ELEC4702 COURSE CATALOG INFO

Course Code : ELEC4702				**Course Name :** Digital Communication Systems			
Semester	**Lecture (Le+T+L)**	**Local Credit**	**ECTS**	**Language**	**Category**	**Instructional Methods**	**Prerequisites**
7 or 8	(3+0+0)	3	6	English	Elective	Lecture	ELEC3701
Course Content	Signal Spaces, conversion of continuous time channels into vector channels. Binary and M-ary signaling. Optimum detectors and probability of error. Digital modulation types, PAM, QAM, PSK, FSK, MSK. Differential modulation. Coherent and noncoherent detection. Multiuser communications: spread spectrum, CDMA and OFDM. Fundamental limits in communication: introduction to information theory. Error correcting codes.						
Course Outcomes	**CO 1.** Derive optimum detectors based on maximum likelihood (ML) and maximum a-posterior (MAP) probability criteria. **CO 2.** Obtain vector space equivalent representations of continuous time signals and channel models. **CO 3.** Evaluate the performance of different digital modulation and coding techniques. **CO 4.** Evaluate the fundamental limits in data compression and communication, and use methods to approach those limits. **CO 5.** Perform an introductory level analysis in advanced graduate topics, and awareness of the depth of communications as a field of graduate study.						

COURSE PLAN	
W1	Vector spaces, geometric representation of signals.
W2	Conversion of continuous time channels into vector channels.
W3	MAP and ML detection in Gaussian noise.
W4	Binary signaling. Optimum detector design for binary signals.
W5	Probability of error analysis for binary signals. Matched filter implementation of optimum detectors.
W6	M-ary signaling, detection, and probability of error.
W7	Passband modulation techniques (BPSK,QPSK, M-ary PSK), probability of error analysis
W8	Passband modulation techniques (QAM, FSK, MSK), probability of error analysis
W9	Band limited channels, Intersymbol Interference (ISI), signal design for no ISI, spectral shaping
W10	Fundamental limits in communication: introduction to information theory (Entropy, mutual information).
W11	Source coding and data compression.

W12	Channel capacity, channel coding.
W13	Error control coding.
W14	Error control coding.

COURSE ASSESMENT AND ECTS WORK LOAD			
Type of Work	**Count**	**ECTS WORK LOAD**	
		Time (Hour)(Including prep. time)	**Work Load**
Attendance	14	3	42
Final Exam	1	18	18
Quizzes		18	18
Term project			0
Reports			0
Final Project			0
Seminar			0
Assignments		14	14
Presentation			0
Midterms		30	30
Project			0
Laboratory		0	0
Tutorial		0	0
Other(Self study, Paper reviews)		28	28
		Total work load	150
		Total work load/25	6
		ECTS Credit	6

PROGRAM OUTCOMES - COURSE OUTCOMES RELATIONS		
PO	**Program Outcomes**	**CO**
1	**1.1.** Adequate knowledge in fundamentals of mathematics (algebra, differential equations, integrals, probability etc), science (physics, chemistry, biology etc.) and computer science (programming and simulation);	
	1.2. ability to use theoretical and applied knowledge in these areas in complex engineering problems.	
2	**2.1.** Ability to identify, formulate, and solve complex engineering problems;	1,..,4
	2.2. ability to select and apply proper analysis and modeling methods for this purpose.	1,..,4
3	**3.1.** Ability to design and integrate components of a complex system or process, as they relate to Electrical and Electronics Engineering discipline, under realistic constraints and conditions, in such a way as to meet desired requirements;	
	3.2. ability to apply modern design methods.	
4	**4.1.** Ability to devise, select, and use techniques and tools needed for analyzing and solving complex problems encountered in engineering practice;	
	4.2. ability to employ information technologies effectively.	
5	**5.1.** Ability to design experiments,	
	5.2. ability to conduct experiments, gather, analyze and interpret data.	
6	**6.1.** Ability to work in intra-disciplinary teams;	
	6.2. ability to work in multi-disciplinary teams;	
	6.3. ability to take individual responsibilities.	
7	**7.1.** Ability to effectively communicate via written and oral means;	
	7.2. knowledge of at least one foreign language;	
	7.3. ability to write effective reports and comprehend written reports;	
	7.4. ability to write design and manufacturing reports	
	7.5. ability to present effectively,	
	7.6. ability to give and follow clear instructions.	
8	**8.1.** Recognition of the need for lifelong learning;	

	8.2. ability to access information, to follow developments in science and technology, and to continue to educate him/herself.	
9	**9.1.** Consciousness to behave according to ethical principles, and about professional and ethical responsibility;	
	9.2. knowledge on standards used in engineering practice.	
10	**10.1.** Knowledge about business life practices such as project management, risk management, and change management;	
	10.2. awareness in entrepreneurship, innovation;	
	10.3. knowledge about sustainable development.	
11	**11.1.** Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering;	
	11.2. awareness of the legal consequences of engineering solutions.	

Revison Date	**Prepared by**	**Approved by**
1.9.2019 1.6.2021	Assist.Prof.Dr. Farshad Miramirkhani	Prof.Dr. Ahmet Aksen