ECE 3620 - Continuous-Time Systems and Signals

COURSE SYLLABUS - FALL 2016

Instructor		Asst. Prof. Zeljko Pantic
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Phone		435/797-2457 (Innovation Campus office) 919/593-4052 (Cell Phone)
Office Location	**Main Campus**	EL 304C
	Innovation Campus	USTAR Building 620, UPEL Lab, Office 102
Office Hours	**M/W/F**	30 min (minimum) - after the class meetings (Main Campus) [(2)]
	Tu/Th	by appointment (Innovation Campus)
TA/grader		TBA

[(1)] Email is a preferred method of communication. However, consider that email cannot be a substitution for office hour discussion and should be used only to **exchange short and important messages** that cannot wait for lecture time or office hours. Subject box of the email should contain "ECE 3620" text.

[(2)] **Canvas** will be used as a prevailing method for communication and course material distribution. USU Canvas website is: https://canvas.usu.edu/. To receive all updates in a timely manner, make sure that your Canvas **Notifications Preferences are adjusted properly.**

COURSE MEETINGS

Lectures	Practice Sessions[(3)]
Days: M/W/F	**Days:** TBA
Time: 10:30 pm – 11:20 pm	**Time:** TBA
Location: ENGR 203	**Location:** TBA

[(3)] Not mandatory, **but highly recommended**. Practice sessions will be held once per each homework cycle. The help sessions are designed to deepen and broaden the students' understanding. Attendance is not required. Among other things, student questions on homework and programs will be addressed, usually by the student working through the problem themselves with help from the teacher and other students. However, it is strongly hoped that the help sessions can accomplish more than that. Please note that if less than 3 students attend a given help session, the session will be cancelled and questions can be discussed during normal office hours.

LEARNING OUTCOMES

- Demonstrate understanding of system concepts such as linearity, time-invariance, stability, etc. Demonstrate understanding of basic signals used for analysis such as unit impulse, unit step, complex exponential, etc.
- Be able to determine system response using convolution.
- Understand the concept of a frequency domain representation of a signal and basic concepts of bandwidth.
- Demonstrate ability to convert electrical circuit elements and their underlying differential equations to Laplace transform representations.
- Demonstrate understanding of properties of transforms and their use in solving systems problems and analyzing signals.
- Demonstrate understanding of transfer functions, including frequency response and effect of pole/zero placements. Demonstrate ability to use Bode plots for frequency response.

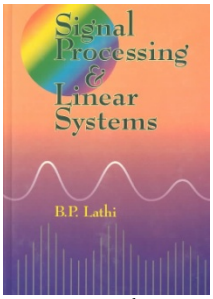
IDEA COURSE EVALUTION

IDEA essential or important objectives for this course are:

1. Learning fundamental principles, generalizations and theories.
2. Gaining factual knowledge (terminology, classifications, methods, trends).
3. Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course.
4. Learning to apply course material (to improve thinking, problem solving, and decisions).

COURSE PREREQUISITES

ECE 2290, CS 1410, Math 2280



COURSE MATERIAL

TEXTBOOK (required):

B. P. Lathi, Signal Processing and Linear Systems, *Oxford University Press*, New York, NY, 1998.

TEXTBOOK (recommended):

1. J. W. Nilsson and S. A. Riedel, Electric Circuits, *Addison Wesley, tenth edition*, 2014.
2. C. L. Phillips and J. M. Parr, and E. A. Riskin, Signals, Systems, and Transforms, *Pearson Prentice Hall*, 4th *edition*, 2008.
3. S. Haykin and B. Van Veen, Signals and Systems, *Wiley, second edition*, 2003.

SOFTWARE:

MATLAB/ (student version is sufficient). Students can access MATLAB through Open Access Computer labs (http://it.usu.edu/labs/lab-software/mat-lab). Be aware that not every computer lab may have installed MATLAB software package.

GRADING

Homework	30
Midterm	20
Final Exam	30
Quizzes	10
Programming assignments	10
Attendance (Practice Sessions)	1
Total [%]	101

(4) Attendance grading policy for practice session meetings:

Attendance	Grading
≥70 %	1%
<70 %	0%

This course uses standard USU letter grading (percentage will always be rounded to two decimal digits):

% max	100.00	92.99	89.99	86.99	82.99	79.99	76.99	72.99	69.99	66.99	62.99	59.99
grade	**A**	**A-**	**B+**	**B**	**B-**	**C+**	**C**	**C-**	**D+**	**D**	**D-**	**F**
% min	93.00	90	87.00	83.00	80.00	77.00	73.00	70.00	67.00	63.00	60	0

Incomplete grade ("I") indicates that a student has up to one year to finish the work and it is NOT common practice "unless extenuating circumstances occur in the life of a student". The university policy on incomplete grades, as well as what might be qualified as extenuating circumstances, is located at http://catalog.usu.edu/content.php?catoid=3&navoid=421#Incomplete

HOMEWORK

Homework will be assigned on regular bases in **Canvas**. Students will have at least 7 days for each assignment. To be considered for the maximum number of points, homework solutions must be scanned and submitted as a single pdf document in Canvas by **10:30 am** of the due date specified. Homework assignment submitted after 10:30 am, but within next 24 hours will be qualified as a **late submission**.

Late submission policy: Except in a case of documented emergency, for any assignment submitted *N* hours after the deadline, the total number of points will be reduced by 4*N*.

Students are encouraged to discuss HW problems. However, each student must turn in their own homework. Partial credits will be given for partially correct or unfinished solutions, but that will be **applied very restrictively**.

To be considered for the maximum number of points, the solution of problems should be **neatly written**, and embrace all supporting figures and clarifications that are necessary to understand the idea. **Illegible handwriting** will be returned to the student to redo it, and it will be qualified as a late submission. Make sure that you always circle the final solution or underline concluding statement. Each homework assignment submitted must start with a **title page** that provides general information about the student and homework. The title page is provided on Canvas.

Dr. Scott Budge: "It is important in this class to learn not just how to perform the math to reach the solution (to "turn the crank"), but to learn how to think through the problem to formulate the mathematical expressions to be solved. That is what makes the difference between a technician's approach and an engineer's approach to a problem. Homework is given to develop both skills. This is why use of a solution manual is prohibited."

EXAMS

Midterm and Final exams will be assigned during the course. The exams will consist of two parts: theoretical quiz-type questions and problem solving part. During the problem solving part of the exams, the **official course textbook and lecture notes will be allowed**. No other textbooks and problem solutions can be used.

LECTURE NOTES

To assist the student in taking notes, lecture notes (prepared by Dr. Scott E. Budge) and PPT slides (prepared by Dr. Pantic) are available on the class website. These are outlines of the material that will be covered in class, and are based on the material in the textbook. Large margins or additional space in slides are provided where the student can write notes during the class lectures.

READINGS

Students should **read assigned material before they come to the session**. Material assigned for the readings will be tested through online quizzes.

QUIZZES

Take-home online time limited quizzes will be assigned to students through Canvas. Each quiz will target a specific part of the course material. Material will emphasize reading assignments and material covered in class. **No collaboration is allowed while doing quizzes.**

TUTORING:

Tutoring services are available free of charge to all College of Engineering students. The Tutoring Center is located in ENGR 322 and 324.

ACADEMIC INTEGRITY

Academic violations of the Academic Integrity Standard include but are not limited to: **cheating, falsification and plagiarism**. The following text is quoted from the USU Students Code of Conduct:

"Students have a responsibility to promote academic integrity at the University by not participating in or facilitating others' participation in any act of academic dishonesty and by reporting all violations or suspected violations of the Academic Integrity Standard to their instructors. To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the following Honor Pledge: "***I pledge, on my honor, to conduct myself with the foremost level of academic integrity***."

Students are required to be aware and comply with the university policy on academic integrity found in the Code of Student Conduct found at http://www.usu.edu/studentservices/studentcode/article6.cfm

The instructor reserves the right to fail any student who can be justifiably accused of cheating. The instructor recognizes that solution manuals are available for the homework. However, use of the solution manual for completing homework is considered cheating.

LATE ARRIVAL TO CLASS/EXAMINATION

Try to be punctual and arrive to the classroom on time. If you are late for the class, enter in most quiet manner possible in order not to interrupt your classmates. Students who arrive late to the mid/final examination will be permitted to enter and take the exam only if nobody of their classmates has already left the classroom. No time extension will be provided for late students.

ELECTRONIC DEVICES IN THE CLASS

No electronic devices except basic non-programmable calculators will be allowed during the exam. **No cell phone verbal conversation** is allowed in the class. Students **are allowed to use their laptops to take notes**. However, if they decide to do so, they should be seated in the classroom in the **last a few rows** or behind all other students who do not use laptops. Video and sound recording during the lecture is prohibited without the permission of instructor.

ACCOMMODATIONS

DRC Statement: "Students with ADA-documented physical, sensory, emotional or medical impairments may be eligible for **reasonable accommodations**. Veterans may also be eligible for services. All accommodations are coordinated through the **Disability Resource Center (DRC)** (https://www.usu.edu/drc/) (435)797-0359. Please contact the DRC as early in the semester as possible. Alternate format materials (Braille, large print, digital, or audio) are available with advance notice."

NON-DISCRIMINATION POLICY

The following text is quoted from Student Code of Conduct web page:

http://www.usu.edu/studentservices/studentcode/

"Utah State University is committed to equity in education for its students and that they not be discriminated against/harassed because of **race, color, national origin, religion, sex, age, disability, or veteran status**. In addition, discrimination on the basis of sexual orientation for students in academic programs and activities is prohibited. Student, who feel their rights have been violated, want information, or just need some guidance relating to their course of action relating to Equal Opportunity issues, **should contact the Affirmative Action/Equal Opportunity Office**, located in Old Main, Room 161 or call (435) 797-1266. Information pertaining to other AA/EO-related laws, policies, and issues at the local (USU), state, and federal levels are also available at the office. These items, along with other information, are also available on the AA/EO Office website at: **http://www.usu.edu/aaeo**"

Tentative Course Schedule

Week	Lecture material	Section	Topic
-	-	Background Section	
Part 1: Continuous-time system and signal analysis in the time domain			
1	1	Intro - 1.5	Overview of the class; review, signal classification
2	1	1.6 - 1.8	Signal classification, Odd/even; System classification and system examples
3	2,3	2.1 - 2.3	Zero-input response, Impulse response
4	3,4	2.4 - 2.7	Zero-state response, convolution, Numerical convolution, stability, insight
Part 2: Frequency domain signal analysis			
5	5,6	3.1 - 3.4	Vector spaces, Fourier series
6	6,7	3.5 - 3.7, 4.1 - 4.2	Fourier series, Fourier transforms
7	7,8	4.3	Properties of the Fourier transform
8	9,10	4.4 - 4.10	Fourier transform applications, Intro. to comms.
Midterm Exam			
Part 3: Laplace transform system analysis			
9	10,11	6.1 - 6.3	Laplace transforms
10	11	6.1 - 6.3	Laplace transforms
11	11	6.4	Analysis of networks
12	12,13	6.5 – 6.6	Block diagrams; System realization
Part 4: Frequency domain system analysis			
13	14,15	7.1 - 7.3	Frequency response, Bode plots, and analog filters
14	16	7.4 - 7.7	Analog filters
15	17	13.1, 13.2	State-space representations (if time permits)