Syllabus

- **Instructors:**

Instructor: Dr. Mojtaba Vaezi
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Office: Tolentine 433A
Office Hours: MW 12:30-13:30 pm

Teaching Assistant: Xinliang Zhang
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Office: Tolentine 403
Office Hours: Thursday 12:00-14:00pm

- **Time and Location:**

	Time	Class Type
Lectures	MWF 11:30-12:20	Virtual (Distance Learning)

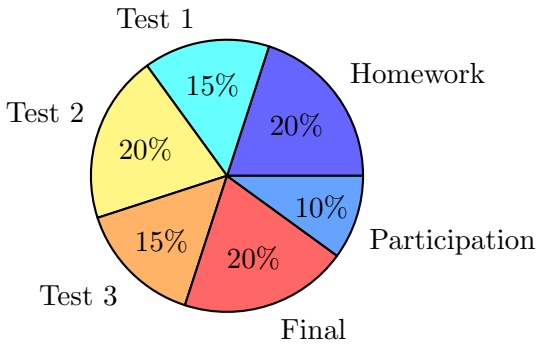
- **Prerequisites:**
ECE 2054, ECE 2409, and MAT 2705

- **Course Description:**
This course introduces the theory and practices of continuous and discrete time *signals & systems* analysis. Topics covered are signal representation and classifications, system representation and properties, linear time-invariant systems, convolution, various Fourier transforms, Laplace and z transforms, sampling, filtering and modulation.

- **Assessment:**

	Weight	Remarks
Homework	20%	7 homework (due in 1 week)
Test 1	15%	Chapter 1, Friday, September 11, 2020
Test 2	20%	Chapter 2, Monday, October 12, 2020
Test 3	15%	Chapters 5 &6, Monday, November 2, 2020
Test 4 (Final)	20%	Chapter 7, Friday December 3, 2020
Quizzes/Participation	10%	Weekly Kahoot! quizzes (one/two per week)

Participation in quizzes will account for 8% and only 2% is for the answers.



The scale used to assign letter grades is:

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

- **Homework policy:**
  - Assignments are due in one week in class.
  - There will be 25% penalty for late assignments. No assignment will be accepted after solutions are posted.
  - You are welcome and even encouraged to discuss with other students about the homework, but everyone should turn in their own write up.
  - When submitting your assignments, please make sure that answers are in order and the solutions are neat and readable.

  Effective (recommended) study habits: Attend the lectures, take notes, ask questions, study in group, do the homework, and attempt the examples (solved or unsolved) of the textbook.

- **Textbook and References:**

  Text: Fawwaz T. Ulaby and Andrew E. Yagle, *Signals and Systems: Theory and Applications*, 2018, `http://ss2.eecs.umich.edu`

  References:
  1. Oppenheim & Willsky, *Signals & Systems*, 2nd ed., Prentice-Hall, 1997.
  2. Hsu, *Schaum's Outline of Signals & Systems*, McGraw Hill,1995.

- **Outline:**
  - **Chapter 1: Signals**
    1-1 Types of Signals
    1-2 Signal Transformations
    1-3 Waveform Properties
    1-4 Nonperiodic Waveforms
    1-5 Signal Power and Energy
  - **Chapter 2: Linear Time-Invariant (LTI) Systems**
    2-1 Linear Time-Invariant Systems
    2-2 Impulse Response
    2-3 Convolution
    2-4 Graphical Convolution
    2-5 Convolution Properties
    2-6 Causality and BIBO Stability
    2-7 LTI Sinusoidal Response
  - **Chapter 5: Fourier Analysis Techniques**
    5-2 Fourier Series Analysis Technique
    5-3 Fourier Series Representations
    5-4 Computation of Fourier Series Coefficients
    5-5 Circuit Analysis with Fourier Series
    5-6 Parseval's Theorem for Periodic Waveforms
    5-7 Fourier Transform
    5-8 Fourier Transform Properties
    5-9 Parseval's Theorem for Fourier Transforms
    5-12 Circuit Analysis with Fourier Transform
  - **Chapter 6: Applications of the Fourier Transform**
    6-1 Filtering
    6-12 Modulation
    6-13 Sampling Theorem
  - **Chapter 7: Discrete-Time Signals and Systems**
    7-1 Discrete Signal Notation and Properties
    7-2 Discrete-Time Signal Functions
    7-3 Discrete-Time LTI Systems
    7-4 Properties of Discrete-Time LTI Systems
    7-5 Discrete-Time Convolution
    7-6 The z-Transform
    7-7 Properties of the z-Transform
    7-8 Inverse z-Transform
    7-10 System Transfer Function
    7-12 System Frequency Response
    7-14 Discrete-Time Fourier Transform (DTFT)
    7-15 Discrete Fourier Transform (DFT)
    7-16 Fast Fourier Transform (FFT)
- **Schedule**

Date	Day	Topic	Reading	Due
17-Aug	M	Introduction		
19-Aug	W	Complex numbers/Math formulas	Appendices B & C	
21-Aug	F	Types of Signals	Section 1.1	
24-Aug	M	Signal Transformations	Section 1.2	HW1
26-Aug	W	Signal Transformations	Section 1.2	
28-Aug	F	Waveform Properties	Section 1.3	
31-Aug	M	Nonperiodic Waveforms	Section 1.4	
2-Sep	W	Signal Power and Energy	Section 1.5	
4-Sep	F	Problem Solving		
7-Sep	M	Labor Day - No Class		
9-Sep	W	Chapter Summary	Chapter 1	HW2
11-Sep	F	**Test 1 (Chapter 1)**		
14-Sep	M	LTI Systems	Section 2.1	
16-Sep	W	Impulse Response	Section 2.2	
18-Sep	F	Impulse Response	Section 2.2	
21-Sep	M	Convolution	Section 2.3	
23-Sep	W	Graphical Convolution	Section 2.4	
25-Sep	F	Convolution Properties	Section 2.5	
28-Sep	M	Problem Solving		HW3
30-Sep	W	Causality and BIBO Stability	Section 2.6	
2-Oct	F	Causality and BIBO Stability	Section 2.7	
5-Oct	M	LTI Sinusoidal Response	Section 2.7	
7-Oct	W	Chapter Summary	Chapter 2	
9-Oct	F	Fourier Series	Section 5.2	HW4
12-Oct	M	**Test 2 (Chapter 2)**		
14-Oct	W	Fourier Series	Section 5.4	
16-Oct	F	Fourier Transform	Section 5.7	
19-Oct	M	Fourier Transform Applications	Chapter 6	
21-Oct	W	Fourier Transform Applications	Chapter 6	
23-Oct	F	Problem Solving		HW5
26-Oct	M	Discrete-Time Signals	Section 7.1	
28-Oct	W	DT Signal Functions	Section 7.2	
30-Oct	F	DT LTI Systems	Section 7.3	
2-Nov	M	**Test 3 (Chapters 5 & 6)**		
4-Nov	W	Properties of DT LTI Systems	Section 7.4	
6-Nov	F	DT Convolution	Section 7.4	
9-Nov	M	DT Convolution Properties	Section 7.5	HW6
11-Nov	W	The z-Transform	Section 7.6	
13-Nov	F	System Transfer Function	Section 7.10	
16-Nov	M	System Frequency Response	Section 7.12	
18-Nov	W	Discrete-Time Fourier Transform	Section 7.14	
20-Nov	F	Discrete Fourier Transform (DFT)	Section 7.15	
23-Nov	M	Chapter Summary	Chapter 7	
25-Nov	W	Course Summary		HW7
3-Dec	F	**Final Exam**	2:30 - 5:00 PM	

- **Other Information:**
  - **Student Code of Academic Integrity:** Academic integrity is a primary value for any institution of higher education. Cheating on tests, plagiarism, and other forms of academic dishonesty and misconduct are completely unacceptable, especially at Villanova which prides itself on its commitment to the Augustinian values of truth, unity, and love. Students are expected to adhere to Villanova's Code of Academic Integrity accessible via the following link: https://www1.villanova.edu/villanova/provost/resources/student/policies/integrity.
  - **Statement on Disability:** "It is the policy of Villanova to make reasonable academic accommodations for qualified individuals with disabilities. If you are a person with a disability (non-physical) please register with the Learning Support office by contacting Learning.support.services@villanova.edu or 610-519-5176 as soon as possible. Registration is needed in order 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 Gregory Hannah, advisor to students with disabilities @ 610-519-3209 or visit the office on the second floor of the Connelly Center."
  - **The Learners' Studio:** Villanova's Learners' Studio provides free 1:1 and small group (max of 10 students) content tutoring for over 100 courses on campus (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. Pop in as-needed or book a regular weekly session to supercharge your academic success. Sessions can be 30 or 60 minutes in length. We are open Sunday through Thursday from 4:00-9:00 p.m. in Old Falvey 301. Walk-ins welcome, or book in advance online: 1. Visit Villanova.mywconline.com 2. Register for an account and select "The Learners' Studio" from the drop-down menu on the sign-in page 3. Use the "limit to" menu to locate your course by code (For example, PHY 2400). This feature will sort the schedule and show you all tutors approved to cover your class 4. White boxes represent available sessions. Click any white box to book Don't see your class listed? Request a tutor for a missing subject with this link: tutorrequest.villanova.edu For more information, contact Juliana.studer@villanova.edu 610-519-5862