

EE483: Introduction to Digital Signal Processing Spring 2018

Schedule:	Lectures: 9:30am-10:50am Tue/Thu, OHE 100C
	Discussion: 5:00pm-5:50pm Mon, OHE 100C
	First Class: Tue, January 9th
	Midterm: Tue, February 27th 9:30am-10:50am (in class)
	Last Class: Thu, April 26th
	Final Exam : Tuesday, May 8th 8:00am-10:00am
Instructor:	Prof. Justin P. Haldar
	E-mail: jhaldar@usc.edu
	Office: EEB 442
	Office Hours: Mon 2:00pm-3:30pm and Thu 2:00pm-3:30pm
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TA:	Divya Varadarajan
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	Office Hours: Wed 10:00am-1:00pm, EEB 403
Catalog Description:	Fundamentals of Digital Signal Processing covering: discrete time linear systems, quantization, sampling, Z-transforms, Fourier transforms, FFTs and filter design.
Required Textbooks:	S. K. Mitra. <i>Digital Signal Processing: A Computer-Based Approach</i> , 4th edition, McGraw Hill 2010. <ul style="list-style-type: none">• A comprehensive modern textbook on digital signal processing. M. H. Hayes. <i>Schaum's Outlines: Digital Signal Processing</i> , 2nd edition, McGraw Hill 2011. <ul style="list-style-type: none">• A nice complement to the text by Mitra, this book contains overviews of important DSP concepts and hundreds of solved example problems.
Other References:	A. V. Oppenheim and R. W. Schaffer. <i>Discrete-Time Signal Processing</i> , 3rd edition, Prentice-Hall 2010.

- The classic textbook on DSP.

J. G. Proakis, D. K. Manolakis. *Digital Signal Processing*, 4th edition, Prentice-Hall 2006.

- Another popular text.

There are also a large number of other DSP books and online DSP resources – take a look at what the USC Library and the internet have to offer.

Prerequisites: 1 from ([EE 301A](#) or [EE 301](#))
Familiarity with MATLAB

**Grading and
Course
Policies:** 25% Homework
35% Midterm
40% Final

Homeworks must be turned in by 5:00pm PST on the due date. All students should submit homeworks electronically through the USC DEN website. Late homeworks will receive a score of zero. The final homework grade will be based on your average score after discarding the lowest.

You are allowed (and encouraged!) to discuss homework assignments with your classmates, but are expected to complete your homework assignments individually. USC's recommended sanction for plagiarism, unauthorized collaboration, and/or cheating on any course work is an F for the course, with a possibility for further disciplinary action.

Several of the homeworks will require MATLAB programming. It is your responsibility to make sure that you know how to access the software and read/write/debug MATLAB code.

All exams are cumulative and closed book, with no calculators. Please check now for any conflicts with the scheduled exam times.

Websites:

All course materials will be distributed through the USC DEN website: <https://www.uscden.net/>. It is your responsibility to check the website regularly for updates (notes, assignments, due dates, etc.). If you have any problems with the website, please contact USC DEN directly (<http://gapp.usc.edu/contact>). The website will also provide access to archived streaming videos of each lecture. However, please note that live attendance of each lecture is required, either on campus or at a remote DEN location. Archived lecture videos should only be used for reviewing course material, or in case you had to miss a lecture because of illness or work-related travel.

We will be using Piazza for class discussion. The system is aimed at getting you help fast and efficiently from classmates and instructors. Rather than emailing questions to us, I encourage you to post your questions on Piazza so that everyone in the course can benefit from the discussion. The Piazza page for the course can be found at: <https://piazza.com/usc/spring2018/ee483>.

Suggestions:

My goal is to teach you and your fellow students as much as possible about DSP, while simultaneously inspiring your interest, excitement, and curiosity about the material. This will be easier if you:

- Come to class on time and pay attention.
- Ask questions and participate in classroom discussion.
- Do all of the assignments.
- Make use of office hours.
- If you're struggling with the material, don't wait until the last minute to talk to us about it.
- Don't violate USC's academic integrity standards – you won't enjoy the consequences.

Course Timeline (subject to change):

Week 1 (1/9, 1/11)	Introduction and overview Discrete-time signals and systems
Week 2 (1/16, 1/18)	Linear Time-Invariant (LTI) systems Causality, stability, impulse response Linear difference equations (LDEs)
Week 3 (1/23, 1/25)	Discrete Time Fourier Transform (DTFT) Frequency response of LTI systems
Week 4 (1/30, 2/1)	Phase and group delay Discrete Fourier Transform (DFT)
Week 5 (2/6, 2/8)	Fast Fourier Transform (FFT) Discrete Cosine Transform, Haar Wavelet transform
Week 6 (2/13, 2/15)	Sampling of continuous-time signals Aliasing, the sampling theorem, signal reconstruction
Week 7 (2/20, 2/22)	Relationships between the Fourier transform, DFT, DTFT Review
Week 8 (2/27, 3/1)	Midterm Nonparametric spectral analysis
Week 9 (3/6, 3/9)	z -Transform Transfer functions of LTI systems
Week 10 (3/21, 3/23)	FIR and IIR digital filters
Week 11 (3/28, 3/30)	Design of FIR filters
Week 12 (4/4, 4/6)	Design of IIR filters
Week 13 (4/11, 4/13)	Digital filter structures, Quantization
Week 14 (4/18, 4/20)	Introduction to multirate filter banks, adaptive filters
Week 15 (4/25, 4/27)	Applications Review
Final Exam (5/8)	

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism - presenting someone else's ideas as your own, either verbatim or recast in your own words - is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu/> or to the *Department of Public Safety* <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety whole USC community. Another member of the university community - such as a friend, classmate, advisor, or faculty member - can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more.

Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* <http://sait.usc.edu/academicsupport/centerprograms/dsp/home.index.html> provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.