ECE 3450: Digital Electronics

Class Meetings

Section 001: M, W, 9 - 11:10 am, CEER 206, (**Last Names A – L, 9 – 10 am, and M – T, 10:10 – 11:10 am**)

Section 002: M, W, 3:25 pm to 5:35 pm, CEER 206, (**Last Names B – H, 3:25 – 4:25 pm, and K – W, 4:35 – 5:35 pm**)

Zoom Sessions will be conducted concurrently with in-class sessions for on-line or ill students

Instructor

Mark A. Jupina, PhD

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Office Hours

M, W 12:30 to 3 PM or by appointment, conducted either in-person or by zoom

Course Objectives

- To understand the properties of digital systems.
- To understand how to use computer aided simulation tools to design, analyze and synthesize digital circuits.
- 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.

Grading Policy

Your final grade will be determined from the following:

- Mid-Term Exam: 25% (**Monday, September 28** on Blackboard (no class on that day))
- Assignments: 30%
- Lab Report: 20% (one practicum will be selected for a write-up in a specified format)
- Electronic Lab Notebook and Lab Performance: 25%

The scale used to assign letter grades is:

Letter Grade	Numerical Grade	Letter Grade	Numerical Grade
A	94 to 100	C	73 to 76
A-	90 to 93	C-	70 to 72
B+	87 to 89	D+	67 to 69
B	83 to 86	D	63 to 66
B-	80 to 82	D-	60 to 62
C+	77 to 79	F	Less than 60

Inclusive Classroom

We consider this classroom to be a place where you will be treated with respect; and, 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 for every other member of the class.

Attendance

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.**

Where possible, students should inform their instructors if they plan to be late or absent from class. In all cases, students should be prepared to provide documentation to petition for *excused* absences to the Associate Dean for Student and Strategic Programs, Dr. Stephen Jones. Students should use the form for requesting an *excused* absence. Excused absences do not count toward a failure in the course for first year students. Absence from class does not release the student from work assigned. Students who miss an in-class obligation (exam, 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 class.

The University's list of excused absences for all students includes the following:

- participation in NCAA athletic competitions
- participation in special academic events (e.g., conferences, field trips, project competitions)
- participation in official university business (e.g., student representatives attending meetings related to university governance)
- attendance at significant events involving the immediate family (e.g., funerals, weddings)
- religious holidays - see the University's policy on Religious Holidays
- college-approved participation in placement activities (e.g., job interviews, graduate school interviews, attending job fairs)
- legally required absence (jury duty, court appearance, short-term military service)
- documented serious illness, such as COVID, or disability

Rules of Conduct

Serious violations include late arrival; unsafe practices; eating food, drinking a beverage, or chewing gum in the laboratory; unauthorized or recreational use of computers; and misuse or abuse of equipment. **A serious violation or repeated minor violations of any rule will result in a deduction of 5 points from the final grade per offense.**

Course Materials

COURSE WEB SITE (Blackboard Site: Fall20_ECE_3450_001_002)

https://elearning.villanova.edu/

TEXTBOOK

Brown and Vranesic, Fundamentals of Digital Logic with VHDL Design, 2nd or 3rd ed., McGraw-Hill.

ADDITIONAL REFERENCES

1. Tocci, Widmer, and Moss Digital Systems, Principles and Applications, Prentice Hall, 2007.
2. Hamblen, Hall, and Furman, Rapid Prototyping of Digital Systems, SOPC Edition, Springer, 2008.

Academic Integrity

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.

Students are encouraged to read the University's academic integrity policy.

The College of Engineering has adopted the following exam guidelines:

- Students must arrive before the start of the exam. Under exceptional circumstances a student may need to arrive late, but he/she can enter the exam no later than 5 minutes after the start of the exam.
- All cell phones must be turned off and stored away until the student exits the exam room.
- The official Villanova class attendance policy must be followed when requesting excuses for absences or lateness to an exam.
- Each student must write and sign the following statement, "*I have neither given nor received any unauthorized assistance in the completion of this exam.*" If taking an exam remotely, students still need to copy and sign this statement (even if signed for electronically).
- In the case of virtual exams, the instructor may implement video proctoring or other measures to ensure academic integrity. For consent purposes, the instructor will announce ahead of time to students if they plan to use any form of video proctoring during an assessment and whether a recording will take place.

Adherence to the Student Code of Conduct and the CARITAS Commitment

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.

Students, faculty, and staff are expected to comply with the CARITAS Commitment. Students must wear masks, practice social distancing and good hygiene, wipe down their work area upon arrival and departure, and request an excused absence if they are not feeling well.

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.

Students with Disabilities

It is the policy of Villanova to make reasonable academic accommodations for qualified individuals with disabilities. If you are a person with a disability please contact me after class or during office hours to make arrangements.

If you have a non-physical disability you need to register with the Learning Support Office by contacting 610-519-5176 or at learning.support.services@villanova.edu as soon as possible. Registration is needed to receive accommodations.

The Office of Disability Services 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 @ 610-519-3209 or visit the office on the second floor of the Connelly Center.

Electronics Policy

Online portions of this class may be recorded so that students that are absent may view the content later.

The use of electronic devices, such as phones, laptops, tablets, etc., during class is…

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.

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, PowerPoints, 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 material. 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 permission of the copyright owner.

Follow these links for more information about intellectual property, copyright, and computer acceptable use.

The Learner's Studio

Villanova's Learners' Studio provides free content tutoring for over 100 courses (excludes writing, math, and entry level VSB courses). From quick homework clarification questions to prep for final exams, we can help! Our peer tutors are each endorsed by two faculty members and are trained according to CRLA national standards. All tutoring services at the university can be found here. Don't see the class you want listed? Click here. For more information, contact juliana.studer@villanova.edu or call 610-519-5862.

Course Topics and Practicums and Schedule (Subject to Change)

1. Properties of Digital Systems	
Practicum 1, Part I – VLs and NMs	Wed, August 19, 2020
Practicum 1, Part II – Power Dissipation	Mon, August 24, 2020
Practicum 1, Part III – Speed and PDP	Wed, August 26, 2020
Practicum 1, Finish up any measurements (Optional)	Mon, August 31, 2020
2. MOS Digital Logic Circuits	
Practicum 2 - CMOS Circuit Layout	Wed, September 2, 2020
Topic 2 Problem Session	Wed, September 9, 2020
3/4. Programmable Logic Technologies and VHDL	
Practicum 3 – DE10 Tutorial	Mon, September 14, 2020
Practicum 3 – Modelsim Tutorial	Wed, September 16, 2020
Practicum 4 – VHDL Coding and Simulation	Mon, September 21, 2020
Exam Review	Wed, September 23, 2020
Mid-Term Exam on Blackboard (No Class)	Mon, September 28, 2020

5. Timing Circuits	
Practicum 5 – Reaction Timer (Design Work)	Wed, September 30, 2020
Practicum 5 – Reaction Timer (Design Work)	Mon, October 5, 2020
Practicum 5 – Reaction Timer (Implementation)	Wed, October 7, 2020
Practicum 5 – Reaction Timer (Implementation)	Mon, October 12, 2020
Practicum 5 – Reaction Timer (Demonstration)	Wed, October 14, 2020
6. Memory	
Practicum 6 – Memory Tutorial	Mon, October 19, 2020
7. A/D and D/A Conversion	
Practicum 7 – DAC0808 and ADC0804	Wed, October 21, 2020
Practicum 7 – Synthesized Source (Design)	Mon, October 26, 2020
Practicum 7 – Synthesized Source (Design)	Wed, October 28, 2020
Practicum 7 – Synthesized Source (Implementation)	Mon, November 2, 2020
Practicum 7 – Synthesized Source (Demonstration)	Wed, November 4, 2020
8. State Machines	
Practicum 8 – FSM Design	Mon, November 9, 2020
9. Data Buses and Data Paths	
Practicum 9 – Sonar Sensor (Design)	Wed, November 11, 2020
Practicum 9 – Sonar Sensor (Implementation)	Mon, November 16, 2020
Practicum 9 – Sonar Sensor (Demonstration)	Wed, November 18, 2020
Open Lab Period (Optional)	Mon, November 23, 2020

Assignment Deadlines

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 33% penalty per business week.**

Electronic Notebook

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, 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.

ABET Outcomes

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

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.