هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA

2024
TP-153

# Course Specification
## (Bachelor)

| | |
|---|---|
| **Course Title:** | Communication Systems |
| **Course Code:** | 432 CNET-3 |
| **Program:** | Bachelor of Computer & Network Engineering |
| **Department:** | Electrical and Electronics Engineering |
| **College:** | College of Engineering & Computer Science |
| **Institution:** | Jazan University |
| **Version:** | 13 |
| **Last Revision Date:** | 27 May 2024 |

## Table of Contents

## 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: (7)** | | | | | |
| **4. Course general Description:** | | | | | |
| This course introduces the fundamental principles of communication systems. It establishes the main concepts and techniques of modern communication systems, both analog and digital. The course covers various analog modulation techniques and explores their design and analysis aspects. It also discusses analog-to-digital conversion and elaborates on its two steps such as sampling and quantization. It provides students with tools to analyze the performance of digital modulation techniques with and without noise. Students can describe and relate these topics to the current developments in wide range of modern communication Systems. Students can perform the experiments and mini-projects using simulation software and/or hardware devices of communication systems lab. | | | | | |
| **5. Pre-requirements for this course** (if any)**:** | | | | | |
| Signals and Systems (331 CNET-3) | | | | | |
| **6. Co-requisites for this course** (if any)**:** | | | | | |
| None | | | | | |
| **7. Course Main Objective(s):** | | | | | |
| • Describe and understand the types of communication systems and their building blocks<br>• Understand the basic concepts and theories underlying communication systems such as modulation and sampling<br>• Analyze and design analog modulation techniques such as AM, FM, and PM<br>• Explore digital modulation techniques such as ASK, FSK, and PSK | | | | | |

- To gain insight into the design and implementation of communication systems in the presence of noise and other impairments
- Apply the theoretical knowledge to practical problems through lab experiments and projects

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

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | Traditional classroom | 60 | 100% |
| 2 | E-learning | - | - |
| 3 | Hybrid<br>● Traditional classroom<br>● 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 program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| **1.0** | **Knowledge and understanding** | | | |
| 1.1 | **Explain the major concepts in structure** | **K1** | ➢ **Lectures**<br>➢ **Classroom discussions** | ➢ **Midterm Exam**<br>➢ **Assignment-1**<br>➢ **Final Exam** |

| Code | Course Learning Outcomes | Code of PLOs aligned with program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| | of Communication systems. | | | |
| 1.2 | Describe the functions of radio transmitter and Receiver. | K2 | ➢ Lectures<br>➢ Classroom discussions | ➢ Assignment-2<br>➢ Final Exam |
| 1.3 | Recognize the communication applications with electronic techniques. | K3 | ➢ Lectures<br>➢ Classroom discussions<br>➢ Lab exercise | ➢ Midterm Exam<br>➢ Assignment-1<br>➢ Lab Exam<br>➢ Final Exam<br>➢ Mini-projects |
| **2.0** | ➢ **Skills** | | | |
| 2.1 | Design time and frequency domains of analog and digital modulation techniques. | S2 | ➢ Lectures<br>➢ Classroom discussion<br>➢ Lab exercise | ➢ Final Exam<br>➢ Assignment-2<br>➢ Lab Exam |
| 2.2 | Analyze the different types of modulation and demodulation schemes. | S3 | ➢ Lectures<br>➢ Classroom discussion<br>➢ Lab exercise | ➢ Final Exam<br>➢ Assignment-2<br>➢ Mini-Projects<br>➢ Lab Exam |
| 2.3 | Identify signal assessments with noise, frequency and phase measurements in analog and digital modulation schemes. | S5 | ➢ Lectures<br>➢ Classroom discussion<br>➢ Lab exercises | ➢ Final Exam<br>➢ Assignment-2<br>➢ Mini-Projects<br>➢ Lab Exam |
| **3.0** | ➢ **Values, autonomy, and responsibility** | | | |
| 3.1 | Recognize ethical and professional responsibilities in communication systems and make informed judgments | V3 | ➢ Final Exam<br>➢ Assignment-2<br>➢ Mini-Projects<br>➢ Lab Exam | ➢ Mini-projects<br>➢ Lab Exam |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1. | **CHAPTER-1: INTRODUCTION TO COMMUNICATION SYSTEMS**<br>● Definition of Communication and Historical Overview<br>● Elements of A Communication System<br>● Types of Communications<br>● Noise Types<br>● SNR (Signal to Noise Ratio)<br>● Noise Figure<br>● Shannon Theorem for Channel Capacity | 4T + 4P |
| 2. | **CHAPTER-2 : REVIEW OF SIGNAL PROCESSING**<br>● Signal Representations<br>● Mandatory Signal Operations<br>● Convolution<br>● Linear Time Invariant Systems<br>● Fourier Series and Transform<br>● Baseband and Passband Signal Representations | 4T+4P |
| 3. | **CHAPTER-3: AMPLITUDE MODULATION**<br>● Amplitude Modulation (AM) Schemes: Double Sideband (DSB), Single Sideband (SSB), and Vestigial Sideband (VSB) Modulation<br>● Main Design Parameters; Modulation Index, Spectral and Power Efficiency<br>● Advantage and disadvantages of AM | 4T+4P |
| 4. | **CHAPTER-4: ANGLE MODULATION**<br>● Angle Modulation Techniques: Frequency Modulation (FM) and Phase Modulation (PM)<br>● Bandwidth Analysis of Angle Modulations<br>● Demodulation of FM Signals<br>● FM Signal Generation<br>● Phased-Locked Loop and Its Applications | 4T+4P |
| 5. | **CHAPTER-5: DIGITIZING ANALOG SIGNALS**<br>● Sampling Theorem<br>● Pulse Code Modulation (PCM)<br>● Differential Pulse Code Modulation (DPCM)<br>● Delta Modulation (DM)<br>● Vocoders and Video Compression | 5T+5P |
| 6. | **CHAPTER-6: PRINCIPLES OF DIGITAL DATA TRANSMISSION** | 5T+5P |

| | | |
|---|---|---|
| | • Elements of Digital Communication System<br>• Pulse Shaping<br>• Eye Diagrams<br>• PAM: M-ary Baseband Digital Modulation<br>• Basic Digital Carrier (Passband) Modulation: ASK, FSK and PSK<br>• M-ary Digital Carrier Modulation: M-ary ASK, M-ary FSK and M-ary PSK | |
| 7. | **Final Exam+ Lab Exam** | 4T+4P |
| **Total** | | **60** |

## D. Students Assessment Activities

| No | Assessment Activities * | Assessment timing (in week no) | Percentage of Total Assessment Score |
|---|---|---|---|
| **1.** | Assignments/Mini-Projects | 3rd to 15th week | 20% |
| **2.** | Midterm Exam | 8th week | 20% |
| **3.** | Lab Exam | 14th week | 20% |
| **4.** | Final Theory 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** | **U. Madhow, *Introduction to Communication Systems*. Cambridge: Cambridge University Press, 2014. doi: 10.1017/CBO9781139137058.** |
| **Supportive References** | **B. P. Lathi and Z. Ding, *Modern Digital and Analog Communication Systems*. Oxford: Oxford University Press, 2011, ISBN-13: 978-0198073802.**<br>**L. E. Frenzel Jr., Principles of Electronic Communication Systems, 4th ed. New York: McGraw-Hill Education, 2016, ISBN: 978-0-07-337385-0.** |
| **Electronic Materials** | **-** |
| **Other Learning Materials** | **-** |

### 2. Required Facilities and equipment

| Items | Resources |
|---|---|
| **facilities** | Classrooms with projectors and computers available. |

| Items | Resources |
|---|---|
| (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.) | Labs with a minimum of 12 sets of trainer kits modules, 12 piece each experiment module is available. |
| **Technology equipment** (projector, smart board, software) | SCILAB simulator or equivalent |
| **Other equipment** (depending on the nature of the specialty) | - |

## F. Assessment of Course Quality

| Assessment Areas/Issues | Assessor | Assessment Methods |
|---|---|---|
| Effectiveness of teaching | Students | Course Evaluation Survey Form |
| Effectiveness of Students assessment | HOD/committee nominated by HOD | Course Evaluation Survey Form |
| Quality of learning resources | Track Leaders | Review meetings and star rating with suggestions for further modification and improvements |
| The extent to which CLOs have been achieved | Course Teachers, Course Coordinators, Academic Coordinators/HOD | CLO assessment template that is further verified at course coordinator, Track Leader and QAU level. |
| 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** |