



Course Specifications

| | |
|----------------------|--|
| Course Title: | Signals And Systems |
| Course Code: | 221 CNET-3 |
| Program: | Bachelor in Computer and Network Engineering |
| Department: | Computer and Network Engineering |
| College: | Computer Science and Information Technology |
| Institution: | Jazan University |

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A. Course Identification

| | |
|---|---|
| 1. Credit hours: | 03 Hours |
| 2. Course type | |
| a. | University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/> |
| b. | Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/> |
| 3. Level/year at which this course is offered: | Level -8 / Year-03 |
| 4. Pre-requisites for this course (if any): | None |
| 5. Co-requisites for this course (if any): | None |

6. Mode of Instruction (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|----|-----------------------|---------------|------------|
| 1 | Traditional classroom | 52 | 100 |
| 2 | Blended | - | - |
| 3 | E-learning | - | - |
| 4 | Distance learning | - | - |
| 5 | Other | - | - |

7. Contact Hours (based on academic semester)

| No | Activity | Contact Hours |
|----|---|---------------|
| 1 | Lecture | 22 |
| 2 | Laboratory/Studio | 22 |
| 3 | Tutorial | - |
| 4 | Others (specify) Mid-Term ,Final Exams and Review | 8 |
| | Total | 52 |

B. Course Objectives and Learning Outcomes

1. Course 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. In many diverse fields this course can be used like: Analog and Digital Communication, Image procession, Digital Signal Processing, Acoustics, etc.

2. Course Main Objective

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.

3. Course Learning Outcomes

| CLOs | | Aligned PLOs |
|----------|---|--------------|
| 1 | Knowledge and Understanding: | |
| 1.1 | Explain different types of signals in continuous-time and discrete time domain and their properties. | K1 |
| 1.2 | Classify different types of system including LTI system and properties of systems. | K1 |
| 1.3 | Describe the signals in frequency domain using Fourier series and Fourier transform. | K2 |
| 2 | Skills : | |
| 2.1 | Evaluate the system on the basis input/output relation. | S1 |
| 2.2 | Analyze different transformations and operations on different types of signals. | S2 |
| 2.3 | Demonstrate the properties of Fourier Series and Fourier Transform. | S5 |
| 3 | Values: | |
| 3.1 | Perform the techniques required to process signals as well as systems. | V2 |

C. Course Content

| No | List of Topics | Contact Hours |
|----|---|---------------|
| 1 | Chapter-1:- Basic Mathematics & Introduction to Signals <ul style="list-style-type: none"> ● Definition of Signals ● Continuous-Time & Discrete-Time Signals ● Periodic and Aperiodic Signals ● Even(Symmetric) and Odd(Anti-symmetric) Signals ● Exponential and Sinusoidal Signals ● Unit Impulse and Unit Step Function | 4T+4P |
| 2 | Chapter-2:- Operations on Signals & Introduction to Systems <ul style="list-style-type: none"> ● Basic Mathematical Operations on Signals ● Transformations of the Independent Variable ● Definition of Systems ● Continuous-Time and Discrete-Time Systems ● Interconnection of systems | 4T+4P |
| 3 | Chapter-3:- Properties of Systems & Discrete-Time LTI System <ul style="list-style-type: none"> ● Basic System Properties ● Linear Time-Invariant Systems ● Discrete-Time LTI Systems | 4T+4P |

| | | |
|--------------|---|-------|
| | <ul style="list-style-type: none"> Representation of Discrete-Time signals in term impulses Discrete-Time Unit impulse response and convolution Sum | |
| 4 | Chapter-4:- CT LTI System & Properties <ul style="list-style-type: none"> 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 | 4T+4P |
| 5 | Chapter-5:- Fourier Series and Fourier Transform <ul style="list-style-type: none"> 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 | 6T+6P |
| | Final Exams | 4T+4P |
| Total | | 52 |

Online Study Topics :

1. Examples on bounded and unbounded integration.
2. Properties of LTI system.
3. Some basic mathematical operations on signals.
4. Convolution Sum for Discrete time system.

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|------|---|--|--|
| 1.0 | Knowledge and Understanding | | |
| 1.1 | Explain different types of signals in continuous-time and discrete time domain and their properties. | <ul style="list-style-type: none"> ➤ Lectures ➤ Classroom discussions ➤ Lab exercises | <ul style="list-style-type: none"> ➤ Mid-Term Exam ➤ Assignments-1 ➤ Final Exam |
| 1.2 | Classify different types of system including LTI system and properties of systems. | <ul style="list-style-type: none"> ➤ Lectures ➤ Classroom discussions ➤ Lab exercises | <ul style="list-style-type: none"> ➤ Assignments-2 ➤ Lab Exam ➤ Mid-Term Exam ➤ Final Exam |
| 1.3 | Describe the signals in frequency domain using Fourier series and Fourier transform. | <ul style="list-style-type: none"> ➤ Lectures ➤ Classroom discussions ➤ Lab exercises | <ul style="list-style-type: none"> ➤ Assignments-2 ➤ Lab Exam ➤ Final Exam |
| 2.0 | Skills | | |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|------------|--|---|---|
| 2.1 | Evaluate the system on the basis input/output relation. | <ul style="list-style-type: none"> ➤ Lectures ➤ Classroom discussion ➤ Lab Exercises | <ul style="list-style-type: none"> ➤ Mid-Term Exam ➤ Final Exam ➤ Assignment-1 |
| 2.2 | Analyze different transformations and operations on different types of signals. | <ul style="list-style-type: none"> ➤ Lectures ➤ Classroom discussion ➤ Lab exercises | <ul style="list-style-type: none"> ➤ Mid-Term Exam ➤ Assignment-2 ➤ Lab Exam |
| 2.3 | Demonstrate the properties of Fourier Series and Fourier Transform. | <ul style="list-style-type: none"> ➤ Lectures ➤ Classroom discussion ➤ Lab exercise | <ul style="list-style-type: none"> ➤ Final Exam ➤ Assignment-2 ➤ Lab Exam |
| 3.0 | Values | | |
| 3.1 | Perform the techniques required to process signals as well as systems. | <ul style="list-style-type: none"> ➤ Lectures ➤ Classroom discussion ➤ Lab exercise | <ul style="list-style-type: none"> ➤ Mid-Term Exam ➤ Assignment-1 ➤ LAB Exam ➤ Final Exam |

2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|----------------------------|-----------------------|--------------------------------------|
| 1 | Assignments / Mini Project | 4 th Week | 20% |
| 2 | Midterm Exam | 6 th Week | 20% |
| 3 | Lab Exam | 11 th Week | 20% |
| 4 | Final Theory Exam | 12 th Week | 40% |

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Department have an arrangement for “Academic Counseling and Support” for each student by the department. The Department Coordinator nominates faculty members for “**Student Academic Advisory Committee**” every semester. These “**Academic Advisors**” are responsible for student counseling and advising to a group of fix number of students (around 10-15 students) and maintaining students’ files. At the beginning of semester and at time of course registration all students take counseling from Academic Advisor according to his previous grades and coverage of pre-requisite course and follow-up.

In addition, students with GPA below than 2.00 are remained under deep observation and continuous meetings with respective course teachers about their performance are arranged to help and support the students. The course teacher is to be associated with this course provide a proper guidance for students who are looking to focus on their future career based on their intellectual interests, identify better opportunities related to this course and connections in their academic fields.

F. Learning Resources and Facilities

1. Learning Resources

| | |
|---------------------------------------|--|
| Required Textbooks | <ul style="list-style-type: none"> Signals and Systems, A. V. Oppenheim, A.S. Willsky, S.Hamid, Pearson, 2nd Edition, 2015, ISBN-10: 9332550239 |
| Essential References Materials | <ul style="list-style-type: none"> Signals and Systems Simplified , A. Nagoor Kani, McGraw-Hill Education, 1st Edition, 2018, ISBN: 9789353161743 |
| Electronic Materials | <ul style="list-style-type: none"> https://lms.jazanu.edu.sa/webapps/login/?action=login# 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. Facilities Required

| Item | Resources |
|--|---|
| Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) | Equipped classroom with projector, whiteboard, and sufficient seating arrangements. Updated software in the Lab and individual computer terminal for each student. |
| Technology Resources (AV, data show, Smart Board, software, etc.) | Whiteboards and projectors for classroom and lab. Scilab software for lab work. |
| Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | --- |

G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|----------------------------------|--|
| Sufficiency of resources and facilities for students. | Students | Course evaluation survey form |
| Effectiveness of teaching / learning process | Students / QAU / HOD | Course reports / result analysis |
| Quality of learning Resources | Track leaders | Review meetings and star rating with suggestions for further modification and improvements |
| Verifying standards of student achievement / evaluation | HOD / committee nominated by HOD | Random re-checking of evaluated answer sheets |
| Achievement of course learning outcomes | Course Teachers / QAU | CLO assessment template that is further verified at |

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|-----------------------|---|
| | | course coordinator and QAU level. |
| Achievement of course learning outcomes | Course Teachers / QAU | CLO assessment template that is further verified at course coordinator and QAU level. |

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

| | |
|----------------------------|--------------------|
| Council / Committee | Department Council |
| Reference No. | |
| Date | |