

ECE 4213/5213

Digital Signal Processing

Fall 2026

TIME: TR 4:30 – 5:45 PM

PLACE: Felgar Hall, Room FH 0300

INSTRUCTOR:

Dr. J.P. Havlicek

DEH 333

Tel: (405) 325-8131

Office Hours: TR 3:15 – 4:15 PM and by appointment

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ASSISTANT:

Elnaz Aghdaei

DEH 346

Office Hours: W 3:00 – 4:00 PM and by appointment

E-mail: elnaz.aghdaei@ou.edu

TEXT & REFERENCES:

1. A.V. Oppenheim and R.W. Schaffer, *Discrete-Time Signal Processing*, 3rd ed., Prentice Hall/Pearson, Upper Saddle River, NJ, 2010.
2. S.K. Mitra, *Digital Signal Processing Laboratory Using Matlab*, McGraw-Hill, New York, 1999 (out of print but available on the course web site).
3. Matlab use is required for this course. The following toolboxes are also required: Symbolic Math, Signal Processing, DSP, Control Systems. OU has a campus-wide Matlab license – see handout on the course web site. Install from the Mathworks web site at <https://www.mathworks.com/academia/tah-portal/university-of-oklahoma-norman-557289.html>. Matlab is also available on the College of Engineering Virtual Lab (see handout on the course web site).

PREREQUISITES:

Graduate standing in ECE *or* ECE 3793, Signals and Systems

COURSE WEB SITE: <http://coecs.ou.edu/Joseph.P.Havlicek/ece5213/>

Lecture notes, handouts, homework assignments, homework solutions, test solutions, and certain other information will be posted to the course web site.

CANVAS: <http://canvas.ou.edu>

Canvas will be used primarily for submitting homework assignments. Canvas grading will **not** be used in this course. More information about grading is given later in this syllabus.

UNIVERSITY POLICY ON ACADEMIC HONESTY:

<http://integrity.ou.edu>

This page outlines the University's expectations of academic honesty, defines misconduct, provides examples of prohibited conduct, and explains the sanctions available for those found guilty of misconduct. Additional information about the meaning of *academic misconduct* in this course is provided later in this syllabus.

The UOSA Academic Integrity Pledge will be used in this course.

GENERATIVE AI POLICY:

Do not use generative AI to directly produce any document or solution that you turn in for this course. You may use generative AI to perform research in the process of developing solutions for assignments in this course. But *do not* use generative AI to directly produce any document, text, or solution file that you submit for this class. Turning in any document or solution file that was directly produced in part or in whole by generative AI will be considered academic misconduct in this course. Use of generative AI during the test and exam in this course is strictly forbidden and will be considered academic misconduct.

COURSE DESCRIPTION/LEARNING OUTCOMES:

This course will provide an introduction to the fundamental techniques of digital signal processing, including discrete-time linear systems, finite impulse response digital filters, infinite impulse response digital filters, fast Fourier transforms, response of LTI systems to statistical signals, digital filter design, and applications.

HOMEWORK:

Homework assignments and solutions will be posted to the course web site. Working the homework problems on time will help YOU to do well on the tests and exam.

Homework assignments will be submitted electronically on Canvas and will generally be due at midnight on the published due date.

For paper and pencil homework assignments, you will scan or photograph your paper and upload it to Canvas.

For Matlab homework assignments, you will be provided with an MS WORD shell file to use in developing your solution. Once you complete the assignment, you can print the file to PDF and upload the PDF version to Canvas (preferred). If you have difficulty printing to PDF, you can alternatively upload your completed WORD file to Canvas.

You are encouraged to work together on homework, but **DO NOT COPY!** Each problem solution that you turn in must be your own;

- **If** you copy another person's solution and turn it in as your own, **then** *you are guilty of academic misconduct*.
- **If** you copy an old homework solution without working the problem yourself and turn it in, **then** *you are guilty of academic misconduct*.

These standards of academic honesty apply to Matlab assignments as well. In addition:

- **If** you obtain code or results from another person in an electronic format and incorporate it into the solution that you turn in, **then** *you are guilty of academic misconduct*.
- **If** you obtain code or results from another person in electronic or hardcopy formats and then type it into the solution that you turn in, **then** *you are guilty of academic misconduct*.

LATE HOMEWORK POLICY:

Late homework will not be accepted. There are two reasons for this policy. First, accepting a late homework assignment from one person is unfair to others who may have stayed up all night to get the assignment done and may also have sacrificed grades in other classes to get it done. Second, it would be detrimental to the overall learning outcomes of the class to delay the posting of homework solutions in order to accommodate late assignments. Homework assignments not turned in due to an officially excused absence, including medically excused absences, will be dropped.

TESTS & EXAM:

There will be two tests and a cumulative final exam. Each test will be announced in class at least one week in advance.

The tests and exam are OPEN BOOK and OPEN NOTES. Calculators are allowed. You should also bring a clean copy of the formula sheet that is published on the course web site. Other materials are NOT ALLOWED. On each test and on the final exam, students enrolled for undergraduate credit (ECE 4213) will be permitted to omit one problem.

The tests and exam are *individual* exercises. **If** you collaborate with another person on a test or exam, **then** *you are guilty of academic misconduct*.

Makeup tests will not be given. If you miss a test and your absence is NOT officially excused, then you will receive a zero grade for that test. If you miss a test and your absence IS officially excused, then your final exam grade will be used in place of the missed test grade.

GRADING:

Your final average will be calculated as shown in the table below.

What	Value
Homework	20%
Test One	25%
Test Two	25%
Final Exam	30%

These numerical grades will be converted into letter grades using a curve determined by the instructor. For each section (ECE 4213 and ECE 5213), the same curve will be applied to everyone in the class. The curve will never hurt your grade relative to the standard ten-point grading scale.

TOPICS:

1. Introduction
2. Time domain representation and analysis
3. Fourier transform, distribution theory, distributional Fourier transforms
4. z -transform
5. Digital processing of analog signals
6. Discrete Fourier transform (DFT)
7. LTI systems in the frequency domain
8. Analog filter design
9. IIR digital filter design
10. FIR digital filter design
11. Digital filter structures
12. LTI filters with statistical inputs
13. Introduction to multirate signal processing
14. Finite wordlength effects

ADDITIONAL REQUIRED UNIVERSITY LEGAL & POLICY STATEMENTS

MENTAL HEALTH SUPPORT SERVICES:

Support is available for any student experiencing mental health issues that are impacting their academic success. Students can either be seen at the University Counseling Center (UCC) located on the second floor of Goddard Health Center or receive 24/7/365 crisis support from a licensed mental health provider through TimelyCare. To schedule an appointment or receive more information about mental health resources at OU please call the UCC at 405-325-2911 or visit University Counseling Center. The UCC is located at 620 Elm Ave., Room 201, Norman, OK 73019.

TITLE IX RESOURCES AND REPORTING REQUIREMENT:

The University of Oklahoma faculty are committed to creating a safe learning environment for all members of our community, free from sex-based discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking, in accordance with Title IX. There are resources available to those impacted, including: speaking with someone confidentially about your options, medical attention, counseling, reporting, academic support, and safety plans. If you have (or someone you know has) experienced any form of sex-based discrimination or violence and wish to speak with someone confidentially, please contact OU Advocates (available 24/7 at 405-615-0013) or University Counseling Center (M-F 8 a.m. to 5 p.m. at 405-325-2911).

Because the University of Oklahoma is committed to the safety of you and other students, and because of our Title IX obligations, I, as well as other faculty, Graduate Assistants, and Teaching Assistants, are mandatory reporters. This means that we are obligated to report sex-based violence that has been disclosed to us to the Institutional Equity Office. This includes disclosures that occur in: class discussion, writing assignments, discussion boards, emails and during Student/Office Hours. You may also choose to report directly to the Institutional Equity Office. After a report is filed, the Title IX Coordinator will reach out to provide resources, support, and information and the reported information will remain private. For more information regarding the University's Title IX Grievance procedures, reporting, or support measures, please visit Institutional Equity Office at 405-325-3546.

ADJUSTMENTS FOR PREGNANCY/CHILDBIRTH RELATED ISSUES:

Should you need modifications or adjustments to your course requirements because of pregnancy or a pregnancy-related condition, please request modifications via the Institutional Equity Office website or call the Institutional Equity Office at 405/325-3546 as soon as possible. Also, see the Institutional Equity Office FAQ on Pregnant and Parenting Students' Rights for answers to commonly asked questions.

REASONABLE ACCOMMODATION POLICY:

The University of Oklahoma (OU) is committed to the goal of achieving equal educational opportunity and full educational participation for students with disabilities. If you have already established reasonable accommodations with the Accessibility and Disability Resource Center (ADRC), please log into AIM to request your semester accommodations as

soon as possible and contact me privately, so that we have adequate time to arrange your approved academic accommodations.

If you have not yet established services through ADRC, but have a documented disability and require accommodations, please complete ADRC's pre-registration form to begin the registration process. ADRC facilitates the interactive process that establishes reasonable accommodations for students at OU. For more information on ADRC registration procedures, please review their website. You may also contact them at (405)325-3852 or adrc@ou.edu, or visit www.ou.edu/adrc for more information.

Note: disabilities may include, but are not limited to, mental health, chronic health, physical, vision, hearing, learning and attention disabilities, pregnancy-related. ADRC can also support students experiencing temporary medical conditions.

RELIGIOUS OBSERVANCE:

It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty. [See Faculty Handbook 3.15.2]

FINAL EXAM PREPARATION PERIOD:

Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's Final Exam Preparation Period policy. Graduate courses are exempt from this policy.

EMERGENCY PROTOCOL:

During an emergency, there are official university procedures that will maximize your safety.

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather.

1. Look for severe weather refuge location maps located inside most OU buildings near the entrances.
2. Seek refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building.
3. Go to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows.
4. Get in, Get Down, Cover Up
5. Wait for official notice to resume normal activities.

Additional Weather Safety Information is available through the Department of Campus Safety.

ADDITIONAL REQUIRED UNIVERSITY LEGAL & POLICY STATEMENTS...

THE UNIVERSITY OF OKLAHOMA ACTIVE THREAT GUIDANCE:

The University of Oklahoma embraces a Run, Hide, Fight strategy for active threats on campus. This strategy is well known, widely accepted, and proven to save lives. To receive emergency campus alerts, be sure to update your contact information and preferences in the account settings section at one.ou.edu.

RUN: Running away from the threat is usually the best option. If it is safe to run, run as far away from the threat as possible. Call 911 when you are in a safe location and let them know from which OU campus you're calling from and location of active threat.

HIDE: If running is not practical, the next best option is to hide. Lock and barricade all doors; turn off all lights; turn down your phone's volume; search for improvised weapons; hide behind solid objects and walls; and hide yourself completely and stay quiet. Remain in place until law enforcement arrives. Be patient and remain hidden.

FIGHT: If you are unable to run or hide, the last best option is to fight. Have one or more improvised weapons with you and be prepared to attack. Attack them when they are least expecting it and hit them where it hurts most: the face (specifically eyes, nose, and ears), the throat, the diaphragm (solar plexus), and the groin.

Please save OUPD's contact information in your phone.

NORMAN campus: For non-emergencies call (405) 325-1717. For emergencies call (405) 325-1911 or dial 911.

TULSA campus: For non-emergencies call (918) 660-3900. For emergencies call (918) 660-3333 or dial 911.

FIRE ALARM/GENERAL EMERGENCY:

If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates:

1. *LEAVE* the building. Do not use the elevators.
2. *KNOW* at least two building exits
3. *ASSIST* those that may need help
4. *PROCEED* to the emergency assembly area
5. *ONCE* safely outside, *NOTIFY* first responders of anyone that may still be inside building due to mobility issues.
6. *WAIT* for official notice before attempting to re-enter the building.