



**School of Computer Science
Faculty of Science**

**COMP-2650: Computer Architecture I: Digital Design
Fall 2020**


Course Outline (Syllabus) v1.0

Description¹	<p>Digital systems are indispensable and the foremost means of technology in today's everyday life that we refer to the present period as the <i>digital age</i>. Digital systems are used in communication, traffic control, spacecraft guidance, medical treatment, and many other enterprises. Today, a myriad of digital devices surrounds us, including digital telephones (Smart Phones), digital televisions (Smart TVs), digital cameras, and, of course, digital <i>computers</i>. Although these devices enable us to execute commands easily, they involve precise execution of a sequence of complex internal instructions underneath at the hardware level indeed.</p> <p>This course, <i>COMP-2650: Computer Architecture I: Digital Design</i>, provides a first introduction to the design of digital circuits and computer architecture following a bottom-up approach, from basic logic gates to circuits like adders, decoders, flip-flops, registers to be then combined into more complex units such as memory and processors as well as a whole computer system. Topics covered include number systems, switching algebra, logic gates, circuit minimization, combinational circuit, read-only memory, random-access memory, programmable logic, synchronous and asynchronous sequential circuits, latches, flip-flops, registers, counters, register transfer language, and CPU architecture overview. This course is followed by complementary course <i>COMP-2660: Computer Architecture II: Microprocessor Programming</i>, where more in-depth topics such as memory segmentation are covered.</p> <p>It is essential to understand how a modern computer works underneath, from the bottom up, to develop efficient programs by knowing the followings:</p> <ul style="list-style-type: none"> - Physical memory layout when using data types, e.g., (un)signed numbers and floating-point, and data structures like arrays, linked lists, and hash tables, - Boolean algebra and applying logical operation, - How CPU oscillates the program statements and commands. <p>And at the end of the day, everything runs on hardware!</p>
Learning Outcome	blackboard.uwindsor.ca → COMP2650-1-R-2020F-a: Comp Archtre I: Digital Design → Learning Outcome
Course Type	Required
Program Level	COMP 2
Prerequisite	COMP-1400: Introduction to Algorithms and Programming
Required for	COMP-2660: Computer Architecture II: Microprocessor Programming COMP-3150: Database Management Systems COMP-3300: Operating Systems Fundamentals COMP-3500: Introduction to Multimedia Systems COMP-3670: Computer Networks
Instructional Hour	3:00 lecture + 01:20 laboratory, each week.
Lecture	Mondays & Wednesdays, 08:30AM - 09:50AM, Blackboard Collaborate Ultra
Office Hour	Mondays & Wednesdays, 10:00AM - 11:00AM, Blackboard Collaborate Ultra
Homepage	blackboard.uwindsor.ca → COMP2650-1-R-2020F-a: Comp Archtre I: Digital Design
Instructor	Name: Hossein Fani Email: hfani@uwindsor.ca ² Page: hfani.myweb.cs.uwindsor.ca Office: 5111 Lambton Tower



¹ This course is based on schematic design only and Hardware Description Language (HDL) is not covered.

² Wishing to contact the instructor via email about the course, please use [uwinid]@uwindsor.ca and indicate full name, studentid, a course title.

Book	Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, 6/E M. Morris R. Mano, Michael D. Ciletti ISBN-10: 0134549899, ISBN-13: 9780134549897 ©2018 Pearson		
Marking Scheme	Lecture (Weekly) Assignments	20%	
	Lab Assignments	20%	
	Midterm Exam	30%	
	Final Exam	30%	
	Discussion Board (Bonus+)	10%	
Remarks	The written reports will be assessed not only on their academic merit but also on the communication skills of the student as exhibited through the reports. To achieve a passing grade, the students must achieve at least 50% of the entire marking scheme. The students earn final course grades as per the Senate policy for Grading and Calculation of Averages and Grading Key.		
Theoretical ³	W01A: Meet and Greet Course Outline. Digital Systems.	Sep. 14	
	W01B: Number Systems I Binary, Octal, and Hexa Numbers. Number-base Conversions.	Sep. 16	
	W02: Number Systems II Complements of Numbers. Signed Numbers. Binary Codes.	Sep. 21 & 23 Last Day Academic Add/Drop	
	W03: Boolean Algebra and Logic Gates Axiomatic Definition, Basic Theorems, and Properties of Boolean Algebra. Boolean Functions. Canonical and Standard Forms. Digital Logic Gates.	Sep. 28 & 30	
	W04: Gate-Level Minimization The Map Method. Four-Variable K-Map. Product-of-Sums Simplification.	Oct. 05 & 07 Financial Drop Date	
	W05: Reading Week No Class	Oct. 10 - 18	
	W06A: Midterm Exam W06B: Gate-Level Minimization Don't-Care Conditions. NAND, NOR, XOR, Wired AND, Wired OR.	Oct. 19 Oct. 21	
	W07: Combinational Logic I Adders. Subtractors. Multipliers.	Oct. 26 & 28	
	W08: Combinational Logic II Decoders. Encoders. Multiplexers. Demultiplexers.	Nov. 02 & 04	
	W09: Synchronous Sequential Logic I Sequential Circuits. Latches. Flip-Flops.	Nov. 09 & 11 Midterm Exam Grade Release	
	W10: Synchronous Sequential Logic II Analysis of Clocked Sequential Circuits. State Reduction and Assignment.	Nov. 16 & 18 Last Day Voluntarily Withdraw	
	W11: Synchronous Sequential Logic III Registers and Counters. Shift Registers.	Nov. 23. & 25	
	W12: Synchronous Sequential Logic IV Ripple Counters. Synchronous Counters.	Nov. 30 & Dec. 02	
	W13: Memory and Programmable Logic RAM, Memory Decoding. Error Detection & Correction. ROM.	Dec. 07 & 09 Last Day: Fall 2020 Classes	
W14: Final Exam Date and Time to be Announced	Dec. 11 - 22		
Laboratory ⁴	Section 51, Mondays	11:30AM - 12:50PM, Blackboard Collaborate Ultra	
	Section 52, Wednesdays	11:30AM - 12:50PM, Blackboard Collaborate Ultra	
	Section 53, Mondays	01:00PM - 02:20PM, Blackboard Collaborate Ultra	
	Section 54, Wednesdays	01:00PM - 02:20PM, Blackboard Collaborate Ultra	
	Section 55, Tuesdays	11:30AM - 12:50PM, Blackboard Collaborate Ultra	
Attendance	Encouraged but not mandatory due to time zone accommodation in the COVID-19 pandemic era.		

³ This is a preliminary schedule. The material and depth and order of presentation are subject to change at the discretion of the instructor and student pace.

⁴ There is no lab session in the first and last weeks of the course as well as reading week. For more information refer to Laboratory Guide v1.0.

Notes to Students:

1. **Equity, Diversity, and Inclusiveness (EDI):** This course, along with all its components such as lab sections are, without question, safe places for students of all races, genders, sexes, ages, sexual orientations, religions, disabilities, and socioeconomic statuses. Disrespectful attitude, sarcastic comments, offensive language, or language that could be translated as offensive and/or marginalize anyone are absolutely unacceptable. Immediate actions will be taken by the instructor to protect the safety and comfort of the students. An ethnically rich and diverse multi-cultural world should be celebrated in the classroom. The instructor, too, must treat every student equally and with the respect and compassion that all students deserve. Furthermore, UWindsor is committed to combatting sexual misconduct. All members are required to report any instances of sexual misconduct, including harassment and sexual violence, to the [Sexual Misconduct Response & Prevention Office](#) so that the victim may be provided appropriate resources and support options.
2. **Student Accessibility Services:** Students who have special needs due to legitimate medical reasons should notify the [Student Accessibility Services](#) and the instructor at the beginning of the course and before any assessment.
3. **Lab and Lecture (Weekly) Assignment:** Assignments are expected to be submitted on the assigned due date and time. **Late submission is not accepted and receive zero** unless a verifiable reason with appropriate documentation is provided. The students should follow the submission procedure for each assignment. Failure to follow the procedure (e.g., incorrect, unreadable, and/or missing file attachments as instructed) heavily penalizes the assignment. **Each assignment must be done individually.** The last 7 calendar days prior to, and including, the last day of classes are free from any procedures for which a mark will be assigned.
4. **Midterm Exam:** Should a student miss a midterm exam, with appropriate documentation and verifiable reason, the weight of the missed midterm exam will be moved to the final exam. The results of the midterm exam will be released to students at least 2 days prior to the voluntary withdrawal deadline as per the [Senate Bylaw 54: Undergraduate Academic Evaluation Procedures](#).
5. **Final Exam:** Students who miss a final exam for a verifiable reason and with appropriate documentation will be given a make-up exam prior to the submission of final course grades that carries the same weight and measure the same knowledge.
6. **Make-up of the Make-up:** There will be *no* make-up of the make-up exam, and the final grade will be assigned based on overall work.
7. **Required Documentation for Missing Exam:** Medical or compassionate documents for the missing of an exam must be submitted within 1 week of the exam. Students are responsible for notifying the instructor that they will be missing an exam as soon as possible.
8. **Accommodation for Religious or Spiritual Observance:** Requests for accommodation of specific religious or spiritual observance must be presented to the instructor no later than 2 weeks prior to the conflict in question (in the case of final examinations within two weeks of the release of the examination schedule). In extenuating circumstances, this deadline may be extended. If the dates are not known well in advance because they are linked to other conditions, requests should be submitted as soon as possible in advance of the required observance. Timely requests will prevent difficulties in arranging constructive accommodations.
9. **Academic Accommodation:** A student who has 3 or more major in-term evaluations scheduled or due within 24 hours may apply, no later than the end of the first quarter of classes, to seek an appropriate accommodation such as a due date extension, alternative assignment, or rescheduled exam.
10. **Appeal:** Students have the right to review the exams and assignments marking within 1 week of their release.
11. **Bonus:** Students are encouraged to initiate course-related topics and participate in discussions in forums in Discussion Board available in *COMP2650-1-R-2020F-a: Comp Archtre I: Digital Design* → [Discussion Board](#). Motivating bonus points of +10% have been allocated in marking schema.
12. **Policies, Bylaws, and Procedures:** Students are required to adhere to all relevant policies, bylaws, and procedures at the University of Windsor, including, but not limited to, the student code of conduct, academic integrity, student academic and non-academic conduct. Failure to follow the policies, bylaws, and procedures are subject to disciplinary procedures as set out under, but not limited to, the [Senate Bylaw 31: Academic Integrity](#) and [Procedures for Addressing Student Non-Academic Misconduct](#). Regarding the plagiarism, the Blackboard's SafeAssign will be used for some or all student assignments or equivalent at the instructor's discretion. **Plagiarized submissions or equivalent (e.g., exams), i.e., submissions with the same or minor modifications, receive zero.** Should you need to record the lectures, please follow the [Senate Policy on Recording Lectures](#).
13. **Communication:** Students are required to obtain and maintain a University of Windsor e-mail account, [uwindid]@uwindsor.ca, for timely communications with the instructor. The course homepage on the Blackboard, *COMP2650-1-R-2020F-a: Comp Archtre I: Digital Design*, is the main notification center for the course announcements and repository for the course material and resources. Blackboard Collaborate Ultra at *COMP2650-1-R-2020F-a: Comp Archtre I: Digital Design* → [Virtual Classroom](#) → [Course Room](#) is the official place for the lectures and office hours with the instructor. In Microsoft Teams, the team [SCS - COMP2650 - Fall2020](#) is provided for emergency cases and backup plans only.

14. **Change Notification:** Any changes in the course outline, exam dates, marking, or evaluation will be discussed in class at least 2 weeks prior to being implemented.
15. **Student Evaluation of Teaching (SET):** The Student Evaluation of Teaching (SET) will be conducted during the last 2 weeks of the classes.
16. **Online Experience:** Participants in online lectures and lab sections include an instructor, a moderator, and students. Students are able to share camera or send messages but cannot share audio unless they Raise Hand, and the moderator or the instructor allows them. The moderator also supervises private messages. Students are encouraged to let the moderator and/or the instructor know of any connection issues asap regarding the quality of presentation in terms of audio and video (e.g., slides).
17. **Feeling Overwhelmed?** Should face obstacles and experience difficulties that affect her academic performance, students can reach out to the following service centers as well as other on- and off-campus resources listed here www.uwindsor.ca/wellness:
 - [Student Health Services](#)
 - [Student Counselling Centre](#)
 - Peer Support Centre