James Madison University

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Digital Technology

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| Class Location: EnGeo2022 | Class Time: 1:00PM-3:00PM |
| Office location: EnGeo2209 | E-mail: karan.r.nair@gmail.com |
| Virtual office hours(Zoom) Meeting ID: 769558 Passcode: checkout | Office hours: 11:00AM-12:00PM |

Prerequisites  
Grade of C or better in MATH 220, MATH 112 or permission from instructor  
  
Course Description  
Introduces digital systems, circuits, and computers. Topics include binary systems and codes, digital logic gates and circuits, microelectronics and integrated circuits, coding and multiplexing, multivibrators, shift registers, counters, A\/D converters, and elementary computer architecture.  
  
Course Materials  
Textbook: Fundamentals of Digital Logic with VHDL Design, 3rd Edition by Stephen Brown and Zvonko Vranesic  
ISBN: 978-0-07-722143-0  
  
Learning Objectives  
Students who successfully complete this course will achieve the following learning objectives: Student will be able to analyze combinational logic circuits. Student will be able to minimize Boolean expressions using Boolean algebra and Karnaugh maps. Student will be able to specify a Boolean expression in either of the standard forms, and design the associated two-level combinational logic circuits. Student will be able to design a minimum-cost combinational logic circuit, given the circuit specifications. Student will be able to design complex digital logic circuits and systems from simple logic circuits. Student will be able to design a 1-bit adder circuit. Student will be able to design a multiple-bit adder\/subtractor circuit. Student will be able to analyze sequential logic circuits. Student will be able to design a 1-bit memory element from basic logic gates. Student will be able to design registers and shift-registers from 1-bit memory elements. Student will be able to design counters from 1-bit memory elements. Student will be able to design a minimum-cost sequential logic circuit, given the circuit specifications.  
  
Lab Policy  
The laboratory experiments complement the material covered in the lectures and in the assigned readings. They focus on the historical design methodology, making use of discrete components, a breadboard, and circuit wiring to realize combinational and sequential logic circuits. Each experiment will provide hands-on experience with one or more of the concepts covered in class. The labs will be performed in-person using lab components in EnGeo 0009 and using EasyEDA online tool https:\/\/easyeda.com\/ You are expected to be prepared for each lab. This includes review of the associated lecture materials, completion of the associated reading, and, most importantly, completion of the pre-lab. You will NOT be allowed to participate in the lab unless you have completed the pre-lab. You will be expected to complete a lab report for each laboratory experiment. The laboratory experiments are administered by the instructor who will provide additional materials regarding the lab, including the lab schedule, pre-lab requirements, and lab report guidelines.  
  
Assignments  
Homework is an essential part of the learning process. It is your opportunity to make use of the concepts discussed in class and in the assigned reading, and to apply these concepts to various types of problems. It will help you identify those things that you do not understand, and help you prepare for the exams. You are expected to complete the assigned reading and ALL of the problems in the problem set on each homework assignment. You are encouraged to work together, to understand how to solve each of the problems, and to develop a more complete understanding of the material. However, you must submit your own work. If you copy someone elses work or allow others to copy your work, you will receive a 0 for the homework assignment. Homework assignments will be posted on Canvas, on a weekly basis. You will have one week to complete each assignment. Homework MUST be submitted by the indicated due date on Canvas in electronic format. You can write your homework using any tool such as Microsoft word or do it on paper and then convert it to electronic form by taking clear images of it. Whichever method you choose, make sure to convert your homework to a single PDF file before submitting it to blackboard. Failure to submit a single PDF file for your homework assignment will result in point deductions up to losing all the points for a homework assignment if it is a repeated incident. Late homework will NOT be accepted.   
  
Expectations  
Show up for class on time  
  
Exam  
See the detailed schedule for the date of each of the exams. All exams are closed book. I will provide the necessary reference materials for each exam. Use of calculators will be specified for each exam. There will be NO makeup exams. If you cannot make one of the scheduled exams, you must speak with me in advance to arrange for an alternate time to take the exam.  
  
Attendance  
Attendance is mandatory. You cannot receive credit for in-class exercises if you are absent from class. You are responsible for all material covered in class and in the assigned reading. The class meets twice a week through in either the lab or the classroom (check the schedule for the specific dates). Should you miss class, you must con-sult with one of your classmates to obtain the missed material. If you miss more than 3 classes, you will receive a zero for attendance. Any further absences will result in further point deduction from the overall course points. Special circumstances and illness will be dealt with on individual basis.  
  
Grading  
A 93.00 to 100 A- 90.00 to 92.99 B+ 87.00 to 89.99 B 83.00 to 86.99 B- 80.00 to 82.99 C+ 77.00 to 79.99C 73.00 to 76.99 C-70.00 to 72.99 D+ 67.00 to 69.99 D 63.00 to 66.99 D- 60.00 to 62.99 F 59.99 and lower  
  
Disability Services  
If you are a student with a documented disability who will be requesting accommodations in my class, please make sure you are registered with JMUs Office of Disability Services (www.jmu.edu\/ods\/, 107 Wilson Hall, 568-6705) and provide me with an Access Plan letter outlining your accommodations. I will be glad to meet with you privately during my office hours to discuss your special needs.  
  
Honor Code  
You are expected to abide by both the JMU Honor Code and the JMU Appropriate Use of Information Technology Resources Policy. Please familiarize yourself with these documents. JMUs Honor Code prohibits unauthorized sharing and use of electronic or printed material. Others work used in relation to your Project must be properly cited. Citation assistance is available from the Library and from JMUs Writing Center. Protect your work knowingly providing access to your work and unauthorized use of another persons work are both violations of the JMU Honor Code. A JMU degree is a valuable commodity. Please dont diminish the value of your degree by participating in or ignoring others dishonest actions. Use good judgment and insist that others do the same. I will gladly answer questions you have about applying the Honor Code, Appropriate Use Policy, and Academic Honesty to this course. Do NOT cheat -- I will take appropriate action if I detect any instances of unauthorized collaboration or assistance. At a minimum this will result in a report to the JMU Honor Council and a reduction in your course grade.  
  
Final Exam  
See the detailed schedule for the date of each of the exams. All exams are closed book. I will provide the necessary reference materials for each exam. Use of calculators will be specified for each exam. There will be NO makeup exams. If you cannot make one of the scheduled exams, you must speak with me in advance to arrange for an alternate time to take the exam.  
  
Inclement Weather  
Class will be online if there is inclement weather  
  
Withdrawals  
Withdrawals are allowed up to week 6.  
  
Lecture Schedule

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| --- | --- | --- | --- | --- | --- |
| Date | Topic | HW due | Lab due | Quiz | Exam |
| 1/17 | Intro week |  |  |  |  |
| 1/19 |  | HW1 |  |  |  |
| 1/24 |  |  | Lab 1 |  |  |
| 1/26 |  |  |  | Quiz 1 |  |
| 1/31 |  | HW2 |  |  |  |
| 2/2 |  |  | Lab 2 |  |  |
| 2/7 |  |  |  | Quiz 2 |  |
| 2/9 |  | HW3 |  |  |  |
| 2/14 |  |  | Lab 3 |  | Exam 1 |
| 2/16 | Holiday |  |  |  |  |