Course Specification
(Bachelor)

Course Title:	Signals & Systems
Course Code:	CNET 331
Program:	BS in Computer and Network Engineering
Department:	Electrical and Electronics Engineering
College:	College of Engineering & Computer Science
Institution:	Jazan University
Version:	4
Last Revision Date:	23 September 2024

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A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐ University	☐ College	☒ Department	☐ Track	☐ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: (5th Level / 3rd Year)					
4. Course General Description:					
This course covers the fundamentals of Signals and System analysis, focusing on the classification of signals, types of signals like sinusoidal, unit impulse, unit step and exponential signals. Moreover, basic mathematical operations are performed on signals, transformation of the independent variable and representation of a Discrete-Time signal in term of impulse is also covered. It deals with Discrete-Time & Continuous-Time LTI systems, interconnection of systems, convolution sum, convolution integral and properties of LTI Systems. This course also includes Fourier Series and Fourier Transform of continuous-time periodic and aperiodic signals respectively, and properties of Fourier series and Fourier Transform, Laplace transform and Z transform. In many diverse fields this course can be used like: Analog and Digital Communication, Image procession, Digital Signal Processing, Acoustics, etc.					
5. Pre-requirements for this course (if any)**:**					
MATH 234					
6. Co-requisites for this course (if any)**:**					
N/A					
7. Course Main Objective(s):					
1. Compare and classify different types of signals and their representation. **2.** Discuss different types of transformations and operations on signals. **3.** Explain system properties - linearity, time invariance, presence or absence of memory, causality, bounded-input bounded-output stability and invertibility. **4.** Understand convolution of signals and its implication for analysis of linear time invariant systems. 5. Learn Fourier series and Fourier transform for periodic and aperiodic signals respectively.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	-	-
3	Hybrid ● Traditional classroom ● E-learning	-	-
4	Distance learning	-	-

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	26
2.	**Laboratory/Studio**	26
3.	**Field**	-
4.	**Tutorial**	-
5.	**Others (specify)**	8
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Explain** different types of signals and systems in continuous-time and discrete time domain and their properties.	K1	➢ Lectures ➢ Classroom discussions Lab exercises	➢ Mid-Term Exam ➢ Assignments-1 ➢ Final Exam
1.2	**Describe** the systems and signals using various tools.	K2	➢ Lectures ➢ Classroom discussions Lab exercises	➢ Assignments-2 ➢ Lab Exam Final Exam
2.0	**Skills**			

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.1	**Evaluate** the system on the basis input/output relation.	S1	➢ Lectures ➢ Classroom discussion ➢ Lab Exercises	➢ Mid-Term Exam ➢ Final Exam ➢ Assignment-1
2.2	**Demonstrate** different operation and convolution on signals.	S2	➢ Lectures ➢ Classroom discussion ➢ Lab exercises	➢ Mid-Term Exam ➢ Assignment-2 ➢ Lab Exam
2.3	**Analyze** different transformations and operations on different types of signals.	S5	➢ Lectures ➢ Classroom discussion ➢ Lab exercise	➢ Final Exam ➢ Assignment-2 ➢ Lab Exam
3.0	**Values, autonomy, and responsibility**			
3.1	**Perform** the techniques required to process signals as well as systems.	V2	➢ Lectures ➢ Classroom discussion ➢ Lab exercise	➢ Assignment-1 ➢ LAB Exam

C. Course Content

No	List of Topics	Contact Hours
1.	Chapter-1:- Basic Mathematics ● Bounded and Unbounded Integration ● Number of Numerical ● Key Elements	3T
2.	Chapter-2:-Introduction to Signals ● Definition of Signals ● Continuous-Time & Discrete-Time Signals ● Periodic and Aperiodic Signals ● Even(Symmetric) and Odd(Anti-symmetric) Signals ● Energy and Power Signals ● Exponential and Sinusoidal Signals ● Unit Impulse and Unit Step Function	4T+6P
3.	Chapter-3:- Operations on Signals & Introduction to Systems ● Basic Mathematical Operations on Signals ● Transformations of the Independent Variable ● Definition of Systems ● Continuous-Time and Discrete-Time Systems	4T+4P

	• Interconnection of systems	
4.	Chapter-4:- Properties of Systems & Discrete-Time LTI System • Basic System Properties • Linear Time-Invariant Systems • Discrete-Time LTI Systems • Representation of Discrete-Time signals in term impulses • Discrete-Time Unit impulse response and convolution Sum	4T+5P
5.	Chapter-5:- CT LTI System & Properties • Continuous-Time LTI Systems • Representation of Continuous-Time signals in terms of impulse • Continuous-Time Unit impulse response and convolution integral representation of LTI system • Properties of Convolution • Properties of Linear Time- Invariant System	5T+5P
6.	Chapter-6:- Fourier Series and Fourier Transform • Introduction of Fourier Series and Fourier Transform • Fourier Series Representation of Continuous -Time Periodic Signals • Properties of Continuous-Time Fourier Series and Fourier Transform • Linearity, Time Shifting, Frequency Shifting, Time Differentiation, Multiplication of two signals convolution Property, Multiplication Property • Laplace and Z transform	6T+6P
7.	**Revision**	2T + 2P
8.	**Final Exam+ Lab Exam**	2T + 2P
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	ASSIGNMENT-1	6th week	10%
2.	MIDTERM	7-8th week	20%
3.	ASSIGNMENT-2	11th week	10%
4.	LAB EXAM	14th week	20%
5.	FINAL EXAM	15th week	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Signals and Systems, A. V. Oppenheim, A.S. Willsky, S.Hamid, Pearson, 2nd Edition, 2015, ISBN-10: 9332550239

Supportive References	Signals and Systems Simplified , A. Nagoor Kani, McGraw-Hill Education, 1st Edition, 2018, ISBN: 9789353161743
Electronic Materials	http://web.cecs.pdx.edu/~ecexx/ECE222/Slides/ http://web.ece.jhu.edu/`cooper/course/214/signalsand systemsnotes.pdf en.wikibooks.org/wiki/Signals_and_Systems http://www.nptel.iitm.ac.in/courses/117104074/
Other Learning Materials	A soft copy of the material is provided to the students.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	1. Equipped classroom with projector, whiteboard, and sufficient seating arrangements. 2. Updated software in the Lab and individual computer terminal for each student.
Technology equipment (projector, smart board, software)	1. Whiteboards and projectors for classroom and lab. 2. Scilab software for lab work.
Other equipment (depending on the nature of the specialty)	--

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, HoD	Indirect, Direct
Effectiveness of Students assessment	CT / CC / HoD	Direct
Quality of learning resources	TL / CRC / PQC	Indirect, Direct
The extent to which CLOs have been achieved	CT /CC / TL / PQC	Indirect, Direct
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DEPARTMENT COUNCIL**
REFERENCE NO.	**ENGCSEEE2411**
DATE	**10/10/24**