

**ROBOTICS AND INTELLIGENT SYSTEMS MASTER PROGRAM  
COURSE SYLLABUS**

Course Details				
<b>Code</b>	<b>Academic Year</b>			<b>Semester</b>
RIS510	1			2
<b>Title</b>	<b>T</b>	<b>A</b>	<b>L</b>	<b>ECTS</b>
Digital Image and Signal Processing	3	0	0	7
<b>Language</b>	English			
<b>Level</b>	<b>Undergraduate</b>		<b>Graduate</b> x	<b>Postgraduate</b>
<b>Department / Program</b>	Robotics and Intelligent Systems			
<b>Forms of Teaching and Learning</b>				
<b>Course Type</b>	<b>Compulsory</b>		<b>Elective</b>	x
<b>Objectives</b>	Learning the current theories and techniques about image formation, enhancement, interpretation. To be able to extract information from the image, to determine the problems in the field and to produce solutions.			
<b>Content</b>	Digital Image Fundamentals, Intensity Transformations and Spatial Filtering, Frequency Domain Filtering, Reconstruction and Enhancement, Color Spaces, Various Transformations, Compression Methods, Segmentation, Feature Extraction, Classification			
<b>Prerequisites</b>				
<b>Coordinator</b>				
<b>Lecturer(s)</b>	Asst. Prof. Dr. N. Özben Önhon			
<b>Assistant(s)</b>				
<b>Work Placement</b>				
Recommended or Required Reading				
<b>Books / Lecture Notes</b>	Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Pearson, 2018. ISBN-10 : 1292223049			
<b>Other Sources</b>	-Digital Image Processing, Kenneth R. Castleman Englewood Cliffs, N.J. : Prentice Hall, 1996. ISBN: 0132114674 -Digital Image Processing, Bernd Jähne, Berlin ; New York : Springer, 2002. ISBN: 3540677542 -Multidimensional Signal, Image, and Video Processing and Coding, John W. Woods, Elsevier, 2006. ISBN: 0120885166 -Image Processing: Analysis and Machine Vision, Milan Sonka, Vaclav Hlavac, Roger Boyle, Thomson-Engineering; 2nd edition, 1998. ISBN: 053495393X			
Additional Course Material				
<b>Documents</b>				
<b>Assignments</b>				
<b>Exams</b>	Midterm, Final			
Course Composition				

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Mathematics und Basic Sciences		%20
Engineering		%60
Engineering Design		%20
Social Sciences		%
Educational Sciences		%
Natural Sciences		%
Health Sciences		%
Expert Knowledge		%

**Assessment**

Activity	Count	Percentage (%)
Midterm Exam	1	40
Quiz		
Assignments		
Attendance		
Recitations		
Projects		
Final Exam	1	60
<b>Total</b>		<b>100</b>

**ECTS Points and Work Load**

Activity	Count	Duration	Work Load (Hours)
Lectures	14	3	42
Self-Study	14	10	140
Assignments			
Presentation / Seminar Preparation			
Midterm Exam	1	8	10
Recitations			
Laboratory			
Projects			
Final Exam	1	8	10
<b>Total Work Load</b>			<b>202</b>
<b>ECTS Points (Total Work Load / Hour)</b>			<b>7</b>

**Learning Outcomes**

1	Learning the basic concepts of signal and image processing
2	Learning image creation, enhancement and information extraction algorithms

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3	Analyzing image processing problems and generating solutions
4	Implementation of algorithms using appropriate software programs
5	
6	
7	
8	
9	
10	
11	
12	

**Weekly Content**

1	Introduction (Electromagnetic Spectrum, Imaging Systems, Optical Resolution)
2	Signals and Systems Review
3	Linear Algebra and Probability Theory Review
4	Intensity Transformations, Spatial Filtering
5	Intensity Transformations, Spatial Filtering
6	2D Fourier Transform, Filtering in Frequency Domain
7	Filtering in Frequency Domain, Noise Types, Image Enhancement
8	Noise Types, Image Enhancement
9	Midterm
10	Color Spaces, Various Transforms, Compression Methods
11	Morphological Operations
12	Image Segmentation
13	Feature Extraction
14	Classification
15	Feature Extraction, Classification

**Contribution of Learning Outcomes to Program Objectives (1-5)**

	P1	P2	P3	P4	P5	P6	P7
1	5	5	5				
2	5	5	5				
3	5	5	5				

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4	5	5	5				
5							
6							
7							
8							
9							
10							
11							
12							

**Contribution Level** 1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High

**Compiled by:**

**Date of Compilation:**