

<b>Identification</b>	<b>Subject (Code, title, credits)</b>	ETR401 Wireless communication technology - 6 ECTS credits	
	<b>Department</b>	Physics and Electronics	
	<b>Program</b>	Undergraduate	
	<b>Term</b>	Fall, 2024	
	<b>Instructor</b>	MSc, MIET, Alim Huseynov	
	<b>E-mail:</b>	Alim.Huseynov@gmail.com	
	<b>Phone:</b>	+99455 425 3599	
	<b>Classroom/hours</b>	11 Mehseti str. (Neftchilar campus)	
	<b>Office hours</b>	Monday-Friday, from 9:00 to 18:00	
<b>Prerequisites</b>	-		
<b>Language</b>	English		
<b>Compulsory/Elective</b>	Elective		
<b>Required textbooks and course materials</b>	<b>Textbooks:</b> 1. Wireless Communication Networks and Systems; Cory Beard, William Stallings 2. Wireless Communications Systems; Randy L. Haupt 3. Wireless Communications; Andrea Goldsmith		
<b>Course outline</b>	The course addresses the fundamentals of wireless communications and provides an overview of existing and emerging wireless communications networks. It covers radio propagation and fading models, fundamentals of cellular communications, multiple access technologies, and various wireless networks, including past and future generation networks. Simulation of wireless systems under different channel environments will be integral part of this course.		
<b>Course objectives</b>	Wireless communication is one of the fastest growing fields in the engineering world, and a tremendous interest for this topic exists among undergraduate students. To understand the examples of wireless communication systems, paging systems, cordless telephone systems. To study the different generations of mobile networks, WAN and PAN. To understand the concepts of basic cellular system, frequency reuse, channel assignment strategies, handoff strategies, interference. To understand the FDMA, TDMA, spread spectrum multiple access. To study the Wireless Networking: Difference between wireless and fixed telephone networks, development of wireless networks. When completing this course, the students should be able to understand the basic concept of wireless system design and get familiar with various wireless networks.		
<b>Learning outcomes</b>	What students should know by the end of the course: Overview of wireless communications and systems Review of digital communications Cellular systems from 1G to 3G Wireless 4G, 5G systems. Radio propagation and propagation path-loss model Free-space attenuation Multipath channel characteristics Signal fading statistics Path-loss models. Fundamentals of cellular communications Hexagonal cell geometry Co-channel interference Cellular system design Sectoring using directional antennas. Multiple access techniques Frequency division multiple access (FDMA) Time division multiple access (TDMA) Code division multiple access (CDMA) Space division multiple access (SDMA) Orthogonal frequency division multiplexing (OFDM) Multicarrier CDMA (MC-CDMA) Random access methods. Wide-area wireless networks (WANs) GSM – IS-136 IS-95 UMTS Cdma2000. Long Term Evolution Technologies (LTE) OFDM MIMO channels Space Time Codes LTE Advanced. Other Wireless systems IEEE 802.11 WLAN (WiFi) WiMAX		
<b>Teaching methods</b>	<b>Lecture</b>		<input checked="" type="checkbox"/>
	<b>Group discussion</b>		<input checked="" type="checkbox"/>
	<b>Experiential exercise</b>		<input type="checkbox"/>
	<b>Case analysis</b>		<input type="checkbox"/>
	<b>Quiz, Classroom Exams</b>		<input checked="" type="checkbox"/>
	<b>Course paper</b>		<input type="checkbox"/>
	<b>Others</b>		<input checked="" type="checkbox"/>
<b>Evaluation</b>	<b>Methods</b>	<b>Date/deadlines</b>	<b>Percentage (%)</b>
	<b>Midterm Exam</b>		30
	<b>Attendance</b>	At each lesson	5
	<b>Quizzes</b>	During the semester	15
	<b>Activity</b>	During the semester	10
	<b>Final Exam</b>		40
	<b>Total</b>		100

<p><b>Policy</b></p>	<ul style="list-style-type: none"> <li>▪ <b>Preparation for class</b> The structure of this course makes your individual study and preparation outside the class extremely important. The lecture material will focus on the major points introduced in the text. Reading the assigned chapters and having some familiarity with them before class will greatly assist your understanding of the lecture. After the lecture, you should study your notes and work relevant problems and cases from the end of the chapter and sample exam questions.</li> <li>• <b>Withdrawal (pass/fail)</b> This course strictly follows grading policy of the School of Humanities, Education and Social sciences. Thus, a student is normally expected to achieve a mark of at least 60% to pass. In case of failure, he/she will be required to repeat the course the following term or year.</li> <li>▪ <b>Cheating/plagiarism</b> Cheating or other plagiarism during the Quizzes, Mid-term and Final Examinations will lead to paper cancellation. In this case, the student will automatically get zero (0), without any considerations.</li> <li>▪ <b>Professional behavior guidelines</b> The students shall behave in the way to create favorable academic and professional environment during the class hours. Unauthorized discussions and unethical behavior are strictly prohibited.</li> <li>▪ <b>Attendance</b> Students who attend the whole classes will get 5 marks. for three absence student loses 1 mark.</li> <li>• <b>Quizzes</b> There will be a quizzes per two weeks. The quizzes will be announced in the classroom two weeks before and will relate to homework.</li> <li>• <b>Activity</b> Students who will be active during discussion of past lessons will be awarded with one activity mark.</li> </ul>
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Tentative Schedule			
Weeks	Date/Day	Topics	Reference to textbooks
1.	19-09-23	Introduction to Wireless Communications, The Global Cellular Network, The Mobile Device Revolution, Future Trends, The Trouble with Wireless	[1] p01 [2] p39
		Conduction of oral and written survey. Problem solving	[3] p30
2.	26-09-23	Transmission Fundamentals, Signals for Conveying Information, Analog and Digital Data Transmission, Channel Capacity Transmission	[1] p09 [2] p47
		Conduction of oral and written survey. Problem solving	
3.	03-10-23	Communication Networks, LANs, MANs, and WANs, Switching Techniques, Circuit Switching, Packet Switching, Quality of Service	[1] p40
		Conduction of oral and written survey. Problem solving	
4.	10-10-23	Protocols and the TCP/IP Suite, The Need for a Protocol Architecture, The TCP/IP Protocol Architecture, The OSI Model, Internetworking	[1] p62 [2] p428
		Conduction of oral and written survey. Problem solving	[3] p564
5.	17-10-23	Overview of Wireless Communication, Spectrum Considerations, Line-Of-Sight Transmission, Fading in the Mobile Environment, Channel Correction Mechanisms, Digital Signal Encoding Techniques, Coding and Error Control, Orthogonal Frequency Division Multiplexing (OFDM), Spread Spectrum	[1] p93 [3] p374
		Quiz 1 - Lecture 1 – Lecture 4	
6.	24-10-23	The Wireless Channel, Antennas, Spectrum Considerations, Line-Of-Sight Transmission, Fading in the Mobile Environment	[1] p156 [2] p139
		Conduction of oral and written survey. Problem solving	
7.	31-10-23	Signal Encoding Techniques, Signal Encoding Criteria, Digital Data, Analog Signals, Analog Data, Analog Signals, Analog Data, Digital Signals,	[1] 201
		Quiz 2 - Lecture 5 – Lecture 6	
8.	07-11-23	Mid term exam	
9.	14-11-23	Orthogonal Frequency Division Multiplexing, Orthogonal Frequency Division Multiple Access (OFDMA), Single-Carrier FDMA , Spread Spectrum, The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum. Direct Sequence Spread Spectrum, Code Division Multiple Access	[1] p252 [1] p432 [1] p236 [3] p403
		Conduction of oral and written survey. Problem solving	
10.	21-11-23	Coding and Error Control, Error Detection, Block Error, Correction Codes, Convolutional Codes, Automatic Repeat Request	[1] p273
		Conduction of oral and written survey. Problem solving	
11.	28-11-23	Wireless LAN Technology, IEEE 802 Architecture, IEEE 802.11 Architecture and Services, IEEE 802.11 Medium Access Control, IEEE 802.11 Physical Layer, Gigabit Wi-Fi, Other IEEE 802.11 Standards, IEEE 802.11 Wireless LAN Security 3	[1] p321 [3] p 564
		Quiz 3 - Lecture 7 – Lecture 10	
12.	05-12-23	Bluetooth and IEEE 802.15, The Internet of Things, Bluetooth Motivation and Overview, Bluetooth Specifications, Bluetooth High Speed and Bluetooth Smart, IEEE 802.15, ZigBee	[1] p376
		Conduction of oral and written survey. Problem solving	
13.	12-12-23	Cellular Wireless Networks, Principles of Cellular Networks, First-Generation Analog, Second-Generation TDMA, Second-Generation, CDMA, Third-Generation Systems	[1] p 409
		Conduction of oral and written survey. Problem solving	
14.	19-12-23	Fourth Generation Systems and LTE-Advanced, Purpose, Motivation, and Approach to 4G, LTE Architecture, Evolved Packet Core, LTE Resource Management, LTE Channel Structure and Protocols, LTE Radio Access Network	[1] p451
		Quiz 4 - Lecture 11 – Lecture 13	
15.	26-12-23	Long Range Communications, Satellite Parameters and Configurations Satellite Capacity Allocation Satellite Applications, Fixed Broadband Wireless Access, WiMAX/IEEE, Smart Grid	[1] p525
		Solving problems and ambiguities of students about the course	

*This syllabus is a guide for the course and any modifications to it will be announced in advance.*