Course Specification
— (Bachelor)

Course Title: **Digital Communication**

Course Code: **EE1352**

Program: **Electrical Engineering**

Department: **Electrical Engineering**

College: **College of Engineering**

Institution: **Imam Mohammad Ibn Saud Islamic University**

Version: **V3**

Last Revision Date: **10-10-2024**

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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: (7th level, 4th year)

4. Course general Description:

Quantization and PCM Encoding. Noise analysis in PCM systems. Baseband pulse transmission (matched filters, intersymbol interference); Eye pattern, Nyquist criteria; Equalization. Digital passband transmission: Coherent PSK/FSK/QPSK/MSK and non-coherent orthogonal modulation; power spectra and bandwidth efficiency of binary and quaternary modulation schemes; Information theory: Mutual information and channel capacity; Error control coding.

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

EE 1351, EE 1321

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

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7. Course Main Objective(s):

Understand signal space representation, the process of sampling, quantization and coding that are essential for digital transmission of analog signals. Understand baseband and bandpass signal transmission and reception techniques including M-ary modulation, performance in awgn channel, detection algorithms. Learn error control coding such as linear block codes- encoding and decoding algorithms for reliable transmission over noisy channels

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	-	-

No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning	-	-

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	-
3.	**Field**	-
4.	**Tutorial**	15
5.	**Others (specify)**	-
Total		60

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**			
K1	Apply knowledge of Various Components, and Concepts in Required for Understanding of Digital Communication Systems	1.1	PPT presentations Computer Animations Encouraging students to use internet and library recourses Direct questions to students during class	Quizzes in class Midterm exams Final exam
K1	Learn the Process of Sampling, Quantization in PCM Communication	1.4	PPT presentations Computer Animations Encouraging students to use internet and library recourses Direct questions to students during class	Quizzes in class Midterm exams Final exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
K1	Analyze Baseband Pulse Transmission in terms of error rate performance	1.4	PPT presentations Computer Animations Encouraging students to use internet and library recourses Direct questions to students during class	Quizzes in class Midterm exams Final exam
2.0	**Skills**			
S1	Analyze the error performance under various Digital Modulation schemes	2.1	PPT presentations Computer Animations Encouraging students to use internet and library recourses Direct questions to students during class	Quizzes in class Midterm exams Final exam
S1	Evaluate different Channel Coding, and perform their design	2.2	PPT presentations Computer Animations Encouraging students to use internet and library recourses Direct questions to students during class	Quizzes in class Midterm exams Final exam
3.0	**Values, autonomy, and responsibility**			
V1/ V2	Use of simulation tools for modelling and designing of different components in building of Digital	3.6 /4.5	Prepare report / presentation using computer	Report / presentation

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	Communication Systems			

C. Course Content

No	List of Topics	Contact Hours
1	**Importance of Course:** Significance of various communication systems and their applications **[1.1, Lathi]**	1
2	**Digital Communication System Concept:** Digital system block diagram **[1.1, Sklar]**, Advantages of Digital Communication **[1.1, Sklar]**, Classification of Signals-Energy and Power Signals **[2.1, 2.2.1, Lathi]** and Spectral Density **[1.3, Sklar]**	3
3	**Baseband Pulse Transmission:** Sampling and PCM Encoding **[2.1, 2.4.1, 2.6, Sklar]**, Noise analysis in PCM systems **[2.5.3, Sklar]**, and Line Coding **[2.8, Sklar]**	8
4	**Optimum Reception of the Baseband Pulse Transmission:** Matched Filters **[4.2, 4.3, Simon]**, Inter-Symbol Interference (ISI) **[4.4, Simon]**, and Pulse Shaping **[7.3, Lathi]**, and Nyquist Criterion **[7.3, Lathi]**.	16
5	**Digital Transmission via Carrier Modulation:** Coherent PSK **[6.3, Simon]**/FSK **[6.5, Simon]**/QPSK **[6.43, Simon]**/MSK **[6.5, Simon]** and non-coherent orthogonal modulation **[6.3, 6.5, Simon]**, Power spectra and Bandwidth efficiency of binary and Quaternary Modulation schemes **[6.1, Simon]**	16
6	**Information Theory:** Measure of information and Channel Capacity **[9.1, 9.2, Simon]**; **Channel Coding:** Error Control Coding **[10.1, 10.2, 10.3, Simon]** ; Multiple Access and Equalizing: Different Types of Multiple Access **[11.1, Sklar]**.	8
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	6th week	20%
2.	Midterm 2	12th week	20%
3.	Homework and mini-project	All term	5%
4.	Quizzes	3rd week & 9th week	15%
5.	Final Exam	Final Exam 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	Simon **Haykin**, Communication System, 4th ed., John Wiley & Sons, 2001
Supportive References	• **Bernard Sklar**, Digital Communications: Fundamentals and Applications, 3rd ed., Pearson, 2020 • **B. P. Lathi, and Zhi Ding**, Modern Digital and Analog Communication Systems, 5th ed., Oxford University, 2018

	• Handouts: distributed from now and then to add or clarify more information
Electronic Materials	Computer animations and online resources supplied by the instructor.
Other Learning Materials	Different Online sites.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	One classroom: fits up to 25 students with white board.
Technology equipment (projector, smart board, software)	A laptop computer connected to a projector to display PowerPoint presentations
Other equipment (depending on the nature of the specialty)	N/A

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**Indirect**
Effectiveness of Students assessment	**Students**	**Indirect**
Quality of learning resources	**Relevant Focus Group**	**Indirect**
The extent to which CLOs have been achieved	**Dept. Quality Committee**	**Direct**
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	