ECE 2713
Digital Signals and Filtering
Spring 2019

TIME: TR 12:00 – 1:15 PM

PLACE: Adams Hall, Room 255

INSTRUCTOR:
> Dr. J. P. Havlicek
> DEH 333
> Office Hours: TR 3:30 – 4:30 PM and by appointment
>   Note: office hours will be 2:30 – 3:30 PM on the following Thursdays:
>   1/17, 2/21, 3/14, 4/18
> E-mail: joebob@ou.edu

ASSISTANTS:
> Hong Jiang
> DEH 425
> Office Hours: T 11:00 AM – 12:00 PM and by appointment
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>
> Gökhan Arıtürk
> DEH 446
> Office Hours: R 10:45 – 11:45 AM and by appointment
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MATLAB ASSISTANT:
> Zachary Potts
> DEH 346
> Office Hours: T 1:30 – 3:30 and by appointment
> E-mail: zpotts@ou.edu

TEXT & REFERENCES:

1. J. H. McClellan, R. W. Schafer, and M. A. Yoder, *Signal Processing First,* Pearson Prentice Hall, Upper Saddle River, NJ, 2003.

2. MATLAB use is required for this course. The following toolboxes are also required: Symbolic Math, Signal Processing, DSP, Control Systems. You can download a license key and instructions for installing MATLAB from the OU IT Store at `https://itstore.ou.edu/` Alternatively, you can purchase the MATLAB and Simulink Student Suite for $99: `http://www.mathworks.com/academia/student_version/` MATLAB is also available on the College of Engineering Virtual Lab (see handout on the course web site).

3. I *strongly* recommend *Schaum's Outlines Mathematical Handbook of Formulas and Tables.* It is inexpensive and will serve you well for a lifetime.

COURSE WEB PAGE: `http://coecs.ou.edu/Joseph.P.Havlicek/ece2713/`

CANVAS: `http://canvas.ou.edu`

You will submit your Design Project and some of your homework assignments electronically on Canvas. Some announcements will also be posted to the course Canvas page. Important information may also be distributed by Canvas notifications. *Make sure to configure your Canvas notifications!*

PREREQUISITES:

ENGR 1411 or ENGR 3511 or concurrent enrollment; CS 1313 or CS 1323 or concurrent enrollment; MATH 2423 or MATH 2924.

REASONABLE ACCOMMODATION POLICY:

The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the instructor as early in the semester as possible. Students with disabilities must be registered with the Disability Resource Center prior to receiving accommodations in this course. The Disability Resource Center is located in the University Community Center at 730 College Avenue, (405) 325-3852 (Tel) or (405) 325-3494 (VP). The Disability Resource Center web site is located at `http://www.ou.edu/drc`.

RELIGIOUS HOLIDAYS:

It is the policy of the University to excuse absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required classwork that may fall on religious holidays. It is the responsibility of the **student** to make alternate arrangements with the instructor *at least one week prior to the actual date of the religious holiday.*

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 Statement of Academic Integrity will be used in this course.

COURSE DESCRIPTION:

This course will provide an introduction to digital signals and filtering. Students will learn fundamental techniques for modeling signals and systems using mathematics, for performing engineering analysis of signals and systems, and for designing simple FIR and IIR filters to process digital signals using MATLAB. Basic frequency domain concepts including discrete Fourier and z-transforms will also be covered.

HOW TO SUCCEED IN THIS CLASS:

It is CRITICAL that you pace yourself and KEEP UP. Don't put off assignments until the night before they are due. Instead, start each assignment early enough that you

can ask questions during class or office hours if you run into trouble or have questions. This will save you LOTS of time. If you start an assignment the night before it is due and you run into trouble, then you will have to stay up all night trying to figure out the answers to your questions. If you start early, then you can stop when you have problems and ask questions during class or office hours. This approach will minimize the total number of hours you spend on each assignment.

Try to LEARN DURING CLASS by participating in the lectures, both intellectually and vocally. Try to use your time outside of class to DRILL by working exercises. The homework assignments will be based primarily on the LECTURES. The tests and exam will be based primarily on the HOMEWORK.

If you keep up, then you should be able to understand the lectures and LEARN DURING CLASS. If you don't understand something in a lecture, then you should raise your hand and ASK QUESTIONS such as "I don't understand what you just said. It confuses me because..." DO NOT BE ASHAMED OR EMBARRASSED to ask questions!

HOMEWORK:

Homework will be assigned during class. 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.*
- **If** you copy an answer from the book or CD-ROM and turn it in without your own complete solution, **then** *you are guilty of academic misconduct.*

Some homework problems will require the use of MATLAB. The standards of academic honesty just articulated above apply to MATLAB problems as well. In addition:

- All computer codes and results that you turn in as solutions must be your own original work.
- **If** you obtain code 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 from another person in electronic or hardcopy format, type some or all of it in yourself, and then include this as part of the solution that you turn in, **then** *you are guilty of academic misconduct.*

Here are some **important** things about homework:

▶ "Paper and pencil" homework assignments will generally be due at the *beginning* of class on the published due date.

▶ Computer-based homework (MATLAB) will generally be due on Canvas at midnight on the published due date.

▶ *Late homework will not be accepted* (see policy below).

▶ Your lowest **two** homework grades will be dropped.

▶ Homework solutions will be posted on the course web site.

Working the homework problems on time will help YOU to do well on the tests and exam.

LATE HOMEWORK POLICY:

Late homework will not be accepted. There are two reasons for this policy. First, accepting a late homework assignment from one student is unfair to other students 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.

If you cannot attend class on the day that a "paper and pencil" homework assignment is due, then you can either:

- ask a friend to turn in your paper for you (preferred), or
- email a PDF or JPG copy of your assignment to the TA(s) and 'cc the instructor. **Please note that this emailed copy of your assignment will not be graded!** It is simply to document the fact that your assignment was done on time. It is then **your** responsibility to deliver a paper copy of your assignment to the TA(s) within 24 hours.

DESIGN PROJECT:

Near the end of the semester there will be a special Design Project. For the Design Project, you will use MATLAB to analyze real-world digital signals. Based on your analysis, you will then use MATLAB to design digital filters for processing the signals. The same standards of academic honesty articulated above for homework apply to the Design Project as well.

TESTS & EXAM:

There will be two tests and a cumulative final exam. Calculators will NOT be allowed on the tests and final exam. The date and time for each test will be announced in class at least one week in advance.

The tests and the exam are CLOSED BOOK and CLOSED NOTES. Formula sheets will be provided with each test and exam. These same formula sheets will be made available on the course site so that you can practice working problems using them.

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 (lowest two dropped)	15%
Test One	20%
Test Two	20%
Design Project	20%
Final Exam	25%

These numerical grades will be converted into letter grades using a curve that will be determined by the instructor. 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. Math review (Appendix A, Ch. 1)

2. Mathematical representation of signals (Ch. 1, Ch. 2)

3. Intro to MATLAB (Appendix B)

4. Spectrum representation and LTI filters (Ch. 3)

5. Sampling and aliasing (Ch. 4)

6. FIR filters (Ch. 5, Ch. 6)

7. z-transform (Ch. 7)

8. IIR filters (Ch. 8)

GOOD LUCK!

REMEMBER TO PACE YOURSELF & KEEP UP!

REMEMBER TO LEARN DURING CLASS!

ASK QUESTIONS WHEN YOU DON'T UNDERSTAND!

USE OUTSIDE-CLASS TIME TO DRILL!