final grade thresholds at any point of time.

Semester Schedule:

WEEK	DATE	TOPICS COVERED	READING ASSIGNMENT	LABORATORY
1	26-Aug-2019	1. Introductory Digital Concepts	1.1-1.7	
2	2-Sep-2019	2. Number Systems, Operations and Codes	2.1-2.6	Lab Introduction, Lab 1 – Instruments
3	9-Sep-2019	3. Logic Gates 4. Boolean Algebra	3.1-3.7; 4.1-4.3	Lab 2 – Logic Gates and Boolean Laws
4	16-Sep-2019	4. Logic Simplification	4.4-4.11	Lab 3 – DeMorgan's Theorems
5	23-Sep-2019	5. Combinational Logic	5.1-5.5	Lab 4 – Combinatorial Logic Circuits [Karnaugh Maps]
6	30-Sep-2019	2. Number Systems, Operations and Codes	2.7-2.11	Lab 5 – Universal Property of NAND and NOR Gates
7	7-Oct-2019	6. Functions of Combinational Logic	6.1-6.5	Lab 6 – Adders and Multiplexers
8	14-Oct-2019	Midterm Review MIDTERM EXAM Thursday, Oct. 17		Lab 7 – Encoders and Decoders
9	21-Oct-2019	6. Functions of Combinational Logic	6.6-6.9	Lab 8 – Seven-Segment Display
10	28-Oct-2019	7. Flip-Flops and Related Devices	7.1-7.7	Lab 9 – Comparators

11	4-Nov-2019	7. Flip-Flops and Related Devices	7.1-7.7	Lab 10 – Look-Ahead Carry Adders
12	11-Nov-2019	9. Counters	9.1-9.4	Lab 11 – Arithmetic Logic Unit
13	18-Nov-2019	8. Shift Registers	8.1-8.8	Lab 12 – Latches and Flip-Flops
14	25-Nov-2019	NO CLASS	NO LAB	THANKSGIVING
15	2-Dec-2019	11. Memory and Storage; Final Exam Review	11.1-11.5;11.10	Lab 13 – Counters
16	9-Dec-2019	FINAL EXAM Tuesday, Dec. 10, 11:00AM-1:00AM		

NOTE: Please maintain a class folder with all your work including class notes, homework and lab assignments, quizzes, and mid-term exam.

Homework, Examination and Lab Project Policy:

Homework and project reports will be due in Canvas one week after assignment. Project reports should be written as per the guidelines provided. A 25% penalty will be assessed for missing the submission deadline and an additional 25% penalty will apply per week for late project reports and homework. Any deviation from this rule will be at the sole discretion of the instructor.

All submissions are required to be in Microsoft Word format with machine readable text and not images or other representations of text. This rule will be applied to all sections of the report including the appendices and program code with comments. All flowcharts and diagrams must be prepared using Microsoft Office and not by hand. Any attempts to defeat the plagiarism checking software by submission of documents that include images instead of body text or any other mechanism will result in a grade of zero. The instructor or responsible grader reserves all rights to make this judgement and reject a project report if the above rules are not followed. Any violations may result in ACADEMIC DISHONESTY charges to be filed against the student.

Student waives all rights to a make-up exam if they miss a scheduled testing date. Any make-up testing will be at the sole discretion of the instructor.

Attendance Policy:

Students are expected to attend all scheduled lectures and lab meetings. By signing up for the class it is understood that the student has checked for ANY significant recurring conflicts with lecture and laboratory meeting times (including work, family, or any other commitments). No exceptions can be made for attendance requirements as this will be unfair to the other students. **The progressive nature of the class means that perfect attendance is recommended if a good grade is desired. No more than three excused absences for valid reasons are allowed and documentation should be submitted for each absence.**

Student Conduct Policy:

Any behavior which distracts from the learning experience of other students including sleeping in class is not allowed and will result in corrective action by the instructor/staff. Students are also expected to follow all safety rules and guidelines in the laboratory setting.

Academic Integrity:

Students should be aware that absolute academic integrity is expected of every student in all undertakings at The University of Texas at Tyler. Failure to comply can result in strong university-imposed penalties. **All lab reports and assignments will be verified using plagiarism checking software and violations will result in a grade of zero for the lab report or assignment at a minimum, and possibly stronger penalties such as a failing grade in the course and a scholastic dishonesty report submitted to the university.**

Students Rights and Responsibilities

To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link: <http://www.uttyler.edu/wellness/rightsresponsibilities.php>

Grade Replacement/Forgiveness and Census Date Policies

Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment Services Center or at <http://www.uttyler.edu/registrar>. Each semester's Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar.

Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract.

The Census Date is the deadline for many forms and enrollment actions that students need to be aware of. These include:

- Submitting Grade Replacement Contracts, Transient Forms, requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit.
- Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)
- Schedule adjustments (section changes, adding a new class, dropping without a "W" grade)
- Being reinstated or re-enrolled in classes after being dropped for non-payment
- Completing the process for tuition exemptions or waivers through Financial Aid

State-Mandated Course Drop Policy

Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date).

Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.

Disability Services

In accordance with federal law, a student requesting accommodation must provide documentation of his/her disability to the Disability Services counselor. If you have a disability, including a learning disability, for which you request an accommodation, please contact the Disability Services office in UC 3150, or call (903) 566-7079.

Student Absence due to Religious Observance

Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by the second class meeting of the semester.

Student Absence for University-Sponsored Events and Activities

If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.

Social Security and FERPA Statement:

It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

Emergency Exits and Evacuation:

Everyone is required to exit the building when a fire alarm goes off. Follow your instructor's directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services.