Course Title: COEN 3322: Signals and Systems
Also listed as EEEN 3341: Signals and Systems

Semester Credit Hours: 3 (3,0)

I. Course Overview

This course presents instruction in electrical signals and systems. Subject matter includes types of signals and systems, signal and system modeling, Fourier Series, Fourier Transform and applications, Laplace Transform and applications, state variable techniques, discrete time signals and systems.

II. PMU Competencies and Learning Outcomes

Understanding and use of electrical signals and systems as taught in this course are major components of professional competence for engineers globally. Throughout the semester, students are helped to apply critical thinking and problem solving skills in discussions, assignments, and projects. Professional leadership and teamwork are stressed and modeled throughout discussions and projects. Active communication skills are encouraged through discussions and through written assignments. Students are led to develop awareness of the professional role of engineers. Effective use of technology is integral in the analysis and design of signals and systems in the course.

III. Detailed Course Description

This course teaches the analysis and design of electrical circuits, devices, and systems. Students are introduced to types of signals, types of systems, the properties of systems, and convolution. Fourier series, transforms, and applications are covered. Laplace transforms and applications are covered. State variable techniques and z-transforms are taught. Problems are presented to help students identify real-life problems and formulate solutions using the skills developed in the course.

IV. Requirements Fulfilled

This is a required course for all computer engineering majors.

V. Required Prerequisites

Successful completion of:

- COEN 3312: Circuits II

VI. Learning Outcomes

In this course, students learn:

- To model linear systems and composite signals.
- To model systems using time domain techniques.
- To apply the Fourier Series to signals.
- To apply the Fourier Transform to signals.
- To use the Laplace Transform to model systems.
- Applications of the Laplace Transform.
- To apply State Variable techniques to linear systems.
- Discrete time signals and systems.

VII. Assessment Strategy

The assessment strategy measures the student's understanding of types of signals and systems, time domain modeling, Fourier Series, Fourier Transform and applications, the Laplace Transform and applications, the ability to apply State Variable techniques to linear systems, and understanding of discrete time signals and systems.

- Class participation is used to indicate each student's level of involvement and understanding of the learning process
- Homework assignments are graded to give feedback to students and to indicate individual's progress in achievement of understanding
- A mid-term examination is used to indicate students' level of mastery
- A student project is assigned, due before the final exam, to encourage student initiative and to measure each student's mastery of skills and ability in the application of principles.
- An end-of-semester final examination is used to indicate the student's maturity in understanding and application of the information and abilities addressed.

Assessment in this course is designed to assist students to further their understanding of the university's learning objectives. Students' preparation for the capstone experience is enhanced through progressive skill building in active oral and written communication, decision making, problem solving, professional demeanor and commitment. In cooperation with the instructor, each student selects one assignment or project to become a part of the student's portfolio.

VIII. Course Format

The class consists of lectures, class discussions, written assignments to be completed outside of class, examinations, and a student project. Students are expected to attend class and to participate in discussions and problem solving assignments. Students prepare for class by reading the text and additional resources and by completion of assignments so that they may be discussed in class are expected as indicators of students' commitment to professional growth.

Classroom Hours:	**Class: 3 hours per week** **Project development: Time each week as needed outside of class**

IX. Topics to be Covered

A. Signal and system modeling
B. Time domain modeling of systems
C. Fourier Series
D. Fourier Transform and applications
E. Laplace Transform and applications
F. State variable techniques
G. Z-Transforms
H. Problem solving using the above
I. Consideration of professional ethics, codes, and standards

X. Laboratory Exercises

This course does not require a separate lab.

XI. Technology Component

Students are expected to have a computer account with the appropriate server to enable class communications. Media assisted instruction is a tool in this class. Appropriate technology for analysis of data and completion of designs is required, for example, use of an engineering calculator, and use of the university computer labs. Completing assignments and examinations requires use of a personal computer and/or university computer labs. Use of the Internet may be indicated to support global understanding of applicability of skills.

XII. Special Projects/Activities

This course incorporates a student project in which students are required to apply the ability to analyze electrical circuits, devices, and systems. The project requires problem solving and the experimental design of circuits, devices, and systems to achieve an applicable solution.

XIII. Textbooks and Teaching Aids

A. Required Textbook

Ziemer, Tranter, and Fannin, *Signals and Systems: Continuous and Discrete*, 4thed., Prentice Hall, 1998.

B. Alternative Textbooks

None

C. Supplemental Materials

1. *CRC Standard Mathematical Tables and Formulae*, CRC Press
2. *Schaum's Outline Mathematical Handbook*, McGraw-Hill
3. Engineer's computation pad