ELEC4503 COURSE CATALOG INFO

Course Code : ELEC4503				**Course Name :** Introduction to Image Processing			
Semester	**Lecture (Le+T+L)**	**Local Credit**	**ECTS**	**Language**	**Category**	**Instructional Methods**	**Prerequisites**
7 or 8	(3+0+0)	3	5	English	Elective	Lecture	ELEC2501
Course Content	2-D sampling theorem, aliasing, and quantization. Fundamentals of color science. Human visual system. 2-D Block transforms. DFT, DCT and wavelet transforms. Image filtering. Edge detection. Image enhancement and restoration. Inverse problems and tomographic reconstruction. Image analysis including color and texture segmentation. image compression.						
Course Outcomes	**CO 1.** Describe the basics of 2D signal processing, convolution, filtering and sampling theory. **CO 2.** Apply 2D DFT and compute frequency response, histogram and entropy. **CO 3.** Analyze the practical applications of image enhancement techniques. **CO 4.** Analyze the performance of image filtering and coding techniques and integrate different coding tools and design compression algorithms. **CO 5.** Design and implement image enhancement, restoration, transformation and coding algorithms in MATLAB.						

COURSE PLAN	
W1	Introduction: Modalities and application areas. Human Visual System. Fundamental tasks: acquisition, processing, interpretation.
W2	Mathematical Preliminaries : 1-D signals and transforms. Probability theory and random variables.
W3	Mathematical Preliminaries : 1-D signals and transforms. Probability theory and random variables.
W4	2-D Signals and Systems: Continuous and discrete-time Fourier transform. Sampling, aliasing, quantization.
W5	2-D Signals and Systems: Continuous and discrete-time Fourier transform. Sampling, aliasing, quantization.
W6	2-D Signals and Systems: Continuous and discrete-time Fourier transform. Sampling, aliasing, quantization.
W7	Image Enhancement and Restoration: Contrast and histogram processing. Spatial and frequency-domain filtering. DFT and DCT transforms. Wiener filter. Noise models. Interpolation.
W8	Image Enhancement and Restoration: Contrast and histogram processing. Spatial and frequency-domain filtering. DFT and DCT transforms. Wiener filter. Noise models. Interpolation.
W9	Image Enhancement and Restoration: Contrast and histogram processing. Spatial and frequency-domain filtering. DFT and DCT transforms. Wiener filter. Noise models. Interpolation.

W10	Image Compression: Lossy vs. lossless coding. Predictive methods. Wavelets and transform coding.
W11	Image Compression: Lossy vs. lossless coding. Predictive methods. Wavelets and transform coding.
W12	Image Analysis: Edge and line detection. Segmentation. Pattern recognition. Feature extraction.
W13	Image Analysis: Edge and line detection. Segmentation. Pattern recognition. Feature extraction.
W14	Advanced Topics: Current state of research and technology in image processing.

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	20	20
Quizzes			0
Term project			0
Reports			0
Final Project			0
Seminar			0
Assignments		20	20
Presentation			0
Midterms		20	20
Project			0
Laboratory		0	0
Tutorial		0	0
Other(Self study, Paper reviews)		23	23
		Total work load	125

	Total work load/25	5
	ECTS Credit	5

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	Prof. Dr. Ümit Güz	Prof.Dr. Ahmet Aksen