COURSE SYLLABUS

1 ECE 3450 - Digital Electronics

2 Meeting Information

3 credits, 4 contact hours Two 100-minute lecture/lab periods

a. **Section 001:**
Lecture: MW from 09:00 am to 10:40 am, **CEER 206**

b. **Section 002:**
Lecture: MW from 03:00 pm to 04:40 pm, **CEER 206**

3 Course Instructor(s), TA(s)

a. **Section 001:**
Class Instructor: Mark A. Jupina, PhD
Office Hours: M, W Noon to 2:30 PM or by appointment, conducted either in-person or by zoom, or by appt.
TA: None

b. **Section 002:**
Class Instructor: Mark A. Jupina, PhD
Office Hours: M, W Noon to 2:30 PM or by appointment, conducted either in-person or by zoom, or by appt.
TA: None

4 Textbook

Brown, Stephen and Vranesic, Zvonko, *Fundamentals of Digital Logic with VHDL Design, 2nd or 3rd edition*, McGraw-Hill Higher Education. OPTIONAL.

a. **Other Supplemental Materials:**

5 Specific Course Information

a. **Catalog Description**
Digital logic families with primary emphasis on external electrical characteristics of the logic devices. Applications and designs at the board-level, involving topics such as series/parallel conversion and analog/digital conversion.

b. **Prerequisites:** ECE 2030 and ECE 2042; **Co-requisites:** None

c. Required for BS CPE

6 Course-specific Goals

a. 1. To understand the properties of digital systems. 2. To understand how to use computer aided simulation tools to design, analyze and synthesize digital circuits. 3. To understand how to prototype and troubleshoot board-level and on-chip applications and designs involving timers, serial and parallel data circuits, analog/digital conversion circuits, sensors, and field programmable logic device circuits.

b.

ABET Student Outcomes						
1	2	3	4	5	6	7
X		X				

The above student outcomes are defined by the Accreditation Board for Engineering and Technology (ABET) as:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
3. an ability to communicate effectively with a range of audiences

7 List of Covered Topics

1. Properties of Digital Systems
2. MOS Digital Logic Circuits
3. Programmable Logic Technologies
4. Quartus, Modelsim, and VHDL
5. Timing Circuits
6. Memory
7. A/D and D/A Conversion
8. State Machines
9. Data Buses and Data Paths

8 Tentative Schedule

Tentative schedules for all sections follow. Be sure to refer to the schedule for your specific section, if more than one is provided.

Tentative Schedule for **All Sections**

Date	Topics and Practicums
08/23/2021	Syllabus; Properties of Digital Systems
08/25/2021	Practicum 1, Part I – VLs and NMs
08/30/2021	Practicum 1, Part II – Power Dissipation
09/01/2021	Practicum 1, Part III – Speed and PDP
09/08/2021	Practicum 1, Finish up measurements; MOS Digital Logic Circuits
09/13/2021	MOS Digital Logic Circuits
09/15/2021	Practicum 2 – CMOS Circuit Layout
09/20/2021	Programmable Logic Technologies and VHDL; Practicum 3 – DE10 and Modelsim Tutorials
09/22/2021	Practicum 3 – DE10 and Modelsim Tutorials; Practicum 4 – VHDL Coding and Simulation
09/27/2021	Practicum 4 – VHDL Coding and Simulation
09/29/2021	Timing Circuits; Midterm Exam Review
10/04/2021	Midterm Exam in Class
10/06/2021	Practicum 5 – Reaction Timer (Overview, Design Work)
10/18/2021	Practicum 5 – Reaction Timer (Design Work)
10/20/2021	Practicum 5 – Reaction Timer (Design Work and Implementation)
10/25/2021	Practicum 5 – Reaction Timer (Implementation continued)
10/27/2021	Memory; Practicum 5 – Reaction Timer (Demonstration)
11/01/2021	A/D and D/A Conversion; Practicum 6 – Memory Tutorial
11/03/2021	Practicum 7 – DAC0808 and ADC0804
11/08/2021	Practicum 7 – Synthesized Source (Design)
11/10/2021	Practicum 7 – Synthesized Source (Design and Implementation)
11/15/2021	Practicum 7 – Synthesized Source (Implementation)
11/17/2021	State Machines; Practicum 7 – Synthesized Source (Demonstration)
11/22/2021	Practicum 8 – FSM Design
11/29/2021	Data Buses and Data Paths; Practicum 9 – Sonar Sensor (Design)
12/01/2021	Practicum 9 – Sonar Sensor (Implementation)
12/06/2021	Practicum 9 – Sonar Sensor (Demonstration)
12/08/2021	Practicum 9 – Sonar Sensor (Demonstration)

9 Grading Policy

Your final grade will be determined from the following:

1. Mid-Term Exam (25%)
2. Assignments (30%)
3. Lab Report (20%), one practicum will be selected for a write-up in a specified format

4. Electronic Lab Notebook and Lab Performance (25%)

Letter grade scale: A(93–100), A–(90–92), B+(87–89), B(83–86), B–(80–82), C+(77–79), C(73–76), C–(70–72), D+(67–69), D(63–66), D–(60–62), F(<60)

10 HW Assignment and Laboratory Report Submission Policy

The submission deadlines of assignments and lab reports will be announced by the instructor. Pre-lab assignments will be collected on Blackboard before the start of the practicum only and will not be accepted after this time period. These assignments are meant to prepare you for each lab session. A late submission of a lab report or non-pre-lab assignments will be assessed a penalty of 33% per business week.

You are required to maintain an electronic notebook for lab. All entries into the notebook are to be recorded as the measurements are performed. Various software tools, such as Microsoft Word, Excel, PowerPoint, Matlab, Modelsim, and Quartus, will be used to create the electronic work (Cntl-Print Screen can be used to capture the work). Each page of the notebook is to be dated and numbered, and an index at the beginning of the notebook should be created. Each practicum write-up should start with an overview or purpose section followed by a brief procedure section outlining the tasks that were performed. Pre-lab assignments, calculations, simulations, circuit diagrams, data (tables and graphs), observations, and conclusions are to be recorded in this electronic notebook. The final version of the electronic notebook will be an Adobe PDF file (pdf only, no word doc files accepted) submitted via Blackboard to the instructor by the due date given at the end of the semester.

11 Attendance Policy

Attendance is required for all scheduled practicum sessions and will be taken via an attendance sheet. Permission for an excused absence from a session will be granted for the conditions listed below. It is solely your responsibility to schedule with the TA or instructor a time to make up work of any excused absence session. For each unexcused practicum absence, your final grade will be lowered by 5 points.

Whenever possible, students should inform the instructor if they plan to be late or absent from class. In all cases, documentation is required to petition for *excused* absences to the Associate Dean for Student and Strategic Programs, Dr. Stephen Jones. The excused absence form is posted at: https://www1.villanova.edu/villanova/engineering/resources/undergraduates.html.

Excused absences do not count towards a failure in the course for first year students. Absence from class does not release the student from assigned work. Students who miss an in-class obligation such as an exam, a presentation, etc., due to an excused absence will not be penalized - the instructor may offer a make-up test, arrange an alternative time for a presentation, exempt a student from the assignment, or provide another arrangement. In the case of illness or injury, the form must be submitted within 24 hours of missing a class. The University's list of excused absences for all students includes the following:

1. Participation in NCAA athletic competitions
2. Participation in special academic events such as: conferences, field trips, project competitions, etc., and in official university business such as student representatives attending meetings related to university governance
3. Attendance at significant events of the immediate family such as: funerals, weddings, etc.
4. Religious holidays - see the University's policy on Religious Holidays

5. College-approved participation in placement activities such as: job interviews, graduate school interviews, job fairs
6. Legally required absence such as: jury duty, court appearance, short-term military service
7. Documented serious illness or disability

12 Examination Policy

The College of Engineering has adopted the following general examination guidelines:

1. Students must arrive before the start of the examination. Under exceptional circumstances a student may need to arrive late, but he/she can enter the examination room no later than five (5) minutes after the start of the exam.
2. Cell phones must be turned off until the student exits the examination room.
3. The official Villanova class attendance policy must be followed when requesting excuses for absences or lateness to an examination.
4. Each student must write and sign the following statement, "I have neither given nor received any unauthorized assistance in the completion of this examination."
5. For online examinations, the instructor may implement video proctoring or other measures to ensure academic integrity. For consent purposes, the instructor will inform students in advance if (s)he plans to use any form of video-proctoring and whether the examination will be recorded.

13 Academic Integrity Policy

The College of Engineering is committed to creating an environment of academic integrity and ethical decision-making that we hope is reflected in the actions of our students and graduates. As Villanova students, integrity is central to the University mission. As engineers, our code of conduct requires us to place honor and integrity at the forefront of everything we do. As engineering students, it is expected that you will begin to adopt these values and instill them into your work habits. Students violating the academic integrity policy will receive a zero on that assignment or exam and the violation will be reported to the Associate Dean for Academic Affairs. The University's academic integrity policy can be found on the following web page:
https://www1.villanova.edu/villanova/provost/resources/student/policies/integrity.html.

14 Adherence to the Student Code of Conduct

Students are expected to act in a professional and respectful manner to their fellow students, faculty, and staff. Students should become acquainted with and understand the responsibilities set forth in the Student Handbook, especially those in the sections on Policy and Regulations. Adherence to university regulations is expected and required for successful completion of the program of studies. Enforcement within the classroom of policies regarding classroom behavior is the responsibility of the faculty member. All other discipline problems are to be referred to the Dean of Students.

15 Online Expectations

To foster a professional environment, please wear appropriate clothes, mute if you are not talking to cut down on background noise, refrain from eating, and select an appropriate setting when we are meeting online.

16 Inclusive Classroom

This classroom is a place where you will be treated with respect; we welcome individuals of all ages, backgrounds, beliefs, ethnicities, gender, gender identities and expressions, sexual orientation, and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming, and inclusive environment to allow all among us to learn and flourish.

17 Students with Disabilities

It is the policy of the university to make reasonable academic accommodations for qualified individuals with disabilities. If you are a person with a disability (non-physical) please register with the office of Learning Support Services (LSS) by emailing Learning.support.services@villanova.edu or by phoning 610-519-5176 as soon as possible. Registration is *required* in order to receive accommodations.

The Office of Disability Services (ODS) collaborates with students, faculty, staff, and community members to create diverse learning environments that are usable, equitable, inclusive and sustainable. The ODS provides Villanova University students with physical disabilities the necessary support to successfully complete their education and participate in activities available to all students. If you have a diagnosed disability and plan to utilize academic accommodations, please contact and register with Gregory Hannah, advisor to students with disabilities at 610-519-3209 or visit the office on the second floor of the Connelly Center.

18 Tutoring Services

Villanova's tutoring services include The Writing Center, The Learner's Studio, and The Center for Speaking and Presentation. These services are offered free of charge to students. Drop in as-needed or book a regular weekly session to supercharge your academic success. Sessions can be 30 or 60 minutes in length.

Register for an account and book sessions in advance at villanova.mywconline.com. If you don't see your class listed, request a tutor for a missing subject at: tutorrequest.villanova.edu For more information, contact Juliana Struder at juliana.studer@villanova.edu or at 610-519-5862.

19 Electronics Policy

The use of electronic devices, such as phones, laptops, tablets, calculators, etc., during class is generally allowed, unless their use causes a disturbance to others. During examinations, the use of any electronic device is prohibited, unless it is expressly authorized by the instructor.

Students are prohibited from making any audio or visual recordings (including taking photographs) of lectures, discussions, or other classroom activities, unless a student (1) has written permission in advance from the instructor, or (2) is permitted to record under terms and conditions as approved by the University's Office of Disability Services or Learning Support Services. Students who have received approval to record classes as an academic accommodation must provide supporting documentation from the Office of Disability Services or Learning Support Services in advance of any recording. Students may use authorized recordings only for the purposes of individual study in the course, and may not disseminate or share them with a wider audience without explicit permission.

20 Copyright Policy

The materials used in Villanova University courses ("Course Materials") generally represent the intellectual property of course instructors, third parties and/or the university which may not be disseminated or reproduced in any form for public distribution (e.g., sale, exchange, etc.) without the written permission of the course instructor. Course materials include all written or electronic documents and materials, including syllabi, current and past examination questions/answers, and presentations such as lectures, videos, slides, etc., provided by a course instructor. Course materials may only be used by students enrolled in the course for academic (course-related) purposes.

Published course readings (book chapters, articles, reports, etc.) available in "Blackboard" are copyrighted materials. These works are made available to students through licensed databases or fair use. They are protected by copyright law, and may not be further disseminated or reproduced in any form for distribution (e.g. uploading to websites, sale, exchange, etc.) without the permission of the copyright owner.

Follow these links for more information on Intellectual Property, Copyright, and Computer Acceptable Use.

21 Professorial Duties

It is important to note that teaching is one of the many duties that professors perform as part of their job responsibilities. In addition to teaching, professors perform research, advise graduate students, edit journals and review journal articles, serve on committees for the university and professional societies, travel to conferences to remain abreast of current developments and to present their results... to name just a few commitments.