Digital Signal Processing Applications

EE482/682Spring 24

http://www.ee.unlv.edu/~b1morris/ee482

Professor:	Brendan Morris	Class:	MW 16:00-17:15, SEB 1240
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Textbook

Real-Time Digital Signal Processing: Fundamentals, Implementations, and Applications, 3rd Edition, Kuo, Lee, Tian — ISBN: 978-1-118-41432-3

Recommended Text

Digital Image Processing, 3rd Edition, Gonzalez and Woods — ISBN: 978031687288

Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools and Techniques to Build Intelligent Systems, 2e, Geron — ISBN: 9781492032649

The Scientist and Engineer's Guide to Digital Signal Processing, Smith — ISBN: 978-0966017632

Grading

Final:	20%	M 5/06
Quizzes (5):	25%	TBD
Project:	25%	Due F 05/10
Homework:	30%	Bi-Weekly

Students may study together in groups but all assignments must be completed individually. Homework will be due in class on the designated date. No late homework will be accepted unless prior notification and arrangements are made.

The course will have a term project. You will be required to submit a project report in the form of a conference styled manuscript and make a presentation.

Catalog Description

Application of signals and systems theory. Topics may include audio and speech signal processing, image processing, multi-spectral imaging, biomedical signals, and active sensing technologies such as Radar and Lidar.

Prerequisites: EE 361

Topics

The most up-to-date information regarding the class will be available on the course website – this will include the course schedule and assignment.

http://www.ee.unlv.edu/~b1morris/ee482

General Topics

- Review of DSP Fundamentals
- Design and Implementation of FIR and IIR Filters
- Frequency Domain Analysis of Signals
  - Discrete Fouier Transform (DFT)
  - Fast Fourier Transform (FFT)
  - Spectral Analysis and Power Spectral Density
- Speech Signal Processing
  - Speech Coding Techniques
  - Speech Enhancement
- Audio Signal Processing
  - Audio Coding
  - Audio Equalizers
  - Audio Effects
- Digital Image Processing
  - 2D-Signals, Systems. and Representation
  - Histograms
  - Image Filtering
- Radar/Lidar Processing
  - Object Detection and Ranging
  - Kalman Tracking

Course Outcomes (Program Outcomes)[UULO]
Upon completion of this course, students will be able to:

- Design a digital filters to meet specifications (1, 2, 6) [1, 2]
- Represent a finite length sequence by its DFT and compute the FFT(1, 6) [1, 2]
- Digitally encode, decode, and enhance speech signals (1, 6) [1, 2, 3]
- Digitally encode/decode audio signals and perform processing for audio effects (1, 6) [1, 2, 3]
- Digitally represent an image and perform basic image processing (1, 6) [1, 2, 3]
- Understand Radar/Lidar signals and track objects (1, 6) [1, 2, 3]
- Design and implement an open-ended DSP application (1, 2, 5, 6) [1, 2, 3]

Course Policies

- There will be no make-up exams or late homework without prior arrangements.
- Extensions will only be granted for medical emergencies or due to the observance of a religious holiday. The instructor must be notified of the absence prior to the last day of late registration.
- As a university student it is your responsibility to conduct yourself ethically and with integrity as described in the Academic Misconduct Policy. Cheating and plagiarism will not be tolerated. Any student caught cheating will be given an F grade.
  (`http://studentconduct.unlv.edu/misconduct/policy.html`)

Electrical Engineering Program Objectives
The Program Educational Objective of the Electrical Engineering program is to create, apply, and disseminate knowledge immediately or within a few years after graduation such that the graduate:

1. can successfully practice and mature intellectually in the field of Electrical Engineering or a related field.
2. can be admitted to and successfully progress through a post graduate program in Electrical Engineering or related program

Electrical Engineering Program Goals
To achieve these objectives and goals, each graduate of the Electrical Engineering Major will attain the following outcomes before graduation:

1. Appropriate technical knowledge and skills
2. Appropriate interpersonal skills
3. The knowledge and skills to be a responsible citizen

Electrical Engineering ABET Student Outcomes
To achieve the above objectives and goals, each graduate of the Electrical Engineering Major will attain the following outcomes before graduation:

(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
(3) An ability to communicate effectively with a range of audiences
(4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
(5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
(7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

University Undergraduate Learning Outcomes [UULO]
The five University Undergraduate Learning Outcomes (UULOs) define what all UNLV students should know and be able to do when they graduate. Because students engage with the UULOs in both their general education and academic majors, the UULOs help make the undergraduate experience intentional and coherent.

Full context online (`https://www.unlv.edu/provost/gen-ed/uulo`)

[1] Intellectual Breadth and Lifelong Learning
[2] Inquiry and Critical Thinking
[3] Communication
[4] Global/Multicultural Knowledge and Awareness
[5] Citizenship and Ethics

Academic Policies for Students `https://www.unlv.edu/policies/students`