

ELC 4351: Digital Signal Processing
10:10–11:00 AM Monday, Wednesday, Friday
Rogers ECS Building 207
Course Materials on [Canvas](#)

Instructor: Dr. Liang (Leon) Dong
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Office Hours: MWF 11:00 AM - 2:00 PM; Other by appointment

Course Description:

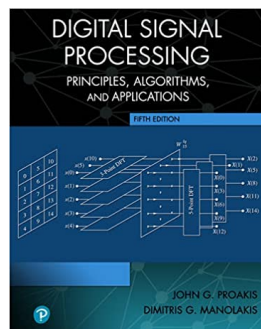
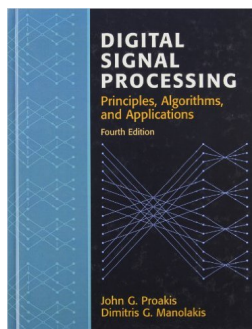
This senior-level engineering course provides an in-depth exploration of the core principles of discrete-time signals, systems, and contemporary digital processing techniques, alongside their pertinent applications. The curriculum encompasses a comprehensive study of discrete-time signals and systems, sampling theory, the discrete Fourier transform, the z -transform, linear system analysis, spectral analysis, and the design of digital filters. Further, it incorporates adaptive filtering and other digital signal processing applications. Advanced modules also introduce students to signal processing within the domains of communication and networking, multimedia, and data analysis. Theoretical insights gained are reinforced through in-class demonstrations and hands-on computer simulation projects.

Prerequisite: ELC 3335 – Signals and Systems
STA 3381 – Probability and Statistics
Basic Matlab skills

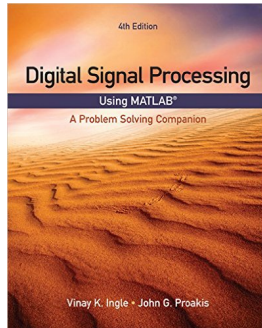
Credit Hours: 3

Textbook 1: *Digital Signal Processing*
Pearson Prentice Hall, 4th Edition, 2006 (5th Ed, 2021)

Author(s): John G. Proakis and Dimitris K Manolakis
ISBN-13: 9780131873742 (5th Ed: 978-0137348244)



Textbook 2: Reference Book
Digital Signal Processing Using MATLAB: A Problem Solving Companion
Cengage Learning, 4th Edition, 2016
Author(s): Vinay K. Ingle and John G. Proakis
ISBN-13: 9781305635128



Course Objectives:

Upon successful completion of this course, participants will be able to:

1. Employ the fundamentals of digital signal processing effectively.
2. Comprehend the mechanics of both analog-to-digital and digital-to-analog conversions.
3. Proficiently represent discrete-time signals in the frequency domain using the z -transform and discrete Fourier transform (DFT).
4. Recognize the implementation intricacies of the DFT through the fast Fourier transform (FFT) and grasp its varied applications, including convolution sums computation and spectral analysis.
5. Familiarize with the foundational structures of finite-impulse-response (FIR) and infinite-impulse-response (IIR) filters, and acquire the skills to design filters with specific frequency responses.
6. Discern the relationships between first-order low-pass and high-pass filters, as well as between second-order Peaking and Notching filters. Craft digital filters utilizing Matlab.
7. Implement suitable windows to mitigate the effects of leakage.
8. Assimilate the methodologies involved in designing filter banks.
9. Execute a comprehensive time-frequency analysis of signals.
10. Recognize and understand various applications of digital signal processing.
11. Grasp foundational principles of signal processing as applied to communication, networking, multimedia, and data analytics.

Computer Usage:

Matlab and Simulink Signal Processing Toolbox (available on computers of College of Engineering and Computer Science, available for download from [Baylor ITS](#) with Baylor Bear ID.)

We will use computers extensively to program and verify homework assignments. Various software tools are available at the Baylor Engineering Computer Center.

Reading Assignment, Homework, and Quiz:

There will be biweekly reading assignments. Reading assignments include textbook reading and technical paper reading. The outcome of your reading assignments will be evaluated through self-reporting and classroom discussions.

There will be homework assignments every two to three weeks. Homework includes textbook problems and Matlab programming projects.

There will be a few in-class quizzes (10-15 minutes). Each quiz has a few questions that are related to the knowledge covered in the previous classes or the current class. The quiz is designed to measure your classroom involvement and learning effectiveness.

Midterm Exam:

There will be two in-class midterm exams. The dates for the midterm exams are

- Midterm Exam 1: Wednesday, October 11, 2023
- Midterm Exam 2: Friday, November 17, 2023

Final Exam:

The final exam will be a comprehensive exam. The date and time are according to the Baylor University Final Exam Schedule: Friday, December 8, 4:30 p.m.

Grade Distribution:

Reading Assignment	10%
Homework Assignments	15%
Quizzes	10%
Midterm Exam 1	20%
Midterm Exam 2	20%
Final Exam	25%

Letter Grade Distribution:

≥ 93.00	A	73.00 - 76.99	C
90.00 - 92.99	A-	70.00 - 72.99	C-
87.00 - 89.99	B+	67.00 - 69.99	D+
83.00 - 86.99	B	63.00 - 66.99	D
80.00 - 82.99	B-	60.00 - 62.99	D-
77.00 - 79.99	C+	≤ 59.99	F

Class Notifications

I will use the announcement function in Canvas to let you know about class assignment deadlines and possible class changes, provide homework instructions and tips, announce possible office hours changes, and more. You need to properly configure Canvas notifications in order to receive all appropriate notifications in a timely manner.

Course Policies:

- **Quizzes and Exams**

- Quizzes and exams are closed book, closed notes.
- The two lowest quiz scores will be dropped.
- If there is any take-home exam, no “collaboration” in the take-home exam.
- **No makeup quizzes or exams will be given.**

- **Homework Assignments**

- You are expected to work independently. **Offering** and **accepting** solutions from others is an act of **plagiarism**, which is a serious offense and **all involved parties will be penalized according to the Academic Honesty Policy**. Discussion amongst students is encouraged, but when in doubt, direct your questions to the professor and the teaching assistant.
- **No late assignments will be accepted.**

- **Attendance and Absences**

- This course relies on peer discussion, so it really helps to have the entire class present and ready to engage with the material. I also understand that some conflicts are unavoidable, which is why each of you are being given three (3) free absences. There is no judgment or direct impact on grades from these absences.
- You are responsible for all missed work, regardless of the reason for absence. It is also the absentee’s responsibility to get all missing notes or materials.
- In the event that you accrue six (6) absences (two full weeks of classes), your final grade will automatically be lowered a full 10 points. Two tardy marks will be considered the same as an absence and will count towards your allotted amount.

Academic Honesty Policy Summary:

Introduction

In addition to skills and knowledge, Baylor University aims to teach students appropriate Ethical and Professional Standards of Conduct. The Academic Honesty Policy exists to inform students and faculty of their obligations in upholding the highest standards of professional and ethical integrity. All student work is subject to the Academic Honesty Policy. Professional and Academic practice provides guidance about how to properly cite, reference, and attribute the intellectual property of others. Any attempt to deceive a faculty member or to help another student to do so will be considered a violation of this standard.

Unauthorized/Excessive Assistance

The student may not give or get any unauthorized or excessive assistance in the preparation of any work.

Authorship

The student must clearly establish authorship of a work. Referenced work must be clearly documented, cited, and attributed, regardless of media or distribution. Even in the case of work licensed as public domain, the student must provide attribution of that work in order to uphold the standards of intent and authorship.

Declaration

Online submission of, or placing one's name on an exam, assignment, or any course document is a statement of academic honor that the student has not received or given inappropriate assistance in completing it and that the student has complied with the Academic Honesty Policy in that work.

Consequences

An instructor may impose a sanction on the student that varies depending upon the instructor's evaluation of the nature and gravity of the offense. Possible sanctions include but are not limited to, the following: (1) Require the student to redo the assignment; (2) Require the student to complete another assignment; (3) Assign a grade of zero to the assignment; (4) Assign a final grade of "F" for the course. A student may appeal these decisions according to the Academic Grievance Procedure. Multiple violations of this policy will result in a referral to the Conduct Review Board for possible additional sanctions.

Title IX:

TITLE IX OFFICE — If you or someone you know would like help related to an experience of sexual violence including sexual assault, harassment, domestic violence, dating violence, stalking or other type of non-consensual sexual conduct, please contact Patty Crawford, the Title IX Coordinator at Baylor University, by email (Patty_Crawford@baylor.edu) or phone (254-710-8454).

Anonymous reporting for students or third parties is also available on the Title IX website, www.Baylor.edu/TitleIX.

The Title IX office understands the sensitive nature of these situations and can provide information about available on- and off-campus resources, such as counseling and psychological services, medical treatment, academic support, university housing and other forms of assistance. Staff members at the office will also explain your rights and the judicial process options, if you choose to file a complaint with the University. You will not be required to share your experience, and the Title IX Office will keep any information private. The Title IX Office exists to support and empower students, while allowing them to remain in control. If you or someone you know feels unsafe or may be in imminent danger, please call the Baylor Police Department (254-710-2222) or Waco Police Department (9-1-1) immediately.