

## EE483: Introduction to Digital Signal Processing Spring 2017

- Schedule:**
- Lectures: 9:30am-10:50am Tue/Thu, [OHE](#) 100C
  - Discussion: 5:00pm-5:50pm Mon, [OHE](#) 100C
  - First Class: Tue, January 10th
  - Midterm: Tue, February 28th  
9:30am-10:50am (in class)
  - Last Class: Thu, April 27th
  - [Final Exam](#): Tuesday, May 9th  
8:00am-10:00am
- Instructor:** Prof. Justin P. Haldar
- E-mail: [jhaldar@usc.edu](mailto:jhaldar@usc.edu)
  - Office: [EEB](#) 442
  - Office Hours: Mon 2:00pm-3:30pm and Thu 2:00pm-3:30pm
  - Phone: (213)740-2358
- TA:** Tae Hyung Kim
- E-mail: [taehyung@usc.edu](mailto:taehyung@usc.edu)
  - Office: PHE 320
  - Office Hours: Wed 3:30pm-5pm and Fri 10am-11:30am
- 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. *Digital Signal Processing: A Computer-Based Approach*, 4th edition, McGraw Hill 2010.
    - A comprehensive modern textbook on digital signal processing.
  - M. H. Hayes. *Schaum's Outlines: Digital Signal Processing*, 2nd edition, McGraw Hill 2011.
    - 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. *Discrete-Time Signal Processing*, 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. On-campus students should place their homeworks in the EE 483 drop-box in the basement of [EEB](#). DEN 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/spring2017/ee483/home>.

**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):**

<b>Week 1 (1/10, 1/12)</b>	Introduction and overview Discrete-time signals and systems
<b>Week 2 (1/17, 1/19)</b>	Linear Time-Invariant (LTI) systems Causality, stability, impulse response Linear difference equations (LDEs)
<b>Week 3 (1/24, 1/26)</b>	Discrete Time Fourier Transform (DTFT) Frequency response of LTI systems
<b>Week 4 (1/31, 2/2)</b>	Phase and group delay Discrete Fourier Transform (DFT)
<b>Week 5 (2/7, 2/9)</b>	Fast Fourier Transform (FFT) Discrete Cosine Transform, Haar Wavelet transform
<b>Week 6 (2/14, 2/16)</b>	Sampling of continuous-time signals Aliasing, the sampling theorem, signal reconstruction
<b>Week 7 (2/21, 2/23)</b>	Relationships between the Fourier transform, DFT, DTFT Review
<b>Week 8 (2/28, 3/2)</b>	<b>Midterm</b> Nonparametric spectral analysis
<b>Week 9 (3/7, 3/9)</b>	$z$ -Transform Transfer functions of LTI systems
<b>Week 10 (3/21, 3/23)</b>	FIR and IIR digital filters
<b>Week 11 (3/28, 3/30)</b>	Design of FIR filters
<b>Week 12 (4/4, 4/6)</b>	Design of IIR filters
<b>Week 13 (4/11, 4/13)</b>	Digital filter structures, Quantization
<b>Week 14 (4/18, 4/20)</b>	Introduction to multirate filter banks, adaptive filters
<b>Week 15 (4/25, 4/27)</b>	Applications Review
<b>Final Exam (5/9)</b>	

## 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](mailto: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.