

Identification	Subject (Code, title, credits)	ETR401 Wireless communication technology - 6 ECTS credits	
	Department	Physics and Electronics	
	Program (Undergraduate, Graduate)	Undergraduate	
	Term	Fall 2026	
	Instructor	MSc, Yusif Shamayev	
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	Phone:	+994776432030	
	Classroom/hours	11 Mehseti str. (Neftchilar campus)	
		Consultations	Saturday 13:00 – 14:00
Prerequisites	None		
Language	English		
Compulsory/ Elective	Compulsory		
Required textbooks and course materials	Textbooks: 1. Wireless Communication Networks and Systems; Cory Beard, William Stallings, 2015 2. Wireless Communications Systems; Randy L. Haupt, 2020 3. Wireless Communications; Andrea Goldsmith, 2005 4. Wireless Communication Systems: From Fundamentals to 6G — Ke-Lin Du & M. N. S. Swamy, 2021 5. Introduction to Wireless Communications and Networks: A Practical Perspective — Krishnamurthy Raghunandan, 2021 6. Enabling Technologies for Next Generation Wireless Communications — Usman Wajid, et al., 2021		
Course description	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.		
Course objectives	To provide students with a comprehensive understanding of the principles and fundamentals of wireless communication systems. To introduce different types of wireless communication technologies, including cellular, satellite, Wi-Fi, and emerging 5G/6G networks. To develop knowledge of radio wave propagation, modulation techniques, and signal transmission in wireless environments. To familiarize students with the design and analysis of wireless communication systems, including antennas, transmitters, and receivers.		
Learning outcomes	Upon successful completion of this course, students will be able to: • Demonstrate a thorough understanding of the principles and concepts underlying wireless communication systems. • Analyze and predict radio wave propagation, path loss, fading, and interference effects in various wireless environments. • Apply appropriate modulation, multiplexing, and coding techniques to design efficient wireless communication links. • Evaluate the performance of antennas, transmitters, receivers, and overall wireless systems in practical scenarios. • Critically assess and optimize wireless network performance, including coverage, capacity, and reliability. • Explain and differentiate modern wireless communication standards and technologies, including LTE, 5G, and emerging 6G systems. • Solve real-world problems in wireless system design, implementation, and network planning using analytical and simulation tools.		
Teaching methods	Case analysis		X
	Group discussion		X
	Lecture		X

Evaluation Criteria	Simulation		x
	Methods	Date/deadlines	Percentage (%)
	Midterm Exam		30
	Attendance	At each lesson	5
	Quizzes	2 quizzes during the semester	20
	Activity	During the semester	5
	Final Exam		40
	Total		100
Class Policy	▪ Preparation for class 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 on relevant problems and cases from the end of the chapter and sample exam questions. ▪ Withdrawal (pass/fail) This course strictly follows the grading policy of the School of Science and Engineering. 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. ▪ Cheating/plagiarism Cheating or other plagiarism during the Quizzes, Midterm, and Final Examinations will lead to paper cancellation. In this case, the student will automatically get zero (0) without consideration. ▪ Generative AI Policy GAI tools may not be used to complete or generate answers for quizzes, midterm exams, final exams, or other assessed work, unless explicitly authorized by the instructor. For activities where participation credit is given based on instructor-assigned tasks, students may use GAI to better understand the assignment and to help develop their own contributions. Submitted work must still reflect the student's own understanding, analysis, and intellectual input, and students remain responsible for the accuracy of any information obtained through GAI. Any permitted use of GAI must be properly acknowledged. ▪ Professional behavior guidelines The students shall behave in a way to create a favorable academic and professional environment during class hours. Unauthorized discussions and unethical behavior are strictly prohibited. ▪ Attendance Students who attend the whole classes will get 5 marks. for three absence student loses 1 mark. ▪ Quizzes There will be 2 quizzes in the semester. The quizzes will be announced in the classroom two weeks before and will relate to homework. ▪ Activity Students who will be active during discussion of past lessons will be awarded with one activity mark.		
Weeks	Topics		Reference to textbooks
1.	Introduction to Wireless Communications, The Global Cellular Network, The Mobile Device Revolution, Future Trends, The Trouble with Wireless. Satellite communication.		[1] p01 [2] p39 [3] p30
	Conduction of oral and written survey. Problem solving		[4] p47
2.	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		
	Communication Networks, LANs, MANs, and WANs, Switching Techniques, Circuit Switching, Packet Switching, Quality of Service		[1] p40

3.	Conduction of oral and written survey. Problem solving	
4.	Protocols and the TCP/IP Suite, The Need for a Protocol Architecture, The TCP/IP Protocol Architecture, The OSI Model, Internetworking Conduction of oral and written survey. Problem solving	[1] p62 [2] p428 [3] p564
5.	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
6.	The Wireless Channel, Antennas, Spectrum Considerations, Line-Of-Sight Transmission, Fading in the Mobile Environment Conduction of oral and written survey. Problem solving	[1] p156 [2] p139
7.	Signal Encoding Techniques, Signal Encoding Criteria, Digital Data, Analog Signals, Analog Data, Analog Signals, Analog Data, Digital Signals, Quiz 1 - Lecture 1 – Lecture 6	[1] 201
8.	Mid term exam	
9.	Orthogonal Frequency Division Multiplexing, 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 Conduction of oral and written survey. Problem solving	[1] p252 [1] p432 [1] p236 [3] p403
10.	Coding and Error Control, Error Detection, Block Error, Correction Codes, Convolutional Codes, Automatic Repeat Request Conduction of oral and written survey. Problem solving	[1] p273
11.	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 802.11i Wireless LAN Security 3	[1] p321 [3] p 564
12.	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 Conduction of oral and written survey. Problem solving	[1] p376
13.	Cellular Wireless Networks, Principles of Cellular Networks, First-Generation Analog, Second-Generation TDMA, Second-Generation, CDMA, Third-Generation Systems Conduction of oral and written survey. Problem solving	[1] p 409
14.	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 Quiz 2 - Lecture 9 – Lecture 13	[1] p451
15.	Long Range Communications, Satellite Parameters and Configurations Satellite Capacity Allocation Satellite Applications, Fixed Broadband Wireless Access, WiMAX/IEEE, Smart Grid Solving problems and ambiguities of students about the course	[1] p525

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

