



Basic principles which underlie electronic computer operation, organization and programming will be studied. These include:

- Binary numbers; arithmetic and information coding
- Boolean Algebra
- Digital logic circuits
- Machine and assembly language programming
- Interfacing including hardware and software aspects

Digital electronic circuitry and the accompanying binary arithmetic and digital logic will be introduced. Using digital logic circuits as building blocks complex register circuits and memory devices will be studied. The synchronized operation of combinations of these circuits on a bus structure forming a microcomputer architecture will be developed. The programmed operation of the microcomputer architecture will serve as a model for the study of machine language programming. The courses will conclude with an introduction to interfacing topics.

**THERE IS NO EXTRA CREDIT!!** Doing poorly for a portion of the semester will not be corrected by any extra projects. Please do not assume you can replace poor work under any circumstances with any “additional assignments”!!

**In the event that the University cancels classes on the day of a quiz or exam, be prepared to take the quiz or exam at the next available class period. Any homework or other assignment due to be turned in on the canceled day, should be turned in at the same time listed on the next day the university is open, whether or not the class is normally held on that day.**

Students are expected to be proactive in dealing with issues that require missing class. The professor would prefer that students who are ill, not come to class and potentially spread their illness to other members of the class. The professor understands that on occasion unforeseen legitimate circumstances will arise such as family deaths or other family emergencies that requires a student miss class. In these cases however, the student should expend every possible effort to keep the professor apprised of the situation (usually by email). Let the professor know when you expect to be back in class. It is unacceptable to wait until the next time you happen to be in class to let the professor know what is going on. If you choose to wait until you are in class again, the professor is within his rights to deny the making up of any missed work or even accepting previously completed work that was not turned in on time. Finally understand that the professor needs to be fair to all members of the class and may ask some questions about the situation. He might require appropriate documentation from additional sources such as a doctor or the dean of students. Students are expected to provide reasonable information.

Because of the amount of work done in this class, falling behind will cause a severe hardship to a student. Catching up is extremely difficult. In order to prevent this from occurring, homework and labs must be turned in on time. **Any assignment not turned in on time may incur a 10% per day**

**late penalty. Moreover, no work will be accepted more than one week late.** If you have a specific problem that requires your work to be turned in late, you should discuss the situation with the instructor.

All quizzes and exams are closed book; no notes of any kind will be permitted to be used. For certain situations the professor may provide data sheets. You will be informed of this prior to the quiz or exam. **Laptop computers and all other electronic devices (including calculators) such as pagers, cell phones, and mp3/music players are not allowed to be used at all during quizzes and exams.** Quizzes are given every Friday of the semester.

Quiz and exam solutions will be available on the World Wide Web. The location of my webpage is <http://physics.nmu.edu/~ddonovan/> Select the My Courses Option. If you need assistance in learning how to use the world-wide web, see your instructor. **Please Note: I do not use Moodle or NMU EduCat!**

**Attendance at all labs is mandatory.** Make ups for quizzes and labs will only be provided for at the discretion of the professor. This will occur only for reasonable excuses. Desire to go home for the weekend or to go hunting are not considered reasonable excuses. Informing the professor **BEFORE** an absence is more likely to result in a make-up than informing the professor after the absence. **A missed lab is a zero for that experiment and all associated work!! Labs begin in the FIRST WEEK OF CLASSES!!!**

**There will be questions that pertain to material only covered in laboratory on most quizzes and exams. Anything covered in Lab is fair game!!!**

Lab partners will be provided with toolkits for doing lab work. These kits will be checked both before and after a lab. IF your kit is found to be missing any tools, **you and your partner will be charged for the replacement** of the missing item(s). Please be sure your tools do not walk out of lab.

**Food of any kind (including snack food) is not allowed in the lab or classroom.** Please do not bring it in. Drinks will be permitted as long as care is taken not to have spills occur and the drinks do not result in loud noises. If excessive spillage or noise occurs, drinks may be restricted as well. **This policy includes all exams and quizzes.**

The professor will make every effort to respond to all email ([ddonovan@nmu.edu](mailto:ddonovan@nmu.edu)) questions received by 5 PM Monday through Friday, with a response by 10 PM Monday through Friday. Students are expected to regularly check **their NMU issued email** accounts for any messages the professor may send out to the class as a whole or to an individual in the class. Moreover, when students ask the professor a question requiring an answer, it is expected for students to check their email in an equally timely fashion and to confirm the receipt of the answer, and if necessary provide any answers to questions the professor may have posed about the situation. **The professor reserves the right to cancel any deals proposed in email correspondence if the student fails to confirm the deal with a final email.**

The professor will also make every effort to have all handouts available on his web site (<http://physics.nmu.edu/~ddonovan/>) for download if you should lose your copy.

**Again Please Note: I do not use Moodle or NMU EduCat!**

Students in this class are expected to conform to a code of **academic honesty**. 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. In lab work, it will often be the case that both partners will have identical work. However, both partners are to turn in lab sheets, and both partners are expected to participate equally in completing the lab tasks. It is not acceptable for one partner to do all the work, while the other merely watches and writes. Both partners are expected to understand the lab exercises. If you have questions on what is considered appropriate, ask your professor. **The Professor reserves the right to assign a grade of 0 (zero) to any assignment found to be guilty of cheating, plagiarism, or any other inappropriate activity.**

**Please be sure any cell phones or pagers or other devices do not produce sounds during lectures and/or labs.**

**Computer Usage Policies:**

**UNLESS PERMISSION is GRANTED, All Laptops and other Electronic Communication/Entertainment devices are to be off and remain unused during class times.**

**If Permission is granted then:**

- Computers (both room based and laptops) are to be utilized for course work and activities related to course work.
- Writing computer code whether for this class or another CS class while the professor is lecturing is not appropriate.
- Do not use computers for entertainment or communications during class meetings.
- Do not display material on screen which may be distracting or offensive to other members of the class (including the professor).
- Keep a backup of all your files. The university is not liable for any data lost due to equipment failures, damaged disks, or misuse of computer programs.
- Do not utilize software in violation of licensing agreements. Do not copy software, information, data or other work in violation of applicable copyrights. Be aware of current copyright laws regarding software, music, movies, and other digital information. Copyright information may be accessed through the NMU Library website at: <http://library.nmu.edu/guides/copyright.htm>
- You may not copy, install or use any service, information, data, image, recording, or other work in violation of applicable copyrights or license agreements. You may not possess any software or resource whose purpose is to effect one of the afore mentioned violations.
- You must take full responsibility for what you publish, transmit, or possess.
- You may not steal, forge, cheat with; snoop on; tamper with; misuse, damage, harass with; hoard or monopolize; interfere with; violate the confidentiality of; or destroy any information, resource, equipment or software. This includes using

your personal computer for these activities against other users or against their information resources.

### **Disability Services**

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 (227-1700). 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.

### **Non-Discrimination Policy**

Northern Michigan University does not unlawfully discriminate on the basis of ancestry, race, color, ethnicity, religion or creed, sex or gender, gender identity, gender expression, genetic information, national origin, age, height, weight, marital status, familial status, handicap/disability, sexual orientation, military or veteran status, or any other characteristic protected by federal or state law in employment or the provision of services. NMU 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.

Note: Hyperlinks in Schedule below will take you to the Textbook website section for that chapter. There are various resources there you might find useful.

## Course Content

- I Introduction and overview
- II Numbers for computers
  - 1 Number system bases ([Chapter 2](#))  
decimal, binary, octal, hexadecimal
  - 2 Binary numbers as codes  
ASCII codes
  - 3 Binary arithmetic ([Chapter 10](#))  
addition, subtraction  
1's compliment subtraction  
signed number codes, 2's compliment numbers
- III Binary logic
  - 1 Basic logic functions ([Chapter 3](#))  
AND, OR, EXOR, NAND, NOR
  - 2 Introduction to Boolean algebra ([Chapter 4](#))  
Algebraic properties  
DeMorgan's rules  
Karnaugh Maps
- IV Electrical devices to perform logic
  - 1 The basic logic gates ([Chapter 3](#))
  - 2 The logic of arithmetic ([Chapter 10](#))
  - 3 The flip-flop circuit ([Chapter 7](#))  
construction and basic operation  
flip-flop types and application  
memory and counters
  - 4 Laboratory experiments with logic devices
- V Registers
  - 1 Buffers, counters and shift registers ([Chapters 9,](#)  
[Chapter 8](#))
  - 2 Synchronized operation
  - 3 Examples of registers
  - 4 Memory devices ([Chapter 11](#))  
addressing  
memory types
  - 5 The tri-state concept
  - 6 Laboratory examples of register and memory  
operations in the computer.

- VI Computer architecture
  - 1 Bus organization
  - 2 Sequential operation of registers
  - 3 Programmed instructions
    - instruction fetch cycle
    - instruction operation cycles
  
- VII Assembly language programming: basic instruction types
  - 1 Data transfer
  - 2 Addressing modes
  - 3 Laboratory examples
  - 4 Arithmetic and logic operation
  - 5 Review of flags
  - 6 Laboratory examples
  
- VIII Branching of the program operation sequence
  - 1 Unconditional branching
  - 2 Conditional branching
  - 3 Relative addressing
  - 4 Laboratory examples
  - 5 Subroutines and stack operation
  - 6 Utility program examples
  - 7 Laboratory examples
  
- IX Interfacing topics
  - 1 Handshaking
  - 2 Parallel data transfer
  - 3 Serial data transfer, the 1650/8250 UART
  - 4 Digital to analog and analog to digital conversion
  - 5 Laboratory examples