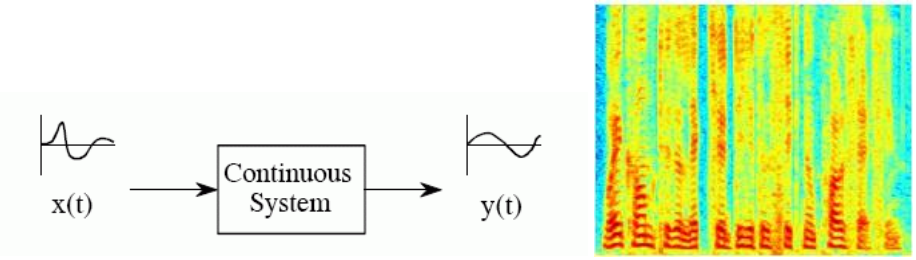
B EE 235 – Continuous-Time Linear Systems



Instructor:

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Office hours

Mondays 10:00-11:30 am
Join Zoom Office Hours
https://washington.zoom.us/j/93953461482

Meeting ID: 939 5346 1482

Guidance on wearing face mask (provided by the tri-campus Student Conduct office):

All students are required to wear a mask during class regardless of vaccination status. Single-use masks will be made available near hand-sanitizing stations in buildings across the UW Bothell campus if you forget to bring your own approved face covering.

If a student refuses to wear a mask after being reminded, they will be asked to leave the class and a report may be filed with UW Bothell's Office of Student Conduct.

In the case of belligerent non-compliance or threats of possible violence, instructors will contact UW Bothell Campus Safety. Active violence will be reported immediately by calling 911.

B EE 235 covers fundamental concepts in the representation of signals and systems as well as time- and frequency-domain analysis of linear systems. Major topics in the course are:

1. Description of continuous signals and linear systems;
2. Basic mathematical operations on signals;
3. Impulse response and convolution;
4. Fourier Series and Fourier Transform;
5. Laplace Transform and system analysis.

Learning Objectives: At the end of the course, you should be able to:

1. *Describe and represent* signals and systems mathematically;
2. *Determine* the output of a system using convolution operation;
3. *Determine* the Fourier Series of periodic signals;
4. *Perform* frequency-domain analysis of systems using Fourier and Laplace transforms;
5. *Use* MATLAB to analyze signals.

Textbook: *Signals* and *Systems* (2nd Edition) by *Alan V*. *Oppenheim*, Alan S. Willsky. Chapters 1-4 and 7-10 will be covered.

Grading policy:

Homework	15%
Labs	15%
Midterm	25%
Quizzes	10%
Final exam	35%

Grading will be curved and based on the total score only. Your final grade will be given based on the following UW grading scale.

Numerical Grade (4.0 Scale)	Percentage of Earned Points
4.0	98-100%
3.9	96-97%
3.8	94-95%
3.7	92-93%
3.6	91%
3.5	90%
3.4	89%
3.3	88%
3.2	87%
3.1	86%
3.0	85%
2.9	84%
2.8	83%
2.7	82%
2.6	81%
2.5	80%
2.4	79%
2.3	78%
2.2	77%
2.1	76%
2.0	75%
1.9	74%
1.8	73%
1.7	72%
1.6	71%
1.5	70%
1.4	69%
1.3	68%
1.2	67%
1.1	66%

Numerical Grade (4.0 Scale)	Percentage of Earned Points
1.0	65%
0.9	64%
0.8	62-63%
0.7	60-61%
0	<60%

Course calendar (subject to change):

	Chapters	notes	Labs
Week 1	1.1-1.3	Basic signal operations	Lab 0
Week 2	1.4-1.6	Common signals	Lab 1
Week 3	2.1-2.3	Convolution	Lab 1
Week 4	3.1-3.5	Fourier series	Lab 2 (Lab 1 report due)
Week 5	4.1-4.3	Fourier transform (FT)	Lab 2
Week 6	4.4-4.6	Properties of FT (**midterm**)	Lab 3 (Lab 2 report due)
Week 7	7.1 8.1-8.4	Properties of FT	Lab 3
Week 8	9.1-9.3	Applications of FT	Lab 4 (Lab 3 report due)
Week 9	9.4-9.6	Laplace transform(LT)	Lab 4 (Monday holiday)
Week 10	9.7-9.9	Application of LT to LTI systems	Optional Final project (Lab 4 report due)
Week 11	**Final exam**	TBD	

Attendance: Attendance is crucial in achieving the learning goals of this course at this special time. It is important for you to make your best efforts to attend all lectures. You're encouraged to take notes during lectures which I found is highly beneficial in this math-intensive course.

Quizzes: In-class quizzes will be held roughly every two weeks (except the week for midterm). A total of 3-4 quizzes will be given at the end of the lectures and each quiz takes roughly 30-45 minutes to complete.

Homework:

Homework assignments are an integral part of the course and are designed to emphasize the material covered in classroom discussions. Assignments are generally given weekly.

Please submit an electronic copy of your solutions to Canvas before the due time (no hardcopy submission). Any late submission (without permission from the instructor) will be subject to a 10% penalty. You will be allowed to submit late HWs only before the solutions are posted. Homework will no longer be accepted after the solutions have been posted.

Write your homework solutions clearly and legibly. Show your solution step by step. Giving just the final answer as a solution to a problem is not acceptable, and no grade will be given to it.

Labs:

There will be four lab experiments, to be done individually or in a group of 2. There are no dedicated lab sessions and you are required to find your own time to work on the labs.

Matlab will be used to perform these lab procedures. Please check here to find out how to obtain a free license for UW students: https://itconnect.uw.edu/wares/uware/matlab/

Each lab will be assigned every 2 weeks. Please submit an electronic copy of your lab report to Canvas before the due time.

Guidelines for Writing Lab Reports:

In each lab, you will be asked to follow certain procedures to get yourself familiar with programming in Matlab. Your lab report should at least include:

Cover Sheet: This page has the course number and assigned lab section, the title of the experiment, your name, your lab partner's names, and the date that the lab was performed.

Abstract: It should provide a statement of the purpose of each experiment and a concise description of the lab experiments/procedures.

Graphs: Please follow the guidelines/procedures in each lab to include all graphs necessary to show your results. Plots generated in Matlab are essential to demonstrate whether you have the correct results.

Codes: Please include the final version of your source codes in your report with brief comments to explain the functions of your commands.

Conclusions/Discussion: The purpose of the Discussion is to interpret your results, that is, to explain, analyze, and compare them. It's also important to provide some details of what you have learned about the theory or principle or procedure at the center of the lab.

Matlab tutorials (copy & paste if the links are not working):

http://www.mit.edu/people/abbe/matlab/lec1.html

http://www.mit.edu/people/abbe/matlab/lec2.html

https://www.mathworks.com/help/matlab/getting-started-with-matlab.html

Any late submission (without permission from the instructor) will be subject to a 10% penalty.

Final Project (Extra credits):

The final project is optional, and you will receive extra credits for finishing the project. In the final project, you will be asked to implement a channel vocoder in Matlab. You need to write your own Matlab script file to implement a tone vocoder in different settings. Your Matlab program should be able to process any sound file (.wav) you choose. The script file should be able to load a .wav sound file and process it to generate a vocoded sound. You should try to vary the number of bands in a vocoded speech to observe how spectral resolution would affect speech synthesis.

A channel vocoder can be used to generate a classic robotic-voice when modulated with speech, and it has found extensive use as a special effect in Hollywood. The channel vocoder is also often used to simulate the experience of hearing speech transduced by a cochlear implant. More details about the final project will be available on the course webpage.

Access and Accommodations:

Your experience in this class is important to me. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with Disability Resources for Students (DRS), please activate your accommodations via myDRS so we can discuss how they will be implemented in this course.

If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), contact DRS directly to set up an Access Plan. DRS facilitates the interactive process that establishes reasonable accommodations. Contact DRS at uwbdrs@uw.edu.

Veterans Services

Welcome! We at UW Bothell understand that the transition into civilian life can be challenging for our veteran students and we have many resources for any who may want to reach out for guidance or assistance. This includes our Vet Corp Navigator through the WDVA and our Student Veterans Association (SVA). Please contact Veteran Services at 425.352.5307 or

rosal@uw.edu. For those of you needing more URGENT support, please call The Suicide Prevention Hotline 1.800.273.8255 or connect with the UWB CARE Team https://www.uwb.edu/studentaffairs/care-team.

Religious Accommodations

Washington state law requires that UW develop a policy for the accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (https://registrar.washington.edu/students/religious-accommodations-request/).

Academic misconduct:

We have zero-tolerance on any form of plagiarism and cheating. All homework submissions must be your own personal work and all problem-solving steps towards the final solutions must be clearly written in order to receive full points. Each lab group needs to submit one report for each assigned lab and it should your original work as well.

Please also refer to:

Student Governance and Policies – Student Conduct Policy for Academic Misconduct and Behavioral Misconduct:

https://www.uwb.edu/studentaffairs/studentconduct/student-misconduct/academic-misconduct