EGR 2400 – 001: Introduction to Electrical and Computer Engineering
Winter 2018 Syllabus

Instructor:	Dr. Khalid Mirza 338 EC, (248) 370-4629 mirza@oakland.edu
Office Hours:	M/W: 1:00PM – 2:00PM, or by appointment
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 Electrical Circuits" – Sixth Edition By Charles K. Alexander and Matthew N.O. Sadiku, McGraw Hill, 2017 ISBN-13: 978-0-07-802822-9
Course Prerequisites:	EGR 1400 or CSI 1420 Pre/Co-requisite(s): MTH 1555, PHY 1610 or (PHY 1510 and PHY 1100)
Course Website:	Moodle will be used for the class website where all lectures, lecture notes and reading assignments are posted. Go to: https://moodle.oakland.edu/moodle/login/index.php and log in using your OUCA UserName and Password. Click on ***EGR-2400-11344.201810-Intro to Elect and Comp Eng***. Homework, labs, and exam reviews are posted on a "Metacourse" website 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. Prerequisite(s): (CSE 142 or CSI 1420) or (EGR 141 or EGR 1400)
Prerequisite(s): EGR 1400 or CSI 1420
Pre/Co-requisite(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:

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

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.

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.

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

Laboratory:

Labs will be held nearly every week starting on 1/8/2018 for Monday sections and 1/16/2018 for all other sections.

- **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. However, lab quizzes are online and can be completed anytime during the 2 weeks. Lab reports are group projects and only one report per group need 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.

Exams:

There will be two midterm exams during the term and a final exam.

Grading:

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	Pre-lab:	20% of lab grade	20 %
	Lab report / Quiz:	80% of lab grade	
Exam #1			20 %
Exam #2			20 %
Final Exam			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

Excused Absence policy:

Missing a homework, lab, or exam due to absence needs to be reported to the course instructor with reason as soon as the absence occurs or is known to occur 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. Lab instructors are not allowed to make decisions concerning absences.

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.

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 (DS)
2	• Basic Logic Gates • Introduction to Basic Digital Design • Boolean Algebra and Venn Diagrams • Techniques for implementing logic gates	Chapters 3.1-3.9 (DS) Chapters 4.1-4.4 (DS) Chapters 3.10 (DS)
3	• Universal Gates & Application of DeMorgan's Theorem • Karnaugh Maps	 Chapters 3.11-3.18 (DS)
4	• Digital Design • Introduction to HDL (Switches and LEDs) • Basic Gates in Verilog • Equality Detector, Multiplexers • Clocks and Counters	Chapters 4.5-4.8 (DS) Chapter 5.4-5.5, 5.18 (DS)
5	• 7-Segment Decoder (Single and Multiple Displays) • Negative Numbers • Adders, Comparators • 2's Complement 4-Bit Saturator	 Chapters 6.1-6.4 (DS) Chapters 6.9-6.15 (DS)
6	• Flip Flops • Registers ----------*End of Mid-term Exam 1 Material*---------- • Fundamental Electrical Concepts	Chapters 5.1-5.3, 5.6-5.14 (DS) Chapters 5.15-5.17 (DS) Chapters 1.1-1.6, 2.1-2.6, 6.1-6.5 (FEC)
7	• Mid-Term Exam 1 Review • **Mid-Term Exam 1**	
Winter Recess		
8	• Fundamental Math and Phasors • Dividers and Weathstone Bridge • Root Mean Square (RMS)	Appendix A, B; Chapters 9.1-9.7 (FEC) Chapters 2.5, 2.6, 9.7 (FEC) Chapters 11.4 (FEC)
9	• Nodal Analysis (Basic and Multi Source Circuits) • Mesh Analysis (Basic and Multi Source Circuits)	Chapters 3.1-3.3 (FEC) Chapters 3.4-3.5 (FEC)
10	• Operational Amplifiers • AC Operational Amplifiers ----------*End of Mid-term Exam 2 Material*----------	Chapters 5.1-5.8 (FEC) Chapters 10.7 (FEC)
11	• Source Transformation • Superposition • Mid-Term Exam 2 Review • **Mid-Term Exam 2**	Chapters 4.4, 10.5 (FEC) Chapters 4.1-4.3, 10.4 (FEC)
12	• Simplified Mesh and Nodal Analysis • Thevenin Equivalent Circuits	 Chapters 4.5, 10.6 (FEC)
13	• Thevenin Equivalent Circuits • Norton Equivalent Circuits • Maximum Power Transfer	 Chapters 4.6, 10.6 (FEC) Chapters 4.8, 11.3 (FEC)
14/15	• In-Class Homework • Final Exam Review	

DS – Digital Systems

FEC – Fundamentals of Electric Circuits

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 (2/26 – 3/3).

Week # (Dates)	Lab Title	Prelab	Report (Due)	Quiz (Due)
1 (1/3– 1/6)	**No Lab**			
2-3 (1/8– 1/20)	**Lab 0** – Introduction to the EGR 2400 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)**	
11 (3/19 – 3/24)	**No Lab** (Focus on Exam 2) *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** (Focus on Final Exam) *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*			