COURSE OUTLINE

(1) GENERAL

SCHOOL	Social Sciences		
ACADEMIC UNIT	Cultural Technology and Communication		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	PLR105	**SEMESTER**	5th
COURSE TITLE	Image Processing		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	2	3
Laboratories	2	2
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).	4	5

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Core Course/General Background
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.aegean.gr/courses/131107/

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

At the end of this course, the students will be able to:

- report with accuracy the basic characteristics of raster images and the input/output devices.
- Identify the basic kinds of digital images.
- Define the parameters of digital images
- Be aware of the basic principles of image processing (analog to digital signals, image digitization).
- Understand algorithms for: filtering, registration, binarization, image morphology, point operations, global operations, image denoizing, image segmentation.
- Be familiar with color theories, color models, transformations between color models, measurement codes and new technologies such as face detection, pattern recognition with image or video processing.
- Describe the basic theory of signal processing.
- Design algorithmic procedures for image and video processing.
- Composing algorithmic modules using modern freeware software (Scilab and related image processing, and image acquisition toolkits).
- Generate executable applications using modern freeware software (Scilab) and related libraries.

- Communicate efficiently their knowledge, to colleagues to establish fruitful co-operations for creating cultural informatics applications.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working in an interdisciplinary environment
- Production of free, creative and inductive thinking
- Transfer of know-how in other environments
- Working independently
- Practice Critical Thinking

(3) SYLLABUS

This lesson emphasizes on bitmap image processing and analysis, to improve the quality of the image and to extract all useful information. The latest techniques of image acquisition, segmentation, binarization and compression are also discussed analytically in the lectures. The course studies the basic concepts and techniques involved in grayscale and color image processing, as well. Upon the end of the semester, the student will be able to understand the structure of a digital image and the algorithmic ways that we can use to process and extract information from it. Specifically, the concepts of resolution and histogram are extensively studied. Then, the course focuses on pixel-based and edge-based segmentation. Next, the color spaces and transformations between them are analyzed in details. Finally, special techniques for image compression are described, such as the JPEG compression scheme. The course includes laboratory lessons to learn useful techniques in image processing software for image processing algorithmic applications.

The course is structured as follows:

1. Introduction to mathematical background
2. Digitiation – Sampling -Pixels
3. Basic principles of image processing
4. Kinds of digital image
5. Image file size
6. Histograms
7. Image filters
8. Image algebra
9. Compression – non lossless methods
10. Compression –lossless methods
11. Photogrammetry
12. Transformations
13. Course summary

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Use of open source software for laboratory education. Use ICT in teaching and communication with students (GIMP software).</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>13 *2 hours =26 hours</td></tr>
<tr><td>Lectures’ study</td><td>13*5 hours = 65 hours</td></tr>
<tr><td>Laboratory Practice</td><td>13*2 = 26 hours</td></tr>
<tr><td>Laboratory Preparation and semester assignment</td><td>30 hours</td></tr>
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<tr><td>Course total</td><td>147 hours</td></tr>
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<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>Students’ evaluation is performed at the end of the semester with written exams in the form of open questions that require critical thinking. These examinations during the periods of January and September are the major evaluating methods. Students’ performance is measured on a 1-10 scale (10: excellent). A final assignment for the course is released at the middle of the course, which is not mandatory, but it contributes to the final grade with a weighted percentage varying from 20% up to 40%.

Students are familiar with the evaluation criteria from the first course lecture. All lessons are stored in the course’s area in University e-class platform (eclass.aegean.gr).</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Χρήστος-Νικόλαος Αναγνωστόπουλος, ΕΠΕΞΕΡΓΑΣΙΑ ΨΗΦΙΑΚΩΝ ΕΙΚΟΝΩΝ: Αρχές και εφαρμογές στο πεδίο του χώρου, Εκδόσεις Τζιόλα, 2017, (αναμένεται ISBN).
- Νικόλαος Παπαμάρκος, Ψηφιακή Επεξεργασία και Ανάλυση Εικόνας, Αυτοέκδοση, 2010, ISBN 978-960-92731-3-8.
- R.C. Gonzalez, R.E. Woods, Ψηφιακή Επεξεργασία Εικόνας, εκδόσεις Τζιόλα, 2010, ISBN: 978-960-418-255-8.

- Related academic journals:

- IEEE Transactions on Image Processing, IEEE Society
- Image and Vision Computing, Elsevier
- Signal Processing: Image Communication, Elsevier
- International Journal of Computer Vision, Springer
- IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Society
- Pattern Recognition, Elsevier
- Computer Vision and Image Understanding, Elsevier
- Journal of Real-Time Image Processing, Elsevier
- Journal of Visual Communication and Image Representation
- Eurasip Journal on Advances in Signal Processing, Springer