<u>**ABET COURSE SYLLABUS**</u>

ENGR 4333/5333 Digital Signal Processing

Course Catalog Description: This course provides an introduction of the theory and application of fundamental digital signal processing techniques. The topics include: discrete signals and systems, z-transform, discrete Fourier transform and related discrete-time orthogonal transform and related fast algorithms; and IIR and FIR filter design techniques and realizations.

Course Prerequisites: ENGR 3323.
Course Co-requisites: ENGR 4351
Prerequisites by Topic: 1. Complex numbers and trigonometry
2. Differential and integral calculus
3. Fourier series and Fourier transform
4. Laplace transform
5. Differential equation

Textbook: "Essentials of Digital Signal Processing", by Lathi and Green, Cambridge, ISBN: 978-1-107-05932-0

Course Website: http://www.engineering.uco.edu/~mbingabr

Resources: YouTube channel "Engineering with Bingabr"
https://www.youtube.com/channel/UCjlqMn0KwY_gF2AxXrZC6Gw

Instructor: Mohamed Bingabr, Professor
Office Location: Howell Hall 221L
Phone: (405) 974-5718
Email: mbingabr@uco.edu
Course Meeting Time: MW 6:00 pm – 7:15 pm
Course Meeting Location: HOH 101
Office Hours through MS-Teams: MW 10:00 to 11:00 am, Th 1:00 to 2:00 pm, and by appointments.

Overall Education Objective: To introduce concepts, methods, and applications of digital signal processing.

Course Learning Objective: At the end of this course, students should be able to:
1. Apply simple sequences (unit sample, step, sinusoid) to low-order system and calculate the system responses.
2. Understand the basic concepts of discrete time system; be able to apply tests to demonstrate linearity, time-invariance, causality, and stability.
3. Understand sampling and quantization, and the practical issues involved in sampling, aliasing, and analog reconstruction of signals.
4. Understand the discrete Fourier transform and the fast Fourier transform, be able to do hand calculations of DFT and to apply them in spectral analysis.
5. Demonstrate the understanding of the use of windows for reducing frequency leakage.
6. Perform the z-transform of simple sequences and apply z-transform to difference equations.
7. Ability to use various digital filter design methods to design finite impulse filters meeting prescribed specifications.
8. Design digital infinite impulse filters by using various IIR design methods to meet prescribed specifications.
9. Ability to use MATLAB to design and implement digital signal processing algorithms and digital filters including FIR and IIR.

Topics Covered:
1. Signal sampling and quantization.
2. Digital signal and systems: common digital sequences, LTS, digital convolutions
3. Discrete Fourier Transform, window function, spectral analysis.
4. Z-transform
5. Digital filter realization: Direct Form I, Direct Form II, Cascade, and Parallel
6. Finite Impulse Response Filter Design: Fourier Transform method, Window method, Frequency Sampling Design,

Optimal Design.
7. Infinite Impulse Response Filter Design: Bilinear Transformation Design, Impulse Invariant Design, Pole-Zero Placement Design.

Distribution of Points:

Attendance	10%	Quizzes	30%	Homework	10%,
Two Tests	30%,	Final	20%		

Grading Scale: A: 90-100; B: 80-89; C: 70-79; D: 60-69; F: 0-59

Class Polices

Attendance is expected. You will be responsible for any announcements or notes from class. It is expected that each student will spend a total of 8 hours per week on the course (not including lecture times). I don't expect you to memorize formulas but I expect you to understand them. So, you are allowed to bring the formula sheets posted on the course website and one page of your own notes to the quizzes and exams. Should you miss a quiz or test due to illness or an emergency, you will be required to give advance notice or provide a doctor's excuse in order to be allowed to make-up on the tests and quizzes you missed. Make-up tests and quizzes are usually harder than the regular tests and quizzes given during the class. Cheating or academic dishonesty of any kind will not be tolerated.

Homework

The reality is this: you will not truly understand the technical concepts by just paying attention to lectures and reading the materials and examples in the book. To truly understand engineering concepts, you must solve the homework problems yourself even if you are struggling solving them. For this reason, regular homework assignments will be made. The quizzes will be similar to the homework problems. Homework will be due at the beginning of the class period on the due-date. Late homework will be penalized accordingly (25% reduction each day). Homework should be neatly written on only one side.

ADA STATEMENT:

"The University of Central Oklahoma complies with Section 504 of the Rehabilitation Act of 1973 and the American with Disabilities Act of 1990. Students with disabilities who need special accommodations should make their requests by contacting the coordinator of Disability Support Services, Kimberly Fields at 974-2549/2516, DSS@uco.edu . The office is located in the Nigh University Center, Room 415. Students should also notify the instructor of special accommodation needs by the end of the first week of class."

STUDENT INFORMATION SHEET

https://www.uco.edu/academic-affairs/files/student-info-sheet.pdf

UCO COVID-19 Policies

Mask wearing: It is not mandatory.

COVID-19 Direct exposure

If you have had direct exposure to someone with COVID-19, file a report with the COVID-19 Response Team at https://uco.co1.qualtrics.com/jfe/form/SV_39Omw83BStDpw1L.

COVID-19 Positive test or Symptoms Protocol

If you have a positive COVID-19 test or are feeling under the weather and experiencing any of the symptoms related to COVID-19:

- Notify the COVID-19 Response Team at 405-974-2345, covid19response@uco.edu or by submitting the UCO COVID-19 Self-Reporting form.
- Notify your professors.

- If you are living on campus, notify your residence hall staff.
- If you're a student worker on campus, notify your supervisor.
- Do not return to campus until:
    - After 5 days since your test or onset of symptoms AND
    - You have had 24 hours with no fever without the use of fever-reducing medications AND
    - Other symptoms of COVID-19 are improving
- Wear a mask around others for 5 additional days

Students who follow university procedures will not be penalized for class absences assuming they make up missed assignments in a timely fashion, in conformity with the requirements and expectations outlined in the class syllabus. Instructors will provide reasonable opportunities, consistent with the structure and objectives of the class, for students who are following these guidelines to participate in and to keep up with the work of class.

As the conditions on campus and in the community evolve, events may occur that necessitate a change in the procedures, course schedule or modes of delivery. The information provided on www.uco.edu/coronavirus will be updated throughout the academic year. Procedure changes on this webpage and communicated via official correspondence from the university will supersede any prior guidance.

Prepared by:	Mohamed Bingabr, Professor of Engineering and Physics
Date:	January 16, 2023