

EE483: Introduction to Digital Signal Processing Spring 2014

- Schedule:**
- Lectures: 9:30am-10:50am Tue/Thu, [OHE](#) 100C
 - Discussion: 5:00pm-5:50pm Mon, [RTH](#) 115
 - First Class: Tue, January 14th
 - Midterm: Tue, March 4th
9:30am-10:50am (in class)
 - Last Class: Thu, May 1st
 - [Final Exam](#): Tue, May 13th
8:00am-10:00am
- Instructor:** Prof. Justin P. Haldar
- E-mail: jhaldar@usc.edu
 - Office: [EEB](#) 442
 - Office Hours: 2:00pm-3:30pm Mon/Thu
 - Phone: (213)740-2358
- TA:** Amin Rezapour
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 - Office: TBA
 - Office Hours: TBA
 - Phone: TBA
- 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. *Schaums 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 on the third floor 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 highly catered to getting you help fast and efficiently from classmates, the TA, and myself. 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/spring2014/ee483/home/>. If you have any problems or feedback for the developers, email team@piazza.com.

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 (1/14, 1/16)	Introduction and overview Discrete-time signals and systems
Week 2 (1/21, 1/23)	Linear Time-Invariant (LTI) systems Causality, stability, impulse response Linear difference equations (LDEs)
Week 3 (1/28, 1/30)	Discrete Time Fourier Transform (DTFT) Frequency response of LTI systems
Week 4 (2/4, 2/6)	Phase and group delay Discrete Fourier Transform (DFT)
Week 5 (2/11, 2/13)	Fast Fourier Transform (FFT) Discrete Cosine Transform, Haar Wavelet transform
Week 6 (2/18, 2/20)	Sampling of continuous-time signals Aliasing, the sampling theorem, signal reconstruction
Week 7 (2/25, 2/27)	Relationships between the Fourier transform, DFT, DTFT Review
Week 8 (3/4, 3/6)	Midterm Nonparametric spectral analysis
Week 9 (3/11, 3/13)	z -Transform Transfer functions of LTI systems
Week 10 (3/25, 3/27)	FIR and IIR digital filters
Week 11 (4/1, 4/3)	Design of FIR filters
Week 12 (4/8, 4/10)	Design of IIR filters
Week 13 (4/15, 4/17)	Digital filter structures, Quantization
Week 14 (4/22, 4/24)	Introduction to multirate filter banks, adaptive filters
Week 15 (4/29, 5/1)	Applications Review
Final Exam (5/13)	

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.-5:00 p.m., Monday through Friday. Website and contact information for DSP: http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *SCampus*, the Student Guidebook, (www.usc.edu/scampus or <http://scampus.usc.edu>) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Emergency Preparedness/Course Continuity in a Crisis

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.