EGR 2400 – 007: Introduction to
Electrical and Computer Engineering
Winter 2018 Syllabus

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Office Hours: By appointment, typically immediately after class.

Textbooks: Digital Systems Principles and Applications 12th Edition (**Rented e-book**)
by Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss,
ISBN-13: 978-0134220130

Fundamentals of Electric Circuits – Sixth Edition
by Charles K. Alexander and Matthew N.O. Sadiku, McGraw Hill, 2017
ISBN-13: 978-0078028229

Course Prerequisites: EGR 1400 or CSE 1420; pre/co-requisites: MTH 1555, PHY 1610 or (PHY 1510 and PHY 1100)

Course Website: We will use Moodle for the course website. Go to https://moodle.oakland.edu/moodle/login/index.php and log in using your OUCA UserName and Password. Click on ***EGR-2400-13893.201810-Intro to Elect and Comp Eng.*** This will take you to the class web site where all lectures, lecture notes, and reading assignments are posted.

Homework, labs, and exam reviews can be found on a "Metacourse" shared between all EGR 2400 sections.
Metacourse: ***EGR-2400-13893 / EGR-2400-12772 / EGR-2400-11344.201810***

University Catalog Description:
EGR 2400 – Introduction to Electrical and Computer Engineering (4): An introduction to the fundamentals of electrical and computer engineering; DC and AC circuits, digital logic circuits; combinational logic design; sequential circuits, introduction to electronics, operational amplifiers, DC electromechanical machines. With laboratory. Offered fall, winter.
Prerequisites(s): EGR 1400 or CSE 1420
Pre/Corequisite(s): MTH 1555, PHY 1610 or (PHY 1510 and PHY 1100).

General Education Student Learning Outcomes:
This course will satisfy the Oakland University Natural Science and Technology general education requirement. As such, students will demonstrate:

1. knowledge of major concepts from natural science or technology, including developing and testing of hypotheses, drawing conclusions, and reporting of findings and some laboratory experience or an effective substitute
2. how to evaluate sources of information in science or technology

General Education Cross Cutting Capacities:

- Critical Thinking

ABET and Engineering Education:

Engineering programs in the United States are accredited by the Accreditation Board for Engineering and Technology (ABET). All engineering students in such accredited programs (including all engineering majors at Oakland University) must demonstrate, before graduation, that they have achieved the following **program outcomes**:

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

Course Objectives:

By the end of this course you should be able to:

- Convert a number in one base (decimal, binary, hexadecimal) to another and vice versa. (a)
- Identify basic gates (NOT, AND, OR, NAND, NOR, XOR, XNOR) and list the truth tables for each gate. (b,k)
- Find the reduced form of any logic function with 3 or 4 inputs by using Karnaugh maps. (a,b,c)
- Simulate basic digital circuits using Verilog and synthesize these circuits in an FPGA. (b,c,e,k)
- Find the voltages and currents in basic DC circuits. (a,b,c,k)
- Use phasors to find voltages and currents in basic AC circuits. (a,b,c,k)
- Set up the nodal and mesh matrix equations for AC and DC circuits. (a,b,c,k)
- List the properties of an ideal operational amplifier and use these properties in circuit analysis. (b,e)
- Find and draw Thevenin and Norton's equivalent circuits of simple DC and AC circuits (a,b,c)

Course Topics: Below is a tentative schedule of topics that will be covered.

Week	Topic	Reading
1	Introduction to Course; Number Systems	Chapters 1.4 & 2 *(Digital Systems*)
2	Basic Logic Gates ; Techniques for implementing logic gates; Introduction to Basic Digital Design ; Boolean Algebra	Chapters 3.1-3.10, 4.1-4.4, & 4.9-4.14 (*Digital Systems*)
3	Karnaugh Maps; Universal Gates;	Chapters 3.11-3.18, 4.5-4.8 (*Digital Systems*)

Week	Topic	Reading
4	Digital Design; Introduction to HDL design of multiple input gates;Digital Design: Equality Detector, Multiplexers, Clocks and Counters,	Chapter 5.4-5.5, 5.18 (*Digital Systems*)
5	7-Segment Displays; Saturators; Adders, Comparators	Chapters 5.1-5.3, 5.6-5.17, 5.19, 6.1-6.4, 6.9-6.15 (*Digital Systems*)
6	Flip Flops, and Registers; Fundamental Electrical Concepts;	Chapters 1.1-1.6, 2.1-2.6, 6.1-6.5 Appendix A, B, and, 9.1-9.7 (*Fundamental of Electric Circuits*)
7	Introduction to Phasors and other math concepts **Mid-Term Exam 1**	
8	Circuit Analysis: Dividers and Bridges, RMS,	2.5, 2.6, 3.1-3.3, 9.7, 11.4 (*Fundamentals of Electric Circuits*)
9	Circuit Analysis: Nodal Analysis, Mesh Analysis,	3.4, 3.5, 5.1-5.8, 10.7 (*Fundamentals of Electric Circuits*)
10	Circuit Analysis: Operational Amplifiers	4.1-4.4, 10.4, 10.5 (*Fundamentals of Electric Circuits*)
11	Source Transformation, Superposition **Mid-Term Exam 2**	
12	Simplified Mesh and Nodal Analysis, Thevenin Equivalent Circuits	4.5, 4.6, 4.8, 10.6, 11.3 (*Fundamentals of Electric Circuits*)
13	Equivalent Circuits	
14/15	In-class Homework, Prepare for Final Exam	

Homework:
All homework assignments are given on the metacourse website indicated above. Each homework assignment is given in a PDF document. Printing from your browser's PDF viewer will cause equations or circuits to appear incorrectly. Please download the assignment to your computer, type your name in the correct field, then print.

You are free to append additional pages if necessary, but please ensure that your name appears on every page and your assignment is stapled. Please note, **a stapler will not be provided**. Unless otherwise stated, homework assignments are due every week **at the beginning of class**.

Homework submitted after the key has been posted will not be accepted.

Laboratory:
Labs will be held nearly every week starting on 1/18/2018.

- **To pass the course (GPA 1.0 or greater), a 70% grade must be achieved in the lab portion of the course.** A student who attends all labs and makes an honest effort in completing all prelabs, lab reports, and lab quizzes, runs very little risk of falling below this mark.
- Each lab session begins with a lab introduction/lecture given by the lab instructor(s). These lectures take, on average, 15 minutes to setup and deliver. Therefore, **any student arriving 15 minutes late to lab will not be allowed to complete the lab,** and will be instructed to contact their instructor.
    - Any student who misses all or most of the lab lecture, even if arriving less than 15 minutes late, may not be allowed to complete the lab. The decision will be made at the discretion of the lab instructor.
- In the first lab period (Lab 0), students will be assigned to groups of two or three. **Students are not allowed to work alone on lab exercises even if their normal partner is absent.**

- Each individual student is required to submit a completed prelab at the beginning of every lab except Lab 0. The prelabs are considered individual work and are not to be completed as a group. Prelabs are an essential part of the lab exercise, thus **students arriving without a completed prelab will not be allowed to complete the lab**.
- Each lab student is required to bring a printed procedure sheet to every lab except Lab 0. Procedure sheets can be found on the metacourse web page. The students of the group will place their name at the top of the sheet. All notes, equations, data, etc. that are not electronic will be written on the procedure sheet and will be signed off by the lab instructor before the group leaves the lab. These sheets and all electronically recorded data/screenshots are proof of completion of the lab and will be used (in part) to resolve any lab related grade discrepancies.
- To show proficiency in the lab portion of the course the students will submit prelabs, lab reports, and/or lab quizzes for all labs except Lab 0.
    - **Prelabs (20% of lab grade)**: Prelabs are to be submitted at the beginning of every lab session and are not to be completed as a group. (see above)
    - **Lab Report/Lab Quiz (80% of lab grade)**: Lab reports and lab quizzes are due 2 weeks following the completion of the lab. Lab quizzes are online and must be completed after participating in the lab. Lab reports are **group** projects and only one report per group needs to be submitted. Lab quizzes are **individual** projects to be completed by each student participating in the lab. The lab reports and lab quizzes are equally weighted.

Lab Schedule: The Lab Schedule table provides information about when labs will occur, what is due for each lab, and when it is due. If a check mark appears in the same row of a lab, that assignment is to be completed for that lab. For example, Lab 1 requires the completion of a prelab (due at beginning of lab) and a lab quiz (to be completed by 2/10/18) while Lab 2 requires a prelab and lab report. The lab report is due in lab during week 8 (3/1/18).

Week # (Dates)	Lab Title	Prelab	Report (Due)	Quiz (Due)
1 (1/04-1/07)	No Lab			
2-3 (1/08 – 1/20)	Lab 0 – Introduction to the EGR 240 Lab			
4 (1/22 – 1/27)	Lab 1 – Introduction to TTL	✓		✓ **(2/10)**
5 (1/29 – 2/3)	Lab 2 – Digital Design (TTL)	✓	✓ **(week 8)**	
6 (2/5 – 2/10)	Lab 3 – Introduction to Aldec Active-HDL	✓		✓ **(3/3)**
7 (2/12 – 2/17)	No Lab (Focus on Exam 1) *Make-up Labs for excused absences from Lab 1-3*			
2/17-2/25	WINTER RECESS			
8 (2/26-3/3)	Lab 4 – D/A Converter	✓	✓ **(week 10)**	
9 (3/5-3/10)	Lab 5 – Analysis and Measurement of DC circuits	✓		✓ **(3/24)**
10 (3/12 – 3/17)	Lab 6 – Analysis and Measurement of AC circuits and Introduction to Passive Filters	✓	✓ **(week 12)**	

Week # (Dates)	Lab Title	Prelab	Report (Due)	Quiz (Due)
11 (3/19 – 3/24)	No Lab (Focus on Exam 1) *Make-up Labs for excused absences from Lab 4-6*			
12 (3/26-3/31)	Lab 7 – Introduction to Operational Amplifiers and Active Filters	✓		✓ **(4/14)**
13 (4/2 – 4/7)	Lab 8 – Strain Gauge and Differential Amplifier	✓	✓ **(Turn in Procedure Sheet)**	
14 (4/9 – 4/14)	No Lab *Make-up Labs for excused absences from Lab 7-8*			
15 (4/16-4/18)	No Lab (Focus on Final Exam) *No make-up Labs*			

Exams: There will be two midterm exams; these are scheduled to occur Feb. 15, 2018 and March 22, 2018. The final exam will be held on Thursday, April 19th from 7:00 - 10:00 pm. in the classroom where we meet for the lecture.

Evaluating Sources of Information in Science and Engineering:
Students will be instructed in the evaluation and gathering of credible online and printed sources of information in science and engineering. Students' understanding of these topics will be evaluated through an online quiz and a writing assignment.

Excused Absence policy: Any absence where a homework, lab, or exam is missed is to be reported to the course instructor with reason as soon as the absence occurs or is known to occur sometime in the future. The instructor will use OU policies and any supplied supporting documentation to determine if the absence is excused. If the absence is deemed excused, the instructor will work with the student to rectify the situation using due date extensions, make-ups, etc. Labs should still be attended even if your lab partner is going to be absent. **Lab instructors are not allowed to make decisions concerning absences.**

Gradebook Accuracy:
Gradebook mistakes will sometimes occur. It is the student's responsibility to ensure all graded material has been entered correctly into the Moodle gradebook. If an assignment is graded, but not entered or incorrectly entered, the student should report the situation to the instructor and provide the graded assignment so corrections can be made. If a student has turned in an assignment, but does not receive the graded work back nor is a grade entered into the gradebook, the missing assignment should be reported at the earliest possible time.

All gradebook discrepancies must be reported within 2 weeks of the assignment being returned to the class. If reported within this two week time period, the instructor will do everything possible to correct the problem. Once this time frame has past, the instructor reserves the right to refuse gradebook changes. For example, a student who waits until Finals Week to report a missing prelab 1 will likely receive a zero (0) for this assignment.

Grades:
To pass the course a student *must earn a 70% in the laboratory*. A student who does not meet this mark will receive a 0.0 in the course. The final grade will be based on the following weights:

Credibility of Sources Quiz & Assignment		5 %
Homework		10 %
Laboratory Total		20 %
Pre-lab	20% of lab grade	
Laboratory Report	80% of lab grade	
Exam #1 (Feb. 15, 2018)		20 %
Exam #2 (March 22, 2018)		20 %
Final exam [April 19, 2018 7:00 – 10:00 pm]		25 %
		100 %

GPA Mapping:

Below is the typical GPA Mapping based on past semesters of EGR 2400. The GPA mapping is subject to change, and won't be official until grades are posted.

≈95%	4.0
≈90%	3.6
≈80%	3.0
≈70%	2.0
≈60%	1.0

Academic Conduct:

Students are expected to conduct themselves according to the student handbook in the classroom, outside of the classroom, and in the labs. Any student found responsible for cheating by the Academic Conduct Committee will receive a 0.0 in this course in addition to the penalty designated by the committee. We will talk in class more about the do's and don'ts of working together and individually.