



WACO, TEXAS

**COURSE SYLLABUS
AND
INSTRUCTOR PLAN**

Introduction to Digital Systems

ENGR – 2406 – H1

Professor Laura Wright

NOTE: This is a 16-week course.

NOTE: This is a Blended/Hybrid course.

COVID 19 Notice:

McLennan Community College is committed to providing you with every resource you need to reach your academic goals including your safety. We will continue to monitor the evolving situation with COVID 19 and adjust our safety guidelines to make sure we offer a safe environment for you and our faculty. Please make sure to consult your faculty and the MCC website at <https://www.mclennan.edu/crisis-management/coronavirus-updates/index.html> on any changes to these guidelines.

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. Semester Hours 4 (3 lec/3 lab)

Prerequisites and/or Corequisites:

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

Course Notes and Instructor Recommendations:

This class is offered in hybrid format, meaning that 50% of the course content will be delivered online, and the other 50% will be face-to-face. We will meet face-to-face every Thursday from 8-11am.

Instructor Information:

Instructor Name: Professor Laura Wright

MCC Email: lwright@mclennan.edu (preferred method of contact)

Office Phone Number: 254-299-8419

Office Location: S 246 or Zoom Meeting ID: 837-729-4618

Office/Teacher Conference Hours: 2-4pm Mondays & Wednesdays, 3-4pm Thursdays

**I generally try to answer emails, calls, and Slack messages as quickly as possible, however please give me at least 24 hours to respond. Emails/calls/messages sent on weekends may not receive a response until the following Monday.*

This course meets every Thursday from 8am – 10:55am in Room 214 in the Science Building

Required Text & Materials:

- *Digital Systems: Principles and Applications*, 12th ed by Tocci
- Digital Lab kit – available only in the MCC Bookstore
- At least 4 working AA batteries – I don't have extras! You MUST provide your own
- A scientific calculator (any calculator that can handle exponents and logs)
- Five 882-E scantron sheets
- A reliable internet connection
- 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/>

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*)

Introduction to Digital Systems

ENGR – 2406 – H1

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- 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*)
 - 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 before the in-class labs, so that you know the basics behind the lab. I can answer questions, but I will not repeat the online lecture during the lab period. In the event that I need to make a change to the schedule, I will notify you through email, Slack and Brightspace as soon as I possibly can.

Week	What you need to do online this week	Textbook	Thursday - In Class
Week 1 Aug 22-Aug 25	<ul style="list-style-type: none">• Read the Syllabus• Watch Orientation Video• Take Orientation Quiz• Watch Introductory Concepts Pt 1• Watch Introductory Concepts Pt 2	Ch. 1	<ul style="list-style-type: none">• Introduction• Lab 1 – Number Systems and Codes

Introduction to Digital Systems

ENGR – 2406 – H1

Week 2 Aug 26-Sep 1	<u>Watch the following videos:</u> <ul style="list-style-type: none"> • Binary to Decimal Conversion • Hexadecimal Number System • BCD • Bytes, Nibbles, Words and ASCII • Parity Methods for Error Detection 	Ch. 2	<ul style="list-style-type: none"> • HW 1 due at 8am • Quiz 1 • Lab 2 – Basics of Electronics
Week 3 Sep 2 – Sep 8	<u>Watch the following videos:</u> <ul style="list-style-type: none"> • Constructing Logic Circuits from Boolean Expressions • NOR and NAND gates • Boolean Theorems • Universality of NAND NOR 	Ch. 3	<ul style="list-style-type: none"> • HW 2 due at 8am • Lab 3 – OR, AND, and NOT
Week 4 Sep 9 – Sep 15	<u>Watch the following videos:</u> <ul style="list-style-type: none"> • Combinational Logic • Karnaugh Maps • Don't Care Conditions • XOR and XNOR • Enable/Disable Circuits 	Ch. 4	<ul style="list-style-type: none"> • HW 4 due at 8am • Quiz 2 • Lab 4 – NOR and NAND, Boolean Algebra Theorems
Week 5 Sep 16 – Sep 22	Test 1 Review		Test 1 – 8-10am covers chapters 1-3
Week 6 Sep 23 – Sep 29	<u>Watch the following videos:</u> <ul style="list-style-type: none"> • Decoders • Encoders • Multiplexers 	Ch. 9	<ul style="list-style-type: none"> • HW 5 due at 8am • Quiz 3 • Lab 5 – Combinational Logic
Week 7 Sep 30 – Oct 6	<u>Watch the following videos:</u> <ul style="list-style-type: none"> • S-R NAND Latch • S-R NOR Latch • Clock Signals • The Clocked S-R Flip Flop 	Ch. 5	<ul style="list-style-type: none"> • HW 6 due at 8am • Lab 6 – XOR and XNOR, Introduction to VHDL
Week 8 Oct 7 – Oct 13	<u>Watch the following videos:</u> <ul style="list-style-type: none"> • The Clocked J-K Flip Flop • The Clocked D Flip Flop • Asynchronous Inputs • Shift Registers • Frequency Division and Counting 	Ch. 5	<ul style="list-style-type: none"> • HW 7 due at 8am • Quiz 4 • Lab 7 – Decoders, Encoders, and Multiplexers

Introduction to Digital Systems

ENGR – 2406 – H1

Week 9 Oct 14 – Oct 20	Test 2 Review		Test 2 – 8-10am covers chapters 4, 9, and 5
Week 10 Oct 21 – Oct 27	<u>Watch the following videos:</u> <ul style="list-style-type: none"> • Binary Addition and Subtraction • The 2's-Complement System • Addition in 2's-Complement • Subtraction in 2's-Complement • Multiplying and Dividing Binary Numbers • BCD Addition • Hex Arithmetic 	Ch. 6	<ul style="list-style-type: none"> • HW 8 due at 8am • Quiz 5 • Lab 8 – Digital Arithmetic
Week 11 Oct 28 – Nov 3	<u>Watch the following videos:</u> <ul style="list-style-type: none"> • Adders • Asynchronous (Ripple) Counters • Synchronous (Parallel) Counters • Synchronous Counters with MOD Number $< 2^N$ • Up/Down Counters 	Ch. 6, 7	<ul style="list-style-type: none"> • HW 9 due at 8am • Lab 9 – Sequential Logic, D Latches and D Flip Flops
Week 12 Nov 4 – Nov 10	<u>Watch the following videos:</u> <ul style="list-style-type: none"> • Analyzing Synchronous Counters • Designing Synchronous Counters • Ring and Johnson Counters • Register Data Transfer 	Ch. 7	<ul style="list-style-type: none"> • HW 10 due at 8am • Quiz 6 • Lab 10 – Adders
Week 13 Nov 11 – Nov 17	Test 3 Review		Test 3 – 8-10am covers chapters 6 & 7
Week 14 Nov 18 – Nov 24	<u>Watch the following videos:</u> <ul style="list-style-type: none"> • Digital to Analog Conversion • Analog to Digital Conversion 	Ch. 11-12	<i>Thanksgiving – no in-person class</i>
Week 15 Nov 25 – Dec 1	Final Exam Review		<ul style="list-style-type: none"> • HW 11 due at 8am • Lab 11 – Counters
FINAL EXAM – Thursday, December 8 8am – 10am			

Course Grading Information:

Grade Distribution	
Homework	25%
Labs	30%
Quizzes	5%
Test Average	40%
Total	100%

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

Orientation Quiz: In order to receive credit for any other assignment for the semester, you must score a 100% on the Orientation Quiz. The Orientation Quiz is online in the Week 1 module. You may take it as many times as you need to to score a 100%, but you must complete the orientation by Thursday, August 25 at 11:59pm.

Homework: Homework is due each week on Thursday before class starts at 8am. Homework will consist of problems worked from the textbook. There will be no homework due on testing weeks.

Labs: Labs will be completed in person. Each lab will be due at the end of the class period. You will need to watch the lecture videos for the week before attending the lab, as I will not repeat the lectures during the lab. The lowest lab grade will be dropped at the end of the semester.

Quizzes: There will be 6 quizzes throughout the course of the semester that will be given in class on the days indicated in the syllabus. Quiz questions will likely come from the homework assignments. Each quiz will be open note, open book. In addition, there will be random “note-checks” in which you will need to submit your notes from the lecture videos for the relevant time period for 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. You will need a scientific (not-graphing) calculator, and you will need to bring your own 882-E scantron (I do not have extras to give out). Internet capable devices (phones, tablets, etc) will not be allowed. You will have 2 hours (from 8-10am) to complete each of the four tests. If you are late to a test, you will lose that testing time. The tests will be taken in person during the lab period on the dates and times listed in the syllabus. The lowest of the four test grades will be dropped.

Late Work, Attendance, and Make Up Work Policies:

Attendance: Attendance for this course will be taken weekly, every Thursday at 8am. If you are not in class when attendance is taken, you will be marked absent. If you arrive on time, but leave early without permission, you will also be marked absent.

Excused Absences Policy: 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 Work Policy: Late homework, quizzes, and lab assignments will not be accepted, for any reason. If you are not going to be in class to turn in a hard copy of an assignment on a given day, you must scan it and email it to me *before* the due date. If you miss a lab, quiz, or test on the dates listed in the calendar above due to an MCC excused absence reason, you must contact me as soon as possible (before any applicable lab, quiz, test dates, if possible) and provide acceptable documentation as listed above for your absence so that I can make arrangements for you to make up the affected assignment(s). Absences without documentation or for reasons that do not fall under the above will not be considered for makeup and you will receive a zero for each affected assignment.

Drop Policy (student-requested): The last date for student-initiated withdrawals from this course is **Tuesday, October 25 before 5pm**. If you wish to withdraw from this course to receive a grade of “W,” you must send me an email from your MCC student account saying, very clearly, “Please withdraw me from ENGR-2406-H1.” If your language is vague, or if the request comes from any form of communication other than your MCC student email account, I cannot drop you. Once you are dropped, it is very difficult (next to impossible) to reinstate you, so please make sure you are certain you wish to drop before making the request. Any drop requests received after 5pm on October 25 can only be done in extreme, life-changing circumstance that usually involve withdrawing from MCC entirely.

Drop Policy (due to absences): According to MCC policy, you are not eligible to receive credit for the course if you miss 25% of class time, which for this course, is 4 weeks of absences (consecutive or non-consecutive).

- *If the 4 absences occurs on or before the drop date of October 25, you will be automatically withdrawn from the course and receive a grade of “W.”*

- *If the 4th absence occurs after October 25, you will not be withdrawn. However, you will receive an automatic grade of “F” for the course and no assignments submitted after this date will be graded.*

Course Covid Policy: The guidelines are constantly changing on when to quarantine due to exposure or testing positive for Covid. Therefore, whether or not an absence is excused, and/or whether you should quarantine will be evaluated on a case-by-case basis. If you have been exposed to Covid, tested positive for Covid, or think you might have Covid, please self-report here: https://mclennan.co1.qualtrics.com/jfe/form/SV_9FiKfG5D85livQN . You will be contacted by an MCC health official who will determine whether you should or should not quarantine from campus. In the event that you must quarantine, I will work with you to determine how to best make up missed work. You must have completed the self-report in order for me to excuse absences due to quarantine.

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 Attendance/Absences Policy](https://www.mclennan.edu/highlander-guide/policies.html)

(<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 additional guidelines specific to this course.

*****I reserve the right to change any term on this syllabus at any time*****



ACADEMIC RESOURCES/POLICIES

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. For additional information, please visit www.mclennan.edu/disability.

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

disabilities@mclennan.edu

254-299-8122

Room 319, Student Services Center

Title IX:

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 or by calling Dr. Drew Canham (Chief of Staff for Diversity, Equity & Inclusion/Title IX) at (254) 299-8645. Individuals also may contact the MCC Police Department at 299-8911 or the MCC Student Counseling Center at MCC at (254) 299-8210. The MCC Student Counseling Center is a confidential resource for students. Any student or employee may report sexual harassment anonymously by visiting <http://www.lighthouse-services.com/mclennan/>.

Go to McLennan's Title IX webpage at www.mclennan.edu/titleix/. It 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.

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 or want to explore strategies for balancing life and school, we encourage you to contact a Success Coach by calling (254) 299-8226 or emailing SuccessCoach@mclennan.edu. Students may visit the Completion Center Monday-Friday from 8 a.m.-5 p.m. to schedule a meeting with a Success Coach and receive additional resources and support to help reach academic and personal goals. Paulanne's Pantry (MCC's food pantry) provides free food by appointment to students, faculty and staff based on household size. Text (254) 870-7573 to schedule a pantry 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 at https://www.mclennan.edu/foundation/docs/Emergency_Grant_Application.pdf.

MCC Academic Integrity Statement:

Go to www.mclennan.edu/academic-integrity for information about academic integrity, dishonesty, and cheating.

Minimum System Requirements to Utilize MCC's D2L|Brightspace:

Go to <https://www.mclennan.edu/center-for-teaching-and-learning/Faculty-and-Staff-Commons/requirements.html> for information on the minimum system requirements needed to reliably access your courses in MCC's D2L|Brightspace learning management system.

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 notified via 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.

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. For more information about your student email account, go to www.mclennan.edu/student-email.

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 their 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. If you need assistance with set-up, you may email Helpdesk@mclennan.edu for help.

You can find help on the McLennan website about connecting your McLennan email account to your mobile device:

- [Email Setup for iPhones and iPads](https://support.microsoft.com/en-us/office/set-up-an-outlook-account-in-the-ios-mail-app-b2de2161-cc1d-49ef-9ef9-81acd1c8e234?ui=en-us&rs=en-us&ad=us) (<https://support.microsoft.com/en-us/office/set-up-an-outlook-account-in-the-ios-mail-app-b2de2161-cc1d-49ef-9ef9-81acd1c8e234?ui=en-us&rs=en-us&ad=us>)
- [Email Setup for Androids](https://support.microsoft.com/en-us/office/set-up-email-in-android-email-app-71147974-7aca-491b-978a-ab15e360434c?ui=en-us&rs=en-us&ad=us) (<https://support.microsoft.com/en-us/office/set-up-email-in-android-email-app-71147974-7aca-491b-978a-ab15e360434c?ui=en-us&rs=en-us&ad=us>)

Forwarding Emails:

You may forward 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 be lost or placed in junk or spam filters.

For more helpful information about technology at MCC, go to [MCC's Tech Support Cheat Sheet](#) or email helpdesk@mclennan.edu.

Disclaimer:

The resources and policies listed above are merely for informational purposes and are subject to change without notice or obligation. The College reserves the right to change policies and other requirements in compliance with State and Federal laws. The provisions of this document do not constitute a contract.