EE178: Digital Principles (MoWe 1:15PM - 3:05PM & Fr 1:15PM - 4:55PM)

Instructor: Pedram Johari, 205 Davis Hall (pedramjo@buffalo.edu).

TAs: TBA.

Lectures: MoWe 1:15PM - 3:05PM in NSC 216.

Labs: Fr 1:15PM - 4:55PM in Davis 239. Lab sessions will start on week of Jun. 19th.

Office hours: Wed. 3:30PM - 4:30PM (after class) in 205 Davis Hall or by appointment.

Course overview: an introduction to the fundamental elements of digital systems.

Catalog course description: Topics include: number systems; digital arithmetic including adders and multipliers; Boolean algebra; minimization techniques; logic design; programmable logic devices; memory types and devices; registers; counters; synchronous sequential networks; throughput and latency; pipelining. The course includes a hands-on lab component.

Credits: 4

Prerequisites: MTH 141 or MTH 153.


Course requirements:

- **Short quizzes**: Approximately once every 6 meetings at start of lecture. Lectures with quizzes will be randomly selected. Quiz will include 1 short question from previous lectures. Bring sheet of paper to use in quiz.

- **Mid-term exam**: Monday, July 17, 1:15PM - 2:05PM, in class (NSC 216).

- **Final exam**: Friday, August 18, 1:15PM - 3:15PM, in class (NSC 216).

- **Exercises**: Homework is typically assigned once every week (Hand-in/out on Mondays). 6-7 homework assignments.

- **Labs**: Lab assignment will be given once every week (Hand-out on Wednesdays). 6 lab assignments.

Grading: Final exam: 35 points, Mid-term exam: 15 points, Exercises: 25 points, Lab: 10 points, Quizzes: 15 points.

UBlearns: Will include this information sheet and all other course documents including lectures.
Student Learning outcomes (assessed in homework exercises and exams).

1. Convert between various number representations (Ex. 1, midterm, final).
2. Design and simplify a Boolean expression corresponding to a given Boolean function. Design a simplified circuit representation of a given Boolean function. (Ex. 2-3, midterm, final).
3. Understand the fundamental building blocks of combinational logic design (Ex. 3-4, midterm, final).
4. Understand the fundamental building blocks of sequential logic design (Ex. 4-5, final).
5. Design finite state machines and simplified sequential circuits from a given functional description (Ex. 5-6, final).
6. Understand the fundamental constructs in memory arrays and Field Programmable Gate Arrays (Ex. 5-6, final).
7. Implement combinational and sequential circuits (labs).

Syllabus

Each topic below is planned for a time period of 1-3 lectures (50 minutes each). Schedule may change based on real-time progress. Lectures are based on specified chapters in course book (however lectures are not covered completely by course book).

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<td>Introduction. Number representations</td>
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<td>Topic 2</td>
<td>Logic gates</td>
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<td>Circuits. Boolean expressions, logic and algebra</td>
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<td>Circuit minimization via Karnaugh maps</td>
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<td>Topic 5</td>
<td>Building blocks 1: Multiplexers/Decoders</td>
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<td>Topic 8</td>
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<td>4.1-4.3,4.5</td>
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<td>Topic 9</td>
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<td>Topic 10</td>
<td>Sequential building blocks</td>
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<td>Topic 11</td>
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<td>Topic 12</td>
<td>Beneath the digital abstraction</td>
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<td>Topic 15</td>
<td>Logic arrays</td>
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Expectations of Students:

- **Professionalism**: Students are expected to act in a professional manner. A student’s grade may be reduced due to unprofessional or disruptive behavior. Examples include coming to class late, texting (or otherwise using your cell phone) during class, your cell phone ringing during class and/or exams, etc.
• **Individual solving of exercises:** Working in groups on exercises is **prohibited**. Each student must solve his/her exercise **individually**. Searching solutions online and using any material from an online source is **prohibited**.

• **Academic Integrity:** This course will operate with a zero-tolerance policy regarding cheating and other forms of academic dishonesty. Any act of academic dishonesty will subject the student to penalty, including the high probability of failure of the course (i.e., assignment of a grade of F). It is expected that you will behave in an honorable and respectful way as you learn and share ideas. Therefore, **recycled solutions, assistance (from fellow students, online source, or other sources) in preparation of assignments without identifying and acknowledging such assistance are a violation of academic integrity and are not acceptable.** All work for this course must be original for this course. Please be familiar with the University and the School policies regarding plagiarism. Read the Academic Integrity Policy and Procedure for more information. Visit the Senior Vice Provost for Academic Affairs webpage for the latest information at [http://undergradcatalog.buffalo.edu/policies/course/integrity.shtml](http://undergradcatalog.buffalo.edu/policies/course/integrity.shtml).

• **Exams:** Makeup exams will be given in the following circumstances only: (a) You contact the instructor prior to the exam. (b) You have a valid and documented reason to miss the exam. Serious illness or family emergency are acceptable excuses. Sleeping in, lack of preparation, ennui, grogginess, etc. are not acceptable excuses.

• **Quizzes:** Makeup quizzes will be given only if you have a valid and documented reason to miss the quiz.

• **Homework exercises:** Must submit homework on time (and in class). Late homework assignments will receive a grade of zero.

• **Lab assignments:** Must be submitted in lab session (otherwise will receive a grade of zero).

**Accessibility Services and Special Needs:** If you have a disability and may require some type of instructional and/or examination accommodation, please inform me early in the semester so that we can coordinate the accommodations you may need. If you have not already done so, please contact the Office of Accessibility Services (formerly the Office of Disability Services) University at Buffalo, 25 Capen Hall, Buffalo, NY 14260-1632; email: stu-accessibility@buffalo.edu Phone: 716-645-2608 (voice); 716-645-2616 (TTY); Fax: 716-645-3116; and on the web at [http://www.student-affairs.buffalo.edu/ods/](http://www.student-affairs.buffalo.edu/ods/). All information and documentation is confidential.

The University at Buffalo and the School of Engineering and Applied Sciences are committed to ensuring equal opportunity for persons with special needs to participate in and benefit from all of its programs, services and activities.

**Library:** Nancy Schiller, Engineering Librarian, 228 Capen Hall (inside the Silverman Library). Phone: 645-1338. Email: schiller@buffalo.edu

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I hope you enjoy the semester!