



AYDIN ADNAN MENDERES UNIVERSITY COURSE INFORMATION FORM

Course Title		Spectral Imaging							
Course Code		MME622		Couse Level		Third Cycle (Doctorate Degree)			
ECTS Credit	9	Workload	225 (Hours)	Theory	3	Practice	0	Laboratory	0
Objectives of the Course		The aim of the course is to teach principles and applications of advanced digital image processing techniques for spectral image filtering, segmentation, compression, and registration							
Course Content		Principles and applications of advanced digital image processing techniques for spectral image filtering, segmentation, compression, and registration							
Work Placement		N/A							
Planned Learning Activities and Teaching Methods				Explanation (Presentation), Discussion					
Name of Lecturer(s)									

Prerequisites & Co-requisites

Language Requisite	Yes
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Assessment Methods and Criteria

Method	Quantity	Percentage (%)
Midterm Examination	1	40
Final Examination	1	60

Recommended or Required Reading

1	Geometric Partial Differential Equations and Image Analysis, YAZAR: Guillermo Sapiro date BASIM: February 2006, Cambridge Press ISBN: 9780521685078
2	Image Processing: Principles and Applications YAZARLAR: Tinku Acharya, Ajoy K. Ray BASIM: October 2005, Wiley ISBN: 978-0-471-71998-4

Week	Weekly Detailed Course Contents	
1	Theoretical	Partial Differential Equations for Filtering (Edge Stopping, Directional, Isotropic and Anisotropic Diffusion Filters)
2	Theoretical	Model based segmentation (Active Contours)
3	Theoretical	Explicit (Lagrangian) Geometric Curve and Surface Evaluation: Snakes, Applications and Limitations
4	Theoretical	Implicit (Eulerian) Geometric Curve and Surface Evaluation: Level Sets, Applications and Limitations
5	Theoretical	Variational Level Set Methods (Fast Marching)
6	Theoretical	Geodesic Curves and Minimal Surfaces (Minimal path and centerline extraction techniques)
7	Theoretical	Statistical Shape Modeling of Image and Volume Data (Shape representation, Shape Model Construction, Appearance models, Shape correspondence, Applications)
8	Intermediate Exam	Midterm exam
9	Theoretical	Texture extraction (Co-occurrence matrices, sum and different histograms, wavelets, curvelets, contourlets, brushlets)
10	Theoretical	Image Registration Techniques
11	Theoretical	Image Compression Techniques (Parameters of image compression, drawbacks of various methods, advantages of wavelet-based compression techniques, standard and new image formats, strength of new compression techniques)
12	Theoretical	Hyper-spectral and Multi-spectral imaging
13	Theoretical	Multi-dimensional Processing (Multi Planar Reconstruction, Curved and Oblique Sectioning, Volume Rendering, Surface Rendering, Maximum Intensity Projection)
14	Theoretical	Image Mining and Content Based Image Retrieval
15	Theoretical	Image Mining and Content Based Image Retrieval



16	Final Exam	Final exam
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Workload Calculation

Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	9	4	182
Assignment	1	5	1	6
Project	2	8	3	22
Midterm Examination	1	5	3	8
Final Examination	1	5	2	7
Total Workload (Hours)				225
[Total Workload (Hours) / 25*] = ECTS				9
*25 hour workload is accepted as 1 ECTS				

Learning Outcomes

1	Understanding the role of partial differential equations in image filtering
2	Understanding the role of partial differential equations in image segmentation
3	Understanding advanced techniques and applications of image registration
4	Understanding digital image compression standards and techniques
5	Having advanced knowledge and hands on experience on image processing techniques and applications

Programme Outcomes (Mechanical Engineering (English) Doctorate)

1	1. In Mathematics, natural sciences and mechanical engineering, department has the sufficient infrastructure; the ability to use the theoretical and practical information for engineering solutions
2	2. The ability to identify, define, and solve the formula for complex engineering problems; the ability to select and apply for the appropriate analytical methods and modelling techniques
3	3. To meet desired needs of a system, system component, or process, analysing and designing skill under realistic constraints; in this respect, the ability to apply the methods of modern design
4	4. The ability to use and choose modern techniques and tools for required engineering applications and; the ability to use information technology effectively
5	5. The ability to design the experiment, collect the data for the experiment and interpret to analysing results
6	6. The ability to use computer software and hardware information, access to information and other information sources
7	7. The ability to work individually and with multidisciplinary teams effectively, taking responsibility self-confidence for complex situations
8	8. The ability to communicate with foreign colleagues by having high level of foreign language knowledge in the field of engineering
9	9. Monitoring the science and technology developments and the ability to renew itself with innovative ideas constantly
10	10. Professional and ethical responsibility awareness
11	11. Having an adequate information and awareness in the subjects of occupational safety, occupational health, social security rights, quality control and management issues of environmental protection
12	12. The ability to appreciate the effects of engineering solutions and applications in universal and social dimensions
13	13. The ability to be enlightened to the experts or non-expert audience groups on the issues related with engineering problems and solutions written and oral
14	14. The ability to have adequate knowledge and skills in the project development and application, manage the activities planning, including the projects to the employees having the responsibility of the project by increasing vocational awareness

Contribution of Learning Outcomes to Programme Outcomes 1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High

	L1	L2	L3	L4	L5
P1	3	3	5	5	3
P2	4	4	4	4	4
P3	5	5	3	3	5
P4	5	5	3	3	5
P5	4	4	4	4	4
P6	3	3	5	5	3
P7	3	3	5	5	3
P8	4	4	4	4	4
P9	5	5	3	3	5
P10	5	5	3	3	5



P11	4	4	4	4	4
P12	3	3	5	5	4
P13	4	4	5	5	3
P14	5	5	4	4	4

