COURSE OUTLINE

(1) GENERAL

SCHOOL	Social Sciences		
ACADEMIC UNIT	Cultural Technology and Communication		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	PLR 147	SEMESTER	8th
COURSE TITLE	Advanced Issues in 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*	Optional/Special 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/CT-PPS486/

(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 advanced characteristics of raster images.
- Define advanced 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 Artificial Intelligence-based algorithmic procedures for image and video processing.
- Composing algorithmic modules using modern freeware software (OCTAVE).
- 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

The course includes advanced issues of processing and analysis of digital images with the main purpose of extracting information about their content. The theoretical part of the course is accompanied by practical training in the computer laboratory using image processing software packages (Octave) and image sequencing using artificial intelligence.

The course is structured as follows:

1. Compression – lossless methods
2. Compression – lossy methods
3. Photogrammetry from images
4. Photogrammetry from video
5. Image Transformations
6. Scale Invariant Feature Transforms– SIFT-SURF
7. Stereo images – 3Δ images
8. Digital Watermarking
9. Frequency-based Image Processing – Fast Fourier Transform
10. Frequency-based Image Analysis - Fast Fourier Transform
11. Artificial Intelligence applications for image processing: YOLO
12. Artificial Intelligence applications for image processing: Teachable Machines
13. Course summary

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of open-source software for laboratory education. Use ICT in teaching and communication with students (OCTAVE).
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*	

Activity	*Semester workload*
Lectures	13 *2 hours =26 hours
Lectures' study	13*5 hours = 65 hours
Laboratory Practice	13*2 = 26 hours
Laboratory Preparation and semester assignment	33 hours
Course total	***150 hours***

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.*	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).

(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