

(CS 330) Microcomputer Architecture Syllabus

Winter 2021, 4 Credits

Instructor: Dr. William Tireman

Office: WS 2511

Email: wtireman@nmu.edu

Office Hours: See EduCat

Lecture/Lab Location: WS 2506/2508

Phone: (906) 227-1056

Research Lab: WS 3605

Web page: See EduCat

Class Time: 12:00-12:50 MWF

Laboratory Time: T 12 - 2:50

Special Notice due to ongoing top-down requirements: At the end of this syllabus, there will be a section dedicated to the requirements place upon this course due to the SARs-Cov-2 virus. You must read this section. Please note that the requirements maybe changed at any time based upon decisions made outside the professor's control.

Required Materials: *Digital Electronics: Principles and Applications*, 8th Edition (ISBN 978-0-07-337377-5). This textbook is a requirement of the course and laboratory.

Other Requirements: NMU issued ThinkPad laptop computer or suitable substitute. The compatibility of MacBooks is unknown. Windows operating system is necessary unless the student can find a suitable solution. All necessary programs are provided by the instructor. Contact the instructor for more information.

Course Description: *Study of how computer hardware responds to stored instructions. Construction projects with logic circuits lead to the conceptual designs of microprocessors. Assembly language programming is introduced in the context of the logic circuitry being controlled. Projects emphasize the software needed in common interfacing tasks. Prerequisite: CS 122 or instructor's permission.* - Undergraduate Course Catalog.

Course Objectives: The following are the course objectives. By the end of the semester, the successful student will be proficient at each one of the following objectives.

1. Through the successful completion of laboratory exercises students will demonstrate they can construct electronic circuits which employ Boolean logic concepts.
2. Through the successful completion of exams and laboratory exercises students will demonstrate their ability to represent a logical expression as a truth table, a logical equation, or a circuit.
3. Through the successful completion of exams and laboratory exercises students will explain and illustrate how components of a system work together to produce a more complex device.
4. Through the successful documentation of assembly language, students will demonstrate their understanding of how the assembly language commands operate and how their proper use produces a working assembly programs.

Grading: The final course grade will be determined using the following breakdown.

Category	% of class grade
2 exams @ 15% each	30
Final Exam	20
Homework Assignments	20
Lab Grade	30
Total	100

The final grade is a weighted calculation of the total points earned under each category. You must pass both the laboratory portion and the lecture portion of this course. If you receive a failing grade in either portion you fail the entire course regardless of your grade in the other portion.

Grade Range (%)	Letter Grade
93 - 100	A
90 - 92	A-
87 - 89	B+
83 - 86	B
80 - 82	B-
77 - 79	C+
73 - 76	C
70 - 72	C-
67 - 69	D+
63 - 66	D
60 - 62	D-
0 - 59	F

Homework Assignments: There will be homework assignments. These will be posted on EduCat and announced in class. Due dates will be posted on the assignments. A 10% penalty will be applied for turning in an assignment late. The homework assignments are worth 20% of the total course grade.

Exams: There will be two regular exams and a final exam in this course. Each regular exam is worth 15% of the final course grade and the final exam is worth 20% of the final grade. The tentative schedule for exams is as follows: Exam 1 is February 19, 2021, Exam 2 is March 26, 2021, and the Final Exam is Monday, April 26, 2021 from 12 PM to 2:50 PM. The final exam is comprehensive. Exams are closed notes, closed book, and no calculators are allowed. The exams will be given through EduCat and details will be given closer to the first exam. Any make-up exams must fit the missed exam policy.

Missed Exams: If a student must miss an exam and knows before hand they are to approach the Professor before the exam day to arrange for a make-up exam date. If a serious illness or emergency comes up on the exam date then the student is responsible for contacting the Professor as soon as possible to make arrangements for a make-up exam. Note that ALL changes in the exam date and make-up exams are subject to approval of the Professor and are handled on an as-need basis. The Professor reserves the right to refuse the administration of a make-up exam if they feel the reason given is unacceptable. Note that travel for family vacations or holidays on **scheduled class days** is not considered acceptable.

Laboratory: Laboratory meets once a week for three hours **but** the student should expect to spend time outside of regular lab time to complete assignments. Class attendance in laboratory **IS** taken and points

will be deducted for being late to laboratory or missing a laboratory all together. **Labs cannot be made up without special approval.** The Professor retains the right to determine if your excuse is reasonable or not. Wanting to leave early for holidays or family gatherings is NOT a reasonable excuse. Laboratory is worth 30% of the final course grade.

Extra Credit: There is no extra credit given in this course.

Class Attendance: Due to requirements from NMU Administration, class attendance will be recorded for each day. However, attendance in lecture is not required. It is your responsibility to learn the material. Material cannot be repeated due to time constraints. Attendance in laboratory IS required unless you have received approval from Disability Services. If you are going to miss class please make every attempt to contact your Professor just in case there has been any special instructions. You can get class notes from a friend you class.

Calculators: Calculators are not allowed on exams or quizzes. This includes laptops, PDA's, cell phones, and any other device capable of storing data and manipulating numbers.

Laptop Computers: The use of laptop computers will be governed by the following policy:

- Computers are to be used during lecture and laboratory for course work only.
- Use of computers during exams is prohibited except as allowed/agreed upon for a documented disability.
- Displaying offensive or obscene material viewable by the Professor or other students during class on a computer will receive sharp discipline.
- The University is **NOT** responsible for your laptop or files/programs on the laptop. Backup your system! We do work with part of the system later and damage to the core operating systems is possible!!
- Do not utilize software in violation of licensing agreements. Beware of copyright laws and licenses on all programs and files you download or install on a computer.
- You must not use your computer for any malicious act of software or data stealing, copying, harassment, or other misuse.

All Other Electronic Devices: The use of electronic devices other than a calculator in the class room is prohibited except (1) if the device is necessary for an approved documented disability or (2) if the device does not interfere with the learning environment and is being used for coursework. The use of all other electronic devices during class is prohibited at all times and strictly enforced during exams.

Classroom Behavior: The environment of the college classroom is to be one of exploration and learning. Although various levels of success are achieved at different times, it is still expected that the students conduct themselves in a manner of respect to both the professor and the fellow students. All other rules and regulations of Northern Michigan University and the State of Michigan will be enforced.

Class Cancellation: The university does not often cancel classes but if it does local television and radio stations are informed and information is posted on the NMU website. In the unlikely event that the Professor will be absent at the last minute a sign will be posted at the entrances to the classroom. Also,

information concerning make up of the missed time and/or laboratory will be sent by email to all.

Academic Integrity: Northern Michigan University puts a very high value on academic integrity, and violations are not tolerated. Any violation of academic integrity will receive academic and possibly disciplinary sanctions in accordance with NMU policy. See your student handbook for more information.

While it is encouraged for students to work together, there are situations where work is expected to be the student's whose name appears on the work. Quizzes and exams are obvious examples of where cheating will not be tolerated. However, using the same code and documentation (even if you change your name and modify some words), is also considered cheating. Each student is expected to learn how to create their own files. If you have questions on what is considered appropriate, ask your professor.

Veterans Services: If you are a veteran and need assistance with your benefits or are experiencing complications with your education due to military service connected issues, contact the Veteran Resource Representative in 2101 Hedgcock (227-1402 or mrutledg@nmu.edu). The Veteran Resource Representative can advocate for you before the Veterans Administration and can also help you solve any veteran specific issues you may have.

Students with Disabilities: If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Dean of Students Office at 2001 C. B. Hedgcock Building (227-1737 or disserv@nmu.edu). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines.

Mask Accommodation ADA Statement: Certain students may qualify for alternative face-covering accommodations due to a variety of health conditions. These students have gone through a qualifying process with the Office of Disability Services. Faculty have been notified of which students receive these accommodations in their class. If you have concerns regarding this topic please contact the faculty member outside of class. Please do not question or confront fellow students in the classroom who are using alternative or modified face coverings.

Equal Opportunity: Northern Michigan University does not unlawfully discriminate on the basis of race, color, religion, sex, national origin, age, height, weight, marital status, familial status, handicap/disability, sexual orientation or veteran status in employment or the provision of services, and provides, upon request, reasonable accommodation including auxiliary aids and services necessary to afford individuals with disabilities an equal opportunity to participate in all programs and activities.

Special Rules for Winter 2021: This section will detail the changes and rules required for CS 330 for Winter 2021. Please note that most of these rules are imposed upon the Professor and they have little or no control over the rules. I do have control over the course content and how to make it fit within the rules.

1. Lectures: The class will be broken into two groups of students designated A and B. On lecture days, one group will be in the main lecture room and the other group will be in the other room (or remote, if you choose). I will be using a camera to capture lecture from the whiteboard and send to the second room (and Zoom). On the next lecture day the groups will switch places.
2. Laboratory: There is sufficient equipment for each student to have their own laboratory station. All students will meet for laboratory each Tuesday in the same room each week. I will do the pre-lab lecturing (if there is any) from opposite rooms as necessary.
3. I will be taking attendance each day as per requirement from NMU administration. This does not mean you have to attend lecture; laboratory is required. That is up to you if you do not wish to attend lecture. I do encourage it as it will likely improve your performance in the course. As with any other semester, if you become ill we will work it out on a case-by-case basis.
4. NMU has a face mask requirement that covers your nose and mouth. If you do not comply with the requirement I will be forced to report it to the Dean of Students and NMU Police. Do be aware there maybe individuals with medical exemptions for a face covering. I will have knowledge of these individuals and they will generally be wearing an alternative device.
5. No food in the classroom. Laboratory is from 12 noon to 2:50 PM so plan ahead.
6. If you feel ill, stay home and follow the guidelines given to you by NMU. Contact me so that I know you will be out for the day and keep me updated. This helps with material delivery. If you are to be placed in isolation for whatever reason, contact me and we will work out the details to keep you on track. I will have alternatives for missing laboratory. I wish not to use them but I will have them ready.
7. You must complete the work to complete the class. I am willing to be flexible when it comes to being ill, etc.; however, the NMU policy is that if you decided to comeback to campus you are here to complete the courses you registered to complete. There will not be a credit/no credit option this semester like there was in Winter 2020 semester.
8. All work will be submitted online via EduCat. Any work you produce on paper will need to be scanned into a PDF document for uploading. There are several options to accomplish this task. If you have a smart phone, there are free apps that will help you. You can also use a document scanner. In a pinch, you can use your laptop camera to produce a picture, crop the picture in software and then drop it into a file and output to PDF format.

CS 330 Tentative Topics

Topic	Description and Reading material	Duration
Introduction	Introduction to the course – includes laboratory	1 lecture
Numbers for Computers	Number Systems (Ch. 2), binary numbers as codes Binary arithmetic (Ch. 10)	
Binary Logic	Basic logic functions (AND, OR, EXOR, NAND, NOR) (Ch. 3) Introduction to Boolean algebra (Ch. 4)	
Electrical Devices (logic)	Basic logic gates (Ch. 3), Logic of arithmetic (Ch. 10) flip-flop circuit (Ch. 7)	
Registers	Buffers, counters, and shift registers (Ch. 9 & 8) Sync. operations, tri-state concept, registers, Memory (Ch. 11)	
Computer Architecture	Bus, sequential operations, programmed instructions fetch cycle, operation cycles	
Assembly language Programming	Data transfer, addressing modes, laboratory examples, arithmetic and logic ops., review flags	
Branching of program operation sequence	unconditional branching, conditional branching, relative addressing, subroutines and stack ops., utility program	
Interfacing Topics	Handshaking, parallel data transfer, serial data transfer 1650/8250 UART, digital to analog and analog to digital conversion	