University of Massachusetts Amherst
Department of Electrical and Computer Engineering
ECE 313 - Signals and Systems
Fall 2018 Syllabus

COURSE DESCRIPTION

This course focuses on the study of signals and linear systems. It constitutes the basic theory behind a further study of communication systems, control systems, signal processing, digital processing in software engineering systems, microwave and radar systems, networking, and almost all disciplines of electrical and computer engineering. (4 credits)

INSTRUCTION TEAM

Lectures: Prof. Patrick Kelly, Marcus Hall 215B, kelly@ecs.umass.edu, Phone: 545-3637
Office Hours: Monday, 4-5 PM; Tuesday, 11 AM-noon (or by e-mail appointment)
(Roles: Lectures, Exams)

Discussions: Prof. Dennis Goeckel, Marcus Hall 215L, goeckel@ecs.umass.edu, Phone: 545-3514
Office Hours: Wednesday, 1-3 PM (or by e-mail appointment)
(Roles: Discussions, Homeworks, Discussion Quizzes)

Teaching Assistants: (Roles: Office Hours, Homework Grading)
Shermin Hamzehei, shamzehei@engin.umass.edu, Office Hours: Thursday, 5-8 PM, Hasbrouck 230
Bo Guan, boguan@umass.edu

SI Sessions: Tuesday, 7-8:15 PM, ELab 305; Wednesday, 5:30-6:45 PM, ELab 305
SI Leader: Ajey Pandey, apandey@umass.edu

You are always welcome to come to office hours with any questions about the course. Since this is a large class, coming to office hours will also make it easier for us to get to know you.

COURSE FORMAT

Lecture: 10:10 AM–11:00 AM on Monday, Wednesday, and Friday @ Goessmann 20.
Discussion: One 50-minute session on Friday. Sections: 12:20 PM and 1:25 PM @ ELab 305, and 2:30 PM @ ELab 306.

PREREQUISITES

Students must have obtained a grade of C or better in ECE 212 (Circuit Analysis II) and have taken either MATH 235 (Linear Algebra) or MATH 331 (Differential Equations).

TEXTBOOK

No textbook is required. Most of the content is covered in a collection (online course notes) in OpenStax CNX (cnx.org). You can browse through course modules on the website or download them as PDF files to print. The collection URL is http://cnx.org/content/col11557/. Several options exist for students who want to follow a textbook during the course:

- B. P. Lathi, "Linear Systems and Signals," 3rd edition, Oxford, 2017.
- F. T. Ulaby and A. E. Yagle, "Engineering Signals & Systems," NTS Press, 2013.

- A. V. Oppenheim, A. S. Willsky, S. H. Nawab, "Signals and Systems," Prentice Hall, 1997. (Available at the Integrated Science Library)
- H. Hsu, "Signals and Systems," 3rd edition, Schaum's Outline Series, McGraw Hill, 2014. (This book provides a large number of problems and worked-out examples.)

GRADING

- Homework assignments: 10%
- Class worksheets: 5%
- Discussion quizzes: 10%
- Midterm Exam 1: 22.5% (Wednesday Oct. 10, 7-9 PM, Thompson 102)
- Midterm Exam 2: 22.5% (Wednesday Nov. 7, 7-9 PM, Integrated Science Bldg. Room 135)
- Final Exam: 30% (Friday, Dec. 14, 8-10 AM, Marcus 131)

If your overall course grade is in the range:	**You will receive a course letter grade of at least:**
88-100	A
84-87	A-
80-83	B+
76-79	B
72-75	B-
68-71	C+
64-67	C
60-63	C-
55-59	D

HOMEWORK ASSIGNMENTS

There will be around nine homework assignments (one every week, except for exam weeks) that will be posted on the Moodle course website at https://moodle.umass.edu. Each assignment will be posted on a Friday and due the following Friday. Assignments must be turned in at the beginning of the class period on the due date. Late submissions will **not** be accepted. Discussion of the problem sets with other students is encouraged, but each student must turn in a unique personal write-up or code implementation. *Homework assignments are preparation for exams*, so do not rely too heavily on other students for help. Homework solutions will be posted online in Moodle after the due deadline.
Note: Some homework problems will require the use of MATLAB. MATLAB is available on the machines in the ECS computer labs and through the ECS Virtual Lab:
http://engineering.umass.edu/about-us/engineering-computer-services/virtual-lab
You can also get a trial version at a 100% discount for your own computer - for details see the web page:
www.umass.edu/it/support/software/mathworks-licenses-matlab-simulink-and-symbolic-math-toolbox

CLASS WORKSHEETS
Most lectures will include a short worksheet for you to try an example of what is being covered in class. Worksheets will be collected and you will be given credit for attempting to solve the problem (the worksheet grade will *not* be based on the correctness of your answer). We will go through solutions of the worksheet problems in class.

DISCUSSION QUIZZES
A short (10-minute) quiz will be given each week in discussion to check basic skills from the last homework. In addition, a more substantive quiz will be given during the discussion session before each exam with the intention of providing additional (and realistic) preparation for exams. Solutions will be posted on Moodle.

EXAMS
All exams will be closed-book and closed-notes; calculators will **not** be allowed. Exam packets will include some formula sheets (for example, Fourier transform pairs) and will be disclosed in advance by the instructors. Additionally, a **single-sided handwritten** formula sheet will be allowed for exams 1 and 2, which are non-cumulative. The final exam will be cumulative and a **double-sided handwritten** formula sheet will be allowed.

HONORS COLLOQUIUM
Students who intend to complete the Departmental Honors Track should enroll in the 1-credit ECE 313 Honors Colloquium (ECE H313). The Honors Colloquium will involve team-based projects and will begin meeting in early October. More details will be sent soon to students who have registered for the colloquium.

ACADEMIC HONESTY POLICY
It is expected that all students will abide by the Academic Honesty Policy, available at the Academic Honesty Office (Ombud's Office), or online at http://www.umass.edu/dean_students/codeofconduct/acadhonesty/. Acts of academic dishonesty (such as taking or giving answers in an exam, use of extra crib sheets, submitting another person's work as your own, etc.) will result in a grade of F in the course, and possibly additional sanctions including being placed on probation or suspension for a period of time or being dismissed from the University. All students have the right of appeal through the Academic Honesty Board.

ACCOMMODATION POLICY
The University of Massachusetts-Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological or learning disability on file with Disability Services (DS), Learning Disability Support Services (LDSS) or Psychological Disabilities Services (PDS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify the instructors within the first two weeks of the semester so that we may make appropriate arrangements.

INCLUSIVITY AND DIVERSITY
The diversity of the participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued or respected for any reason, please speak with me privately. If you wish to communicate anonymously, you may do so in writing, speak with Assistant Dean Paula Rees

(rees@umass.edu, 413.545.6324, Marston 128), or submit your concern through the College or Engineering Climate Concerns and Suggestions on-line form (tinyurl.com/UMassEngineerClimate). We are all members of an academic community with a shared responsibility to cultivate a climate where all students/individuals are valued and where both they and their ideas are treated with respect.

TENTATIVE LECTURE SCHEDULE

Week 1: Why Learn All This Math? Complex numbers. Graphical operations.

Part 1: Continuous-Time Signals and Systems
Week 2: Continuous-Time Signals. Basic Operations. Classifications and Properties.
Week 3: Continuous-Time Systems. Classification and Properties. System Analysis: Convolution.
Week 4: The Continuous-Time Fourier Transform. Advantages for Analysis (No convolution).
Week 5: Properties of the Continuous-Time Fourier Transform.
Week 6: More Properties of the Continuous-Time Fourier Transform. (Yes, it's that useful)

Part 2: Discrete-Time Signals and Systems
Week 7: Discrete-Time Signals. Basic Operations. Classifications and Properties.
Week 8: Discrete-Time Systems. Classification and Properties. System Analysis: (Easier) Convolution.
Week 9: The Discrete-Time Fourier Transform. Properties and Advantages (Again, no convolution).
Week 10: Properties of the Discrete-Time Fourier Transform: Déjà-Vu All Over Again.

Part 3: From Continuous to Discrete: Sampling Theory
Week 11: Connecting Continuous and Discrete-Time Signals and Systems: Sampling. Aliasing.
Week 12: Discrete-Time Processing of Continuous-Time Signals: All About Bandwidth.
Week 13: Applications in Sensing and Communication. Connections with Other Topics.