



# Course Specification

## (Bachelor)

Course Title: **Signals and Systems**

Course Code: **CENX 351**

Program: **B.S. in Computer Engineering**

Department: **Department of Computer Engineering**

College: **College of Computer and Information Sciences**

Institution: **King Saud University**

Version: *Course Specification Version Number*

Last Revision Date: *Pick Revision Date.*



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## A. General information about the course:

### 1. Course Identification

1. Credit hours: ( 4 hours )

#### 2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others  
B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: ( Level 6 )

#### 4. Course general Description:

Mathematical description and classification of various signals and systems: introduction to mathematical software packages (e.g. MATLAB), continuous linear time-invariant systems, convolution, Fourier series and transform, and Laplace transform.

#### 5. Pre-requirements for this course (if any):

Differential Equations, MATH 204  
Electric Circuits for Computer Engineering, EE 207

#### 6. Co-requirements for this course (if any):

#### 7. Course Main Objective(s):

The aim of the course is to provide an understanding of signals and systems. The ability to sketch and analyze signals, express them in terms of other basic signals and perform basic time-domain operations on them. Perform convolution and understand LTI concepts. Apply the basic definitions of the Fourier series, Fourier transform and Laplace transform.

### 2. Teaching mode (mark all that apply)

| No | Mode of Instruction                                                                                | Contact Hours    | Percentage |
|----|----------------------------------------------------------------------------------------------------|------------------|------------|
| 1  | Traditional classroom                                                                              | 6 hours per week | 100%       |
| 2  | E-learning                                                                                         |                  |            |
| 3  | Hybrid <ul style="list-style-type: none"> <li>Traditional classroom</li> <li>E-learning</li> </ul> |                  |            |
| 4  | Distance learning                                                                                  |                  |            |



### 3. Contact Hours (based on the academic semester)

| No    | Activity          | Contact Hours |
|-------|-------------------|---------------|
| 1.    | Lectures          | 45            |
| 2.    | Laboratory/Studio | 30            |
| 3.    | Field             |               |
| 4.    | Tutorial          | 15            |
| 5.    | Others (specify)  |               |
| Total |                   | 90            |

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

| Code | Course Learning Outcomes                                                                            | Code of CLOs aligned with program | Teaching Strategies    | Assessment Methods |
|------|-----------------------------------------------------------------------------------------------------|-----------------------------------|------------------------|--------------------|
| 1.0  | Knowledge and understanding                                                                         |                                   |                        |                    |
| 1.1  | Classify, sketch and perform basic time domain operations on signals.                               | 1                                 | Lectures and Tutorials | Exams and Homework |
| 2.0  | Skills                                                                                              |                                   |                        |                    |
| 2.1  | Determine if a system is linear, time-invariant, causal, memoryless, stable and invertible.         | 2                                 | Lectures and Tutorials | Exams and Homework |
| 2.2  | Perform convolution for continuous time signals and analyze LTI systems in the time domain.         | 2                                 | Lectures and Tutorials | Exams and Homework |
| 2.3  | Apply the basic definitions of the Fourier series, Fourier transform and inverse Fourier transform. | 2                                 | Lectures and Tutorials | Exams and Homework |
| 2.4  | Apply the basic definitions of the Laplace transform and inverse Laplace transform.                 | 2                                 | Lectures and Tutorials | Exams and Homework |
| 3.0  | Values, autonomy, and responsibility                                                                |                                   |                        |                    |



| Code | Course Learning Outcomes                                              | Code of CLOs aligned with program | Teaching Strategies | Assessment Methods         |
|------|-----------------------------------------------------------------------|-----------------------------------|---------------------|----------------------------|
| 3.1  | Use mathematical software tool for simulation of signals and systems. | 3 and 6                           | Lectures and Lab    | Exams and Homework and Lab |

### C. Course Content

| No    | List of Topics                                        | Contact Hours |
|-------|-------------------------------------------------------|---------------|
| 1.    | Signal classification and basic operations on signals | 12            |
| 2.    | Time-domain analysis of signals and systems           | 12            |
| 3.    | Fourier Representations of signals and systems        | 18            |
| 4.    | Laplace Transform                                     | 12            |
| 5.    | Applications of signals and systems                   | 6             |
| 6.    | Simulation of signals and systems                     | 30            |
| Total |                                                       | 90            |

### D. Students Assessment Activities

| No | Assessment Activities *          | Assessment timing (in week no) | Percentage of Total Assessment Score |
|----|----------------------------------|--------------------------------|--------------------------------------|
| 1. | Midterm Examination              | 6                              | 25%                                  |
| 2. | Assignments and Quizzes          | Bi-weekly                      | 20%                                  |
| 3. | Laboratory Work                  | Weekly                         | 15%                                  |
| 4. | Final Exam (Laboratory + Theory) | End                            | 40% (10+30)%                         |

\*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, Oppenheim A. and Willsky A. with S. Nawab, Prentice Hall, 2nd Ed, 1997.                                                                                                                                                                                                                                                                            |
| Supportive References | Fundamentals of Signals and Systems Using the Web and Matlab, E. W. Kamen and B. S. Heck., Prentice Hall, 3rd Edition., 2007.                                                                                                                                                                                                                                           |
| Electronic Materials  | <a href="https://lms.ksu.edu.sa/">https://lms.ksu.edu.sa/</a><br><a href="http://www.mathworks.com/help/pdf_doc/matlab/getstart.pdf">http://www.mathworks.com/help/pdf_doc/matlab/getstart.pdf</a><br><a href="http://www.mathworks.com/academia/student_center/tutorials/launchpad.html">http://www.mathworks.com/academia/student_center/tutorials/launchpad.html</a> |





|                          |                                                                                                                                                                                                                      |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          | <a href="http://en.wikipedia.org/wiki/Euler%27s_formula">http://en.wikipedia.org/wiki/Euler%27s_formula</a><br><a href="http://en.wikipedia.org/wiki/Complex_number">http://en.wikipedia.org/wiki/Complex_number</a> |
| Other Learning Materials |                                                                                                                                                                                                                      |

## 2. Required Facilities and equipment

| Items                                                                                     | Resources                                                                             |
|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>facilities</b><br>(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.) | Lecture room with number of seats enough to accommodate enrolled students.            |
| <b>Technology equipment</b><br>(projector, smart board, software)                         | Overhead projector with required software to facilitate presentations on smart board. |
| <b>Other equipment</b><br>(depending on the nature of the specialty)                      | Matlab software.                                                                      |

## F. Assessment of Course Quality

| Assessment Areas/Issues                     | Assessor            | Assessment Methods                                      |
|---------------------------------------------|---------------------|---------------------------------------------------------|
| Effectiveness of teaching                   | Department Council  | Course reports are evaluated by the Department Council. |
| Effectiveness of Students assessment        | Faculty-Peer Review | Final examination is moderated.                         |
| Quality of learning resources               | Students            | Indirect – Edu-gate survey.                             |
| The extent to which CLOs have been achieved | Students            | Attainment level of every CLO is measured directly.     |
| Other                                       |                     |                                                         |

**Assessors** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval

|                    |  |
|--------------------|--|
| COUNCIL /COMMITTEE |  |
| REFERENCE NO.      |  |
| DATE               |  |

