**ENGR 3323 Signals and Systems**

**Course Catalog Description:** This course focuses on techniques to represent signals mathematically, and design systems that process these signals. Topics covered in this course are analysis techniques in continuous-time linear systems, and signal representation including Fourier, Laplace transforms.

**Course Prerequisites:** ENGR 2303, 2311 and MATH 3103.

**Course Co-requisites:** ENGR 3331

**Prerequisites by Topic:** Complex Number, Circuit analysis, Differential Equation

**Textbook:** “Linear Systems and Signals”, 3rd edition by Lathi and Green. ISBN: 978-0190200176

**Course Website:** [**http://www.engineering.uco.edu/~mbingabr**](http://www.engineering.uco.edu/~mbingabr)

**Video Lectures:** [**https://www.youtube.com/channel/UCjlqMn0KwY\_gF2AxXrZC6Gw**](https://www.youtube.com/channel/UCjlqMn0KwY_gF2AxXrZC6Gw)

**Instructor:** Mohamed Bingabr, Professor of Engineering

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**Course Meeting Time:** MWF 9:00 am – 9:50 am,

**Course Meeting Location:** HOH 205

**Office Hours:** MWF 10:00 am to 11:00 am, R 1:00 pm to 2:00 pm, and by appointment.

**Overall Education Objective:** To apply mathematical techniques to signal and system analysis and system design and implementation.

**Course Learning Objective:** At the end of this course, students should be able to:

1. Classify signals and systems.
2. Mathematically model the system input-output characteristic.
3. Analyze continuous system behavior and its outputs in the time domain.
4. Use Laplace transform for system analysis, realization, and design.
5. Use Fourier series technique for frequency analysis of periodic signals, and system response to these signals.
6. Use Fourier transform technique for frequency analyze of non-periodic signals and system response to these signals.
7. Apply sampling theorem to convert a continuous signal to discrete signal.

**Topics Covered**:

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| **Subject** | **Reading** |
| Signals and systems  -Size of signal, Classification of signals, Signal Models, Classification of systems, and System models | Ch1 |
| Time-domain analysis of continuous-time systems  -System response to internal condition, Unit impulse response, System response to external input, and System stability  **Test 1** | Ch2 |
| Continuous-time system analysis using the Laplace transform  -Laplace transform and its properties, Analysis of electrical networks, Block diagrams, System realization, Frequency response of an LTIC, and Filter design by placement of poles and zeros  **Test 2** | Ch4 |
| Continuous-time signal analysis using the Fourier series  -Periodic signal representation by Fourier series, Existence and convergence of the Fourier series, Exponential Fourier Series, and LTIC system response to periodic inputs | Ch6  6.1-6.5 |
| Continuous-time signal analysis using the Fourier transform  -Periodic signal representation by Fourier Integral, Some Properties of the Fourier Transform, Signal energy, and Application to Communications | Ch7 |
| Sampling: The bridge from continuous to discrete  -The Sampling Theorem, Signal Reconstruction, and Analog-to-Digital (A/D) Conversion  **FINAL** | Ch8  8.1-8.3 |

**Distribution of Points:**

Attendance 10 % Homework 10 %

Quizzes 30 % 2 Tests 30 %

Final Exam 20 %

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

**COURSE EXPECTATION & CONDUCT:**

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 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 textbook. 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 will be submitted in D2L.

**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](mailto: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 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](mailto:covid19response@uco.edu) or by submitting the [UCO COVID-19 Self-Reporting form.](https://uco.co1.qualtrics.com/jfe/form/SV_39Omw83BStDpw1L)
* 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](http://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.

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| **Prepared by:** | Mohamed G. Bingabr, Professor of Engineering |
| **Date:** | January 16th , 2023 |