COURSE OUTLINE

(1) GENERAL

SCHOOL	Social Sciences		
ACADEMIC UNIT	Cultural Technology and Communication		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	PLR144	SEMESTER	6th
COURSE TITLE	3D Digitization and Visualization		

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/131362/

(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:

- Identify the basic principles of 3D Graphics and Mixed Reality.
- Define the essential parameters of photogrammetry.
- Be aware of the basic principles of remote sensing operations.
- Be familiar with elementary techniques of processing 3D graphics and 3D point clouds acquired from photogrammetry and/or remote sensing.
- Be aware of new technologies for Monument (small and/or large scale) documentation
- Design and prepare the necessary steps for Monument scanning using terrestrial scanners, UAV/drones and portable scanners.
- Composing and registering multiple 3D point clouds and 3D graphics to a single view.
- algorithmic modules using modern freeware software (Scilab and related image processing, and image acquisition toolkits).
- Generate executable applications using modern freeware software 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 analyses Digital Culture applications with emphasis on 3D data Visualization for creating Mixed Reality environments and 3D printing files. In the first part of the course, the students with acquire the fundamental knowledge for 3D Visualization through the theory of photogrammetry and the respective software. The second part of the course deals with the latest 3D data Visualization technologies, including the use of terrestrial 3D scanners, UAV/drones and portable 3D scanners, as well as the successful data registration of multiple 3D point clouds and 3D views.
In the
In the context of the course issues related to efficient documentation and promotion of Cultural Monuments with the latest equipment, as well as the production of Digital Environments for Mixed Reality Applications. The laboratory includes: 1) the use of appropriate software for photogrammetry and cloud management of objects of cultural interest and 2) demonstration and use of the necessary equipment (3D scanners).
The lessons are structured as follows:

1. Introduction
2. Photogrammetry - 3DFZephyr
3. Management of 3D model - Meshlab
4. 3Δ printing
5. Mixed Reality
6. Sketchup
7. Sketchup – Photo match
8. Sketchup drawing using top views and sections
9. Point clouds – CloudCompare
10. Modeling with 3D terrestrial scanners and UAV
11. Virtual Reality application - Unity
12. Augmented reality application - Unity
13. Native mobile application - Unity

(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 or software with free license for Universities. Use ICT in teaching and communication with students (3DFZephyr, Sketchup, CloudCompare, Unity, Meshlab).
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*3 hours = 39 hours
Laboratory Practice	13*2 = 26 hours
Laboratory Preparation and semester assignment	50 hours
Course total	***141 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 with 4 mandatory assignments, weighted with 20%, 20%, 20% and 40%. All lessons are stored in the respective in University e-class platform (eclass.aegean.gr).

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Κουτσούδης Ανέστης , Παυλίδης Γεώργιος, «3Δ ΨΗΦΙΟΠΟΙΗΣΗ», Εκδόσεις Τσότρας, 2016.
- Π. Πατιάς, "Εισαγωγή στη Φωτογραμμετρία", Εκδόσεις Ζήτη, 1993.
- Θεοχάρης Θ., Πλατής Ν., Παπαϊωάννου Γ., Πατρικαλάκης Ν., "Γραφικά και Οπτικοποίηση", Εκδόσεις Αθανασόπουλος, 2010.

- Related academic journals:

- Digital Applications in Archaeology and Cultural Heritage
- Computer Animation and Virtual Worlds, Wiley
- IEEE Computer Graphics and Applications
- IEEE Transactions on Visualization and Computer Graphics
- Journal of Visual Communication and Image Representation
- International Journal of Remote Sensing, Taylor & Francis
- Remote Sensing, MDPI