ECE 429/529: Digital Signal Processing

§ Course Details

Instructor	Gregory Ditzler (Dept. of ECE)
Instructor Email	ditzler@email.arizona.edu
Course Websites	https://d2l.arizona.edu
	piazza.com/arizona/fall2018/ece429
Lecture Times	Tu/Th 11:00AM–12:15PM
Lecture Room	Speech & Hearing Sci, RM205
Instructor Office Hour	ECE Bldg 556D
	F 4–5PM
	All other times are by appointment only.

§ Catalog Description

Discrete-time signals and systems, z-transforms, discrete Fourier transform, fast Fourier transform, digital filter design.

§ Textbook

- "Discrete-Time Signal Processing," Alan V. Oppenheim and Ronald W. Schafer, Prentice-Hall Signal Processing Series, 2010, 3rd Edition

I will supply lecture notes that are specifically to the course content that may not be covered in the textbook. Students should use both the text and the lecture notes as reading material for the course.

§ Software

You will be required to use Matlab to work on assignments throughout the course. Matlab is freely available for your local computer through the University and it is very likely that computers in the campus labs will have it installed.

§ Grading

Your final numerical grade will be computed as follows.

Homework (≈6)	20 points
Mid-term Exams (3)	40 points
Project	20 points
Total	100 points

Your course letter grade will be assigned based on your final numerical grade as follows.

90	100	A
80	89	B
70	79	C
60	69	D
0	59	E

§ Topics (subject to change)

- Introduction to DSP, classification of signals, digital frequency, sampling, aliasing, quantization noise, discrete-time system components, system properties, filter realizations, impulse response, convolution, correlation (9 lectures)
- Forward z-transform, time-shifting, DTFT existence, signal type from ROC, inverse z-transform, applying z-transform properties, poles & stability, system analysis using z-transform (5 lectures)
- Forward discrete-time Fourier transform (DTFT), symmetry, frequency shifting, modulation, filter design from lowpass prototypes, synthesis of filters using DTFT properties, DTFT analysis of downsampling/upsampling and expansion/compression operations, DTFT systems analysis, phase and group delay of filters, frequency response from poles & zeros, minimum-phase filters, forward DFT and inverse DFT, relationship to DTFT, applying DFT properties, convolution and correlation using DFT, DFT symmetry, sinusoidal analysis and frequency resolution, zero-padding and windowing, spectral analysis (16 lectures)
- Filter architectures and limit cycles (if time permits), linear-phase FIR filter types, FIR design by windowing, IIR design using bilinear transformation, decimation-in-time FFT, decimation-in-frequency FFT (9 lectures).

§ **Homework Submission Policy**

Some of the homework assignments will include MATLAB and/or C/C++ programming exercises. Homework must be turned in during class or via D2L (but not both) at the specified due date and time. Homework delivered late, or to any other location, will receive a grade of zero. The lowest homework grade will be omitted before computing the average homework grade for the semester. When submitting papers during class, please staple (do not fold). *Requests for a change in a homework grade must be made in writing no later than one week after the graded homework papers are made available.* Only a subset of the homework problems in a given assignment will be graded. Therefore, when studying for exams, you should rely on the homework solutions rather than the graded homework.

§ **Academic Integrity**

Students are responsible for completing homework assignments by themselves, but may work on strategies to complete the assignments with other students. You are encouraged to work in teams on homework assignments, but copying a completed assignment of another student and submitting it as your own is considered a violation of academic integrity—and it will hurt you when it comes to the exams. Any take-home examinations *may not consist of any group work, even for problem strategies.*

Additional exceptions to this policy will be plainly marked in the requirements for that exercise or project. Any violations of this policy will be dealt with to the full extent permitted by the University of Arizona, and *may result in suspension or expulsion from the university, in addition to a failing grade.* Please familiarize yourself with the Code of Academic Integrity if you have any questions (see http://deanofstudents.arizona.edu/codeofacademicintegrity).

§ **Threatening Behavior by Students**

The University seeks to promote a safe environment where students and employees may participate in the educational process without compromising their health, safety, or welfare. The Arizona Board of Regents (ABOR) Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one?s self. Threatening behavior can harm and disrupt the University, its community, and its families. Threatening behavior is prohibited.

§ **Accessibility and Accommodations**

At the University of Arizona we strive to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, you are welcome to let me know so that we can discuss options. You are also encouraged to contact Disability Resources (520-621-3268) to explore reasonable accommodation.

Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

§ **Subject Change**

The contents of this syllabus are subject to change at the instructor's discretion.