2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Cellular and Wireless Networks**
Course Code:	**CEN 1414**
Program:	**Bachelor in Computer Engineering**
Department:	**Computer Engineering**
College:	**Faculty of Computer and Information Technology**
Institution:	**University of Tabuk**
Version:	**1.0**
Last Revision Date:	**27 July 2022**

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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: (10/5)					
4. Course general Description:					
Underlying principles of personal communications and Cellular systems. Radio signal propagation and signal impairments: Noise & interference-limited communications, multiple access, radio resources management, and mobility management. Building blocks of essential functions of cellular systems. Examination of the leading and standard systems. AMPS, IS-41, TDMA, CDMA, the GSM standards. Wireless & Multimedia Networks: Standards: 802.11, 802.11e, 802.11n, 802.15, and 802.16, QoS, wireless & multimedia networks new trends and applications.					
5. Pre-requirements for this course (if any)**:**					
CEN 1405					
6. Co-requisites for this course (if any)**:**					
N/A					
7. Course Main Objective(s):					
▪ **Understand the difference between wireless and cellular networks.** ▪ **Comparing between TDMA, CDMA AND FDMA** ▪ **Understand Radio Signal Propagations and impairments.** ▪ **Explain Cellular networks and technologies.** ▪ **Describe Wireless Protocols and technologies.** ▪ **Explain WCDMA and HSPA.**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**45**	**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**	-
5.	**Others (specify)**	-
Total		45

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	**Recognize the difference between wireless and cellular networks**	**K1**	**Lectures, textbooks, provided handouts, references.**	**Exams, quizzes, assignments, and the project.**
1.2	**Describe GSM and GPRS standards used in cellular networks**	**K1**		
1.3	**Outline FDMA, TDMA and CDMA techniques**	**K3**		
1.4	**Define WiFi techniques and understand their weaknesses and strengths**	**K5**		
2.0	**Skills**			
2.1	**Analyze the Propagation components and Path loss**	**S1**	**Lectures, textbooks, provided handouts, references.**	**Exams, quizzes, assignments, and the project.**
2.2	**Design blocks of and essential functions of cellular systems**	**S3**		
2.3	**Compare between FDMA, TDMA and CDMA techniques**	**S3**		
3.0	**Values, autonomy, and responsibility**			

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	N/A			

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to wireless and cellular Networks - History and overview of wireless communication concepts.	3
2.	Propagation components and Path loss I - Radio propagation effects, free space loss and multipath fading.	3
3.	Propagation components and Path loss II - Fading countermeasures and modeling path loss.	3
4.	FDMA, TDMA - Multiple access schemes for spectrum sharing: Frequency Division Multiple Access and Time Division Multiple Access.	3
5.	CDMA - Code Division Multiple Access for wireless transmission.	3
6.	Wi-Fi Protocol - IEEE 802.11 protocol for Wireless LANs - architecture, modes, standards.	3
7.	WIMAX and 802.22 Protocols - Wireless broadband protocols - WiMAX and IEEE 802.22 Wireless Regional Area Networks.	3
8.	GSM - Global system for mobile communication architecture and air interface technologies.	3
9.	GPRS - General packet radio system for mobile data services on 2G networks.	3
10.	WCDMA - Architecture and technologies of 3G mobile networks based on Wideband Code Division Multiple Access.	3
11.	HSPA I - High Speed Packet Access evolution of 3G for high speed data - HSPA and HSPA+.	3
12.	Long Term Evaluation I - 4G mobile technologies - LTE, LTE-Advanced and 5G New Radio.	3
13.	Long Term Evaluation II- 5G NR system design, architecture and technologies.	3
14.	Radio resources Management and Mobility - Dynamic radio resource allocation, admission control, handoffs.	3
15.	Handover Algorithms - Algorithms for inter-cell and inter-system handovers in cellular networks.	3
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Two Assignments	5,14	10%

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
2.	Two Quizzes	4,9	10%
3.	Two Midterm Exam	7,12	40%
4.	Final Exam	16	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	▪ Wireless Communications and Networking: Concepts, Technologies and Applications, Stephen Morris, Larsen and Keller Education, ISBN-13: 978-1641726610.
Supportive References	▪ Wireless Communications and Networks, William Stallings, Pearson, ISBN-13: 978-8132231561.
Electronic Materials	
Other Learning Materials	-

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
Technology equipment (projector, smart board, software)	Data show
Other equipment (depending on the nature of the specialty)	TBA

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of Teaching	Faculty, Program Leaders, and Advisory Board	Both Direct and Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
	Students	Indirect
Effectiveness of Students Assessment	Faculty, Program Leaders, Advisory Board, and Independent Opinion	Both Direct and Indirect
Quality of Learning Resources	Faculty, Students, and Advisory Board	Indirect
The Extent to which CLOs have been Achieved	Faculty, Program Leaders, Advisory Board, and Independent Opinion	Direct (as in section B) and Indirect/Surveys
	Students	Indirect
Other	-	-

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	