

# McLennan C O M M U N I T Y C O L L E G E

WACO, TEXAS

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## **COURSE SYLLABUS**

**AND**

## **INSTRUCTOR PLAN**

**Introduction to Digital Systems**

**ENGR - 2406 - 01**

**Professor Laura Wright**

**NOTE: This is a 16-week course.**

**NOTE: This is a 2-Way Blended/Hybrid course.**

### **COVID 19 Notice:**

McLennan Community College is committed to providing you with every resource you need to reach your academic goals. We are also concerned for your safety. We are working through COVID-19 guidelines to make sure we offer a safe environment for you and our faculty. This will include smaller class sizes to manage social distancing and proper cleaning techniques. You will have the advantage of a physical classroom experience but may also need to work part of the time online as we adjust to limited classroom capacity. This will also allow us the flexibility to move online if so directed by federal, state and/or local COVID 19 guidelines. Faculty and staff are preparing now to ensure that you have the best experience in the midst of these uncertain times.

**Course Description:**

Introduction to theory and design of digital logic, circuits, and systems. 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. Prerequisite: MATH 1314 with a grade of C or better. Semester Hours 4 (3 lec/3 lab)

**Prerequisites and/or Corequisites:**

Prerequisite: MATH 1314 with a grade of C or better.

**Instructor Information:**

Instructor Name: Professor Laura Wright

MCC Email: lwright@mclennan.edu

Office Phone Number: 254-299-8419

Office Location: HP 230

Office/Teacher Conference Hours: M/W 2 pm to 4pm, T 3 pm to 4:30 pm (by appointment)

Zoom Meeting ID: 837-729-4618

**This course is a 2-Way Blended Course. This means that part of the instruction will be online synchronously, meaning you must make arrangements to be online during certain times**

**Times that you must absolutely be online through Zoom:**

- **Thursday, September 24 at 8 – 9:30 am**
- **Thursday, October 29 at 8 – 9:30 am**
- **Thursday, December 3 at 8 – 9:30 am**
- **Thursday, December 10 at 8 – 10 am**

**Required Text & Materials:**

- *Digital Systems: Principles and Applications*, 12<sup>th</sup> ed by Tocci
- Digital/Circuit Lab kit
- At least 4 working AA batteries
- A scientific calculator (any calculator that can handle exponents and logs)
- A phone with Zoom for tests
- Access to Brightspace: This course will have a significant component on Brightspace. If you haven't yet logged into the system, learn how to do so. Log in, and make sure you can access the materials for this course.

**MCC Bookstore Website:** <http://www.mclennan.edu/bookstore/>

**Student Support/Resources:**

MCC provides a variety of services to support student success in the classroom and in your academic pursuits to include counseling, tutors, technology help desk, advising, financial aid, etc. A listing of these and the many other services available to our students is available at <http://www.mclennan.edu/campus-resource-guide/>

College personnel recognize that food, housing, and transportation are essential for student success. If you are having trouble securing these resources, we encourage you to contact a success coach by calling (254) 299-8226. Students can visit the Completion Center Monday-Friday from 8:00 a.m.-5:00 p.m. to meet with a success coach and receive additional resources and support to help reach academic and personal goals. Paulanne's Pantry (MCC's food pantry) is open 12:00 p.m.-1:00 p.m., Monday-Friday, without an appointment. The Completion Center and pantry are located on the Second Floor of the Student Services Center (SSC).

**MCC Foundation Emergency Grant Fund**

Unanticipated expenses, such as car repairs, medical bills, housing, or job loss can affect us all. Should an unexpected expense arise, the MCC Foundation has an emergency grant fund that may be able to assist you. Please go to <https://www.mclennan.edu/foundation/scholarships-and-resources/emergencygrant.html> to find out more about the emergency grant. The application can be found [here](https://www.mclennan.edu/foundation/docs/Emergency_Grant_Application.pdf) ([https://www.mclennan.edu/foundation/docs/Emergency\\_Grant\\_Application.pdf](https://www.mclennan.edu/foundation/docs/Emergency_Grant_Application.pdf)).

**Minimum Technical Skills:**

Students should have basic computer skills, knowledge of word processing software, and a basic understanding of how to use search engines and common web browsers.

**Backup Plan for Technology:**

In the event MCC's technology systems are down, you will be contacted/notified through your MCC student email address. Please note that all assignments and activities will be due on the date specified in the Instructor Plan, unless otherwise noted by the instructor.

**\* [Click Here for the Minimum System Requirements to Utilize MCC's D2L|Brightspace](https://www.mclennan.edu/center-for-teaching-and-learning/Faculty%20and%20Staff%20Commons/requirements.html)**  
(<https://www.mclennan.edu/center-for-teaching-and-learning/Faculty%20and%20Staff%20Commons/requirements.html>)

Click on the link above for information on the minimum system requirements needed to reliably access your courses in MCC's D2L|Brightspace learning management system.

**Email Policy:**

McLennan Community College would like to remind you of the policy (<http://www.mclennan.edu/employees/policy-manual/docs/E-XXXI-B.pdf>) regarding college email. All students, faculty, and staff are encouraged to use their McLennan email addresses when conducting college business.

A student's McLennan email address is the preferred email address that college employees should use for official college information or business. Students are expected to read and, if needed, respond in a timely manner to college emails.

**Instructional Uses of Email:**

Faculty members can determine classroom use of email or electronic communications. Faculty should expect and encourage students to check the college email on a regular basis. Faculty should inform students in the course syllabus if another communication method is to be used and of any special or unusual expectations for electronic communications.

If a faculty member prefers not to communicate by email with her/his students, it should be reflected in the course syllabus and information should be provided for the preferred form of communication.

**Email on Mobile Devices:**

The College recommends that you set up your mobile device to receive McLennan emails.

**Forwarding Emails:**

You may forward the emails that come to your McLennan address to alternate email addresses; however, the College will not be held responsible for emails forwarded to an alternate address that may become lost or placed in junk or spam filters.

**Additional requirements:**

Students must have a reliable computer and internet connection. Students must be able to demonstrate basic computer literacy skills such as keyboarding, sending and receiving email, and using a web browser. Students may need access to Xilinx to complete assignments, which is available in the Learning Lab, room 135 in the Science Building, and can be downloaded for free.

***MCC Engineering uses Slack for communication. All major course announcements will be posted in Slack – failure to check Slack will result in you missing important***

*information. Also, anything we hear about jobs, scholarships, speakers, etc., will also be posted to Slack in the #general channel.*

Slack is free and used in the professional community as a workflow management system, so it is good to gain experience with the tool. All “general questions” like “I’m stuck on problem 5” will be directed to Slack, which will allow you and your classmates to support each other, especially in “time-crunch” situations. (Your classmates are a lot more likely to be up at 3 am doing homework than I am going to be checking email.) Always be respectful and professional in your participation.

Please bear in mind that Slack is an open communication tool. Please do not ask for or reveal personal information through the tool. Note that anything you post in Slack in channels will be viewable by other channel participants. Do not post anything about personal grades, due dates, or personal issues. Do not post your own correct solutions to assignments, but you can post incorrect work and ask if anyone can see where you went wrong.

Slack can be used on both a desktop computer and as an app. For more information about Slack in general, visit <https://slack.com/>. You will be invited to our class channel via your MCC student account. Detailed guidelines for Slack are on Brightspace and on Slack itself.

### **Methods of Teaching and Learning:**

Students will learn through lecture videos and reading, as well as through work on homework, labs, and, exams. Additional methods may be used as opportunities present themselves.

### **Course Objectives and/or Competencies:**

Upon successful completion of this course, students will be able to:

- Utilize binary and hexadecimal numbers. (*Chapter 2*)
- Solve problems involving digital codes, operations, and number systems. (*Chapter 2 & 6*)
- Define, describe, and analyze fundamentals of Boolean algebra and digital logic gates. (*Chapter 3*)
- Describe, analyze, design, and fabricate combinational logic circuits. (*Chapter 3, 4, 9*)
- Describe, analyze, design, and fabricate sequential logic circuits. (*Chapter 5-7*)
- Describe and explain the fundamentals of memory operations. (*Chapter 10-12*)
- Apply computer mathematical and/or simulation tools to solve digital systems problems. (*Select labs*)
- Prepare laboratory reports that clearly communicate experimental information in a logical and scientific manner. (*All labs*)
- Conduct basic laboratory experiments involving design and construction of digital circuits and systems. (*All labs*)

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- Relate physical observations and measurements involving digital circuits and systems to theoretical principles. (*All labs*)
  - Evaluate the accuracy of physical measurements and the potential sources of error in the measurements. (*All labs*)
  - Design fundamental experiments involving principles of digital circuits and systems. (*All labs*)
  - Identify and apply appropriate sources of information for conducting laboratory experiments involving digital circuits and systems. (*All labs*)

### **Course Outline or Schedule:**

You are responsible for everything listed in the detailed calendar below. You should watch the associated videos and read the indicated pages in the textbook on or before the due date for each assignment, so that you have time to complete the assignment. This calendar is subject to change. In the event that I need to make changes to the schedule, I will send an email to the class via Brightspace and post on the class Slack channel as soon as I possibly can.

<b>Week</b>	<b>Topic</b>	<b>Textbook</b>	<b>What's due by Sunday @ 11:59pm</b>
Week 1 8/24 – 8/30	<ul style="list-style-type: none"> <li>• Orientation</li> <li>• Introductory Concepts</li> </ul>	Ch. 1	<ul style="list-style-type: none"> <li>○ Orientation Quiz</li> <li>○ HW 1</li> </ul>
Week 2 8/31 – 9/6	<ul style="list-style-type: none"> <li>• Number Systems</li> <li>• Codes and Error Detection</li> </ul>	2.1 – 2.4, 2.7 – 2.9	<ul style="list-style-type: none"> <li>○ HW 2</li> <li>○ Lab 1: Basics of Electronics</li> </ul>
Week 3 9/7 – 9/13	<ul style="list-style-type: none"> <li>• Truth Tables</li> <li>• Boolean Operations</li> </ul>	3.1 – 3.5	<ul style="list-style-type: none"> <li>○ HW 3</li> <li>○ Lab 2: OR, AND, and NOT</li> <li>○ Quiz 1</li> </ul>
Week 4 9/14 – 9/20	<ul style="list-style-type: none"> <li>• Boolean Algebra</li> <li>• Boolean Theorems</li> </ul>	3.6,	<ul style="list-style-type: none"> <li>○ HW 4</li> <li>○ Lab 3: NAND and NOR</li> <li>○ Quiz 2</li> </ul>
Week 5 9/21 – 9/27	<ul style="list-style-type: none"> <li>• <b>Test 1</b></li> </ul>		<ul style="list-style-type: none"> <li>○ <b>Test 1 – Thursday, 9/24 @ 8 – 10 am</b></li> </ul>
Week 6 9/28 – 10/4	<ul style="list-style-type: none"> <li>• Combinational Logic</li> <li>• Karnaugh Maps</li> <li>• Enable/Disable Circuits</li> </ul>		<ul style="list-style-type: none"> <li>○ HW 5</li> <li>○ Lab 4: Combinational Logic</li> </ul>

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Week 7 10/5 – 10/11	<ul style="list-style-type: none"> <li>• Decoders</li> <li>• Encoders</li> <li>• Multiplexers</li> </ul>		<ul style="list-style-type: none"> <li>○ HW 6</li> <li>○ Lab 5: Introduction to VHDL</li> <li>○ Quiz 3</li> </ul>
Week 8 10/12 – 10/18	<ul style="list-style-type: none"> <li>• Latches and Flip Flops</li> <li>• Clock Signals</li> <li>• Clocked FFs</li> </ul>		<ul style="list-style-type: none"> <li>○ HW 7</li> <li>○ Lab 6: XOR and XNOR</li> </ul>
Week 9 10/19 – 10/25	<ul style="list-style-type: none"> <li>• Asynchronous Inputs</li> <li>• Shift Registers</li> </ul>		<ul style="list-style-type: none"> <li>○ HW 8</li> <li>○ Lab 7: Decoders, Encoders, and Multiplexers</li> <li>○ Quiz 4</li> </ul>
Week 10 10/26 – 11/1	<ul style="list-style-type: none"> <li>• <b>Test 2</b></li> </ul>		<ul style="list-style-type: none"> <li>○ <b>Test 2 – Thursday, 10/29 @ 8 – 10 am</b></li> </ul>
Week 11 11/2 – 11/8	<ul style="list-style-type: none"> <li>• Digital Arithmetic</li> <li>• Binary, BCD, and Hex Arithmetic</li> </ul>	6.9-6.15, 7.1- 7.4	<ul style="list-style-type: none"> <li>○ HW 9</li> <li>○ Lab 8: Sequential Logic</li> </ul>
Week 12 11/9 – 11/15	<ul style="list-style-type: none"> <li>• Adders</li> <li>• Counters</li> </ul>	7.5 – 7.10, 7.14, 7.17	<ul style="list-style-type: none"> <li>○ HW 10</li> <li>○ Lab 9: D Latches and Flip Flops</li> <li>○ Quiz 5</li> </ul>
Week 13 11/16 – 11/22	<ul style="list-style-type: none"> <li>• State Machines and Special Counters</li> <li>• IC Registers</li> </ul>	Ch 27-28	<ul style="list-style-type: none"> <li>○ HW 11</li> <li>○ Lab 10: Adders</li> </ul>
Week 14 11/23 – 11/29	<ul style="list-style-type: none"> <li>• DAC/ADC</li> <li>• ROM/RAM</li> </ul>		<ul style="list-style-type: none"> <li>○ HW 12</li> <li>○ Quiz 6</li> </ul>
Week 15 11/30 – 12/6	<ul style="list-style-type: none"> <li>• <b>Test 3 (6, 7, 11, 12)</b></li> </ul>	Ch. 1, 2, 3, 4, 9, 5, 6, 7, 11, 12	<ul style="list-style-type: none"> <li>○ <b>Test 3 – Thursday, 12/3 @ 8 – 10 am</b></li> <li>○ Lab Makeup</li> </ul>

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Week 16  12/10	<b>Final Exam</b>  <b>Thursday, 12/10</b>		○ <b>Final Exam will be taken Thursday, 12/10 from 8 – 10am</b>
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### Course Grading Information:

Grade Distribution	
Homework	25%
Labs	30%
Quizzes	5%
Test Average	40%
<b>Total</b>	<b>100%</b>

**A: 90%+    B: 80% – 89%    C: 70% – 79%    D: 60% – 69%    F: 0% – 59%**

**Orientation Quiz:** In order to unlock the course on Brightspace, you will need to complete an orientation quiz with a score of 80% or higher. This orientation quiz is to make sure you understand the policies of this course before you begin. You can take it an unlimited number of times, and the grade will not be recorded in the gradebook, however you will not be able to access the rest of the course until you receive a score of 80% or higher.

**Homework:** Homework is due each week on Sunday evenings at 11:59pm. All homework will be submitted through Brightspace. Homework will consist of problems worked from the textbook. You will need to scan in your homework assignment and submit through Brightspace. There will be no homework due on testing weeks.

**Labs:** There will be 10 lab assignments throughout the course of the semester. You will need to use your lab kit, purchased from the bookstore, to complete your labs. A video will be posted on Brightspace to give background to the lab assignment and to help you get started. In addition, I will be online through Zoom on Thursdays, 8-11am, to answer questions and help with any lab issues. Attendance will not be mandatory, however, you are encouraged to log in if you have questions. There will be an optional, alternative lab makeup assignment at the end of the semester, which will replace your lowest lab grade and serve as an opportunity to help you bring your grade up.

**Quizzes:** There will be 6 quizzes throughout the course of the semester. The quizzes will be through Brightspace. The quizzes are designed to prepare you for the types of questions you may see on the tests. You can take the quizzes at any time during the week they are assigned, but they will be timed and you must complete the quiz once you start. You will get two attempts for each

quiz. Each quiz will be open note, open book. In addition, there may be “pop” quizzes throughout the semester in which I ask you to submit your notes as a quiz grade.

**Tests:** There will be three tests throughout the course of the semester, plus a comprehensive final exam, for a total of four tests. The tests will be taken on the dates and times listed in the syllabus. The lowest of the four test grades will be dropped.

- In order to take the test, there are some procedures you will need to follow:
  - You will need two internet-capable devices on the test day.
    - A phone – to log into Zoom
    - A computer/laptop – to log into Brightspace
  - On your phone: You’ll join the class Zoom channel so I can proctor the exam.
    - Be ready to present your student ID (or another form of ID if you don’t have one) so we can verify your identity).
    - I will need to watch you for the entire time you’re taking the exam.
    - You can mute your mic, but not your video.
    - Your camera on your phone needs to be arranged so I can see you and your workspace.
    - I will record the Zoom meeting in case there are questions related to academic integrity, but will not post the video.
  - On your computer/laptop
    - Prior to the day of the exam, you will need to complete the Technology Check to make sure you have Respondus Lockdown Browser working on your machine.
    - The test is password protected – you cannot get the password without joining the Zoom meeting.
  - Other important info:
    - The test dates are listed in the syllabus.
      - Please clear your schedule now as there will be no makeup exam except in cases where you can provide documentation of an MCC-approved absence.
      - Make sure you have a technology backup plan (like how to use your phone as a wifi hotspot) in case something goes wrong.
    - Try and get a distraction-free zone for testing, but I understand that things happen. Avoid a situation where someone could make the argument that you are getting unauthorized help on the exam from someone else.

**Late Work, Attendance, and Make Up Work Policies:**

According to MCC policy, you will be dropped from the course if you miss 25% of class. Since this is an online course, attendance will be based upon participation in the course. Students should have activity in the course (homework, test, discussion board, lab). I will run a report each week on Sundays to determine who is participating in the class. Any week in which work is not logged will count as an absence. You will be dropped after two weeks of inactivity (25% of

class time). Attendance will be logged in Brightspace, and students are encouraged to regularly check Brightspace for accuracy.

MCC allows for “excused” absences caused by (1) authorized participation in official College functions, (2) personal illness (this also includes if you have to care for a sick child), (3) an illness or a death in the immediate family, or (4) the observance of a religious holy day. It is your responsibility to let me know the reason for an absence the day you return to campus and provide sufficient documentation (doctor’s note, email from coach, etc.).

Late homework, quizzes, and lab assignments will not be accepted, for any reason. If you are unable to attend class on one of the testing days listed in the calendar above due to an MCC excused absence reason, you must contact me as soon as possible (before the test, if possible) and provide acceptable documentation as listed above for your absence so that I can make an alternate arrangement for you to complete the test. Absences without documentation or for reasons that do not fall under the above will not be considered for make up and you will receive a zero for that test.

#### **Student Behavioral Expectations or Conduct Policy:**

Students are expected to maintain classroom decorum that includes respect for other students and the instructor, prompt and regular attendance, and an attitude that seeks to take full advantage of the education opportunity.

#### **\* [Click Here for the MCC Academic Integrity Statement](#)**

([www.mclennan.edu/academic-integrity](http://www.mclennan.edu/academic-integrity))

The link above will provide you with information about academic integrity, dishonesty, and cheating.

#### **\* [Click Here for the MCC Attendance/Absences Policy](#)**

(<https://www.mclennan.edu/highlander-guide/policies.html>)

Click on the link above for the college policies on attendance and absences. Your instructor may have guidelines specific to this course.

#### **Accommodations/ADA Statement**

Any student who is a qualified individual with a disability may request reasonable accommodations to assist with providing equal access to educational opportunities. Students should contact the Accommodations Coordinator as soon as possible to provide documentation and make necessary arrangements. Once that process is completed, appropriate verification will be provided to the student and instructor. Please note that instructors are not required to provide

classroom accommodations to students until appropriate verification has been provided by the Accommodations Coordinator. Instructors should not provide accommodations unless approved by the Accommodations Coordinator. For additional information, please visit [mclennan.edu/disability](http://mclennan.edu/disability).

Students with questions or who require assistance with disabilities involving physical, classroom, or testing accommodations should contact:

[disabilities@mclennan.edu](mailto:disabilities@mclennan.edu)

254-299-8122

Room 319, Student Services Center

**\* Click Here for more information about Title IX**

**([www.mclennan.edu/titleix](http://www.mclennan.edu/titleix))**

We care about your safety, and value an environment where students and instructors can successfully teach and learn together. If you or someone you know experiences unwelcomed behavior, we are here to help. Individuals who would like to report an incident of sexual misconduct are encouraged to immediately contact the Title IX Coordinator at [titleix@mclennan.edu](mailto:titleix@mclennan.edu) or by calling Dr. Drew Canham (Vice President for Student Success) at 299-8645. Individuals also may contact the MCC Police Department at 299-8911 or the MCC Student Counseling Center at MCC by calling 299-8210. The MCC Student Counseling Center is a confidential resource for students. Any student or employee may report sexual harassment anonymously by visiting the following website: <http://www.lighthouse-services.com/mclennan/>.

McLennan's Title IX webpage (<http://www.mclennan.edu/titleix/>) contains more information about definitions, reporting, confidentiality, resources, and what to do if you or someone you know is a victim of sexual misconduct, gender-based violence or the crimes of rape, acquaintance rape, sexual assault, sexual harassment, stalking, dating violence or domestic violence.

*\* You will need to access each link separately through your Web browser (for example: Internet Explorer, Mozilla, Chrome, or Safari) to print each link's information.*