2309 EIE220/SP101 Course Outline

Subject Code	:	EIE220/SP101
Subject Title	:	SIGNALS AND SYSTEMS
Course Type	:	Compulsory
Level	:	3
Credits	:	3
Teaching Activity	:	Lecture 45 hours
Prior Knowledge*	:	Calculus（MATH102）
		Circuit Analysis（EIE240）

Class Schedule :

Class	Week	Time	Classroom	Date
D1	MON	9:00-11:50	C308	4/9/2023- 17/12/2023

Instructor	:	Xiaolin Tian
Contact Number	:	(853)88972046
E-mail Address	:	xltian@must.edu.mo
Office	:	A217
Office Hour	:	Monday (13:30-15:30)
		Tuesday (9:00-11:30)
		Wednesday (14:30-17:30)
		Thursday (9:00-11:30)

COURSE DESCRIPTION

This subject aims to use mathematical techniques to help analyse and synthesize Continuous-Time systems, which process Continuous-Time signals. The course covers basic Continuous-Time signal and system concepts; analysis of Continuous-Time signals and systems in time domain, frequency domain and complex frequency domain. Definitions and properties of Fourier transform and inverse Fourier transform, Laplace transform with their ROC(region of convergence) and inverse Laplace transform; their applications in analysis of Continuous-Time signals and systems. The object of the course is to help students understanding time domain methods and transform domain methods on linear time invariant systems and to help students setting up their related knowledge basis for the further courses.

TEXT BOOK

Required Text Book:

No recommended textbook, but the learning materials will be provided to students during the classes.

Reference Book:

1. Signals and Systems, Second Edition, Oppenheim, A. V. and Willsky, A. S., QingHua Press，Prentice-Hall. ISBN: 7-302-03058-8
2. Signals and Systems, Second Edition,2002 or later，Zheng Jun Li, Ying Qi Heng, Yang Wei Li, Higher Education Press，ISBN: 7-04-007983-6

INTENDED LEARNING OUTCOMES

Upon successful completion of this subject, students will be able to:

1. **Demonstrate** an understanding of the fundamental properties of Signals and Systems, by **explaining** the properties to others.
2. **Use** time domain and transform domain techniques to **analyze** and **predict** the behavior of signals and LTI systems.
3. **Gain an appreciation** for the importance of signals and LTI systems analysis.

WEEKLY SCHEDULE

Week	Topic	Hours	Teaching Method
1	Introduction. Continuous-Time(CT) Signals and their properties: Examples and Math Representation, Signal Periodic, Energy and Power.	3	lecture
2	Transformations of the Independent Variable of CT Signals: Shifting, Reversal & Scaling; Addition, Multiplication and Scaling of Signal Amplitude; Decomposing signals to Odd & Even parts.	3	lecture
3	Common Signals: Exponential and Sinusoidal Signals, Unit Impulse and Unit Step Signals. The Representation of CT signals in term of Impulses.	3	lecture
4	CT Systems: Simple and Interconnections. Basic Properties of CT Systems: Memory, Invertibility, Causality, Stability, Time Invariance, Linearity.	3	lecture
5	Unit impulse response of LTI CT systems, Convolution Integral of LTI CT systems	3	lecture
6	Properties of Linear Time-Invariant CT Systems: Commutative, Distributive, and Associative.	3	lecture
7	Block Diagram Representation of first order Systems Described by Differential Equations.	3	Lecture
8	Midterm Review & Mid-Term Exam	3	Close book
9	Complex Exponentials as Eigen-functions of LTI Systems, Fourier Series Representation of CT Periodic Signals, Convergence of the Fourier Series.	3	lecture
10	Properties of Continuous-Time Fourier Series, Fourier Series and LTI Systems. Filtering	3	lecture
11	Representation of Aperiodic Signals: The CT Fourier Transform. The Fourier Transform for Periodic Signals, Properties of the CT Fourier Transform and their applications	3	lecture
12	The Laplace Transform. The Region of Convergence(ROC) for Laplace Transforms. Properties of ROC, Relationship between Fourier Transform & Laplace Transform.	3	lecture
13	Laplace Transform Pairs with their ROCs for Common Signals, Properties of the Laplace	3	lecture

	Transform		
14	The Inverse Laplace Transform by Partial-Fraction Expansion.	3	lecture
15	Analysis and Characterization of LTI Systems by the Laplace Transform. Review.	3	lecture

ASSESSMENT APPROACH

Assessment method	% weight
1. Homework	10%
2. Midterm exam	40%
3. Final exam	50%
Total	100 %

GUIDELINE FOR LETTER GRADE

Marks	Grade
96-100	A+
93-95	A
88-92	A-
83-87	B+
78-82	B
72-77	B-
68-71	C+
63-67	C
58-62	C-
53-57	D+
50-52	D
49 or less	F

NOTES

Students will be assessed on several assessment items (i.e. homework, midterm exam, and final exam.).

The homework evaluates the student's participation of the classes.

The midterm exam and the final exam evaluate the student's understanding of the concepts of related contents in Signals & Systems.

ADDITIONAL READINGS

Website:

1. http://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/
2. http://tll.mit.edu/help/signals-and-systems-ilos-unified-engineering-1601-1604
3. http://tll.mit.edu/help/intended-learning-outcomes#outcomes