COURSE OUTLINE

(1) GENERAL

SCHOOL	POLYTECHNIC		
ACADEMIC UNIT	ARCHITECTURE		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	ARC_304	**SEMESTER**	2nd
COURSE TITLE	SUSTAINABILITY AND THE ENVIRONMENT 2		

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**
	2	2
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	specialised general knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	

(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*

Learning outcomes aim to introduce sustainability and environmental concerns through computer simulations as an integral part of architectural thinking. Upon successful completion of the course, students will be able to demonstrate:
- A critical understanding of the concept of sustainability in social ecosystems and the different ways in which it is defined in relation to architecture and the environment.
- A basic understanding of systems thinking and how it can be applied to approach sustainability issues through agent-based simulations.
- Application of the causal loop analysis method for analyzing complex socio-technical systems.
- Analytical and critical thinking skills
- Broad understanding of current trends in intelligent mobility systems and critical understanding of their potential.
- Ability to retrieve, select and critically evaluate information from a variety of sources related to questions and topics discussed in the course.
- Ability to think independently while working in teams.

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 independently
- Team work
- Working in an interdisciplinary environment
- Respect for the natural environment
- Criticism and self-criticism
- Production of free, creative and inductive thinking
- Communication skills
- Capacity for critical thinking

(3) SYLLABUS

From microgrids and urban farms to electronic markets and mobility on demand systems, information technology allows users of connected systems to share, exchange and use resources in more sustainable ways. Yet, understanding how such ecosystems function and perform requires ability to simulate their behavior through models and use the models to pose questions and explore scenarios. The course ARC304 is a continuation of ARC303. It approaches sustainability in social systems as a macroscopic outcome of individual interactions focusing on issues of smart cities, mobility on demand systems, human-machine ecologies, self-organization and commons. Classes will combine discussions with students, lectures, demonstrations with computer simulations and occasionally guest lectures. Each class will focus on a theme, spending the first half on a discussion on the readings and the next half on a lecture or simulation demo on the topic. The discussion will be organized and based on short critical positions on the readings from each team that will be posted as blog entries in the course website the day before each class meeting from each team.

Topics

- Connected, sustainable cities
- Computational sustainability
- Human-machine ecosystems
- Landscape automation and robotic farming
- Hyperloop and mobility on demand systems
- Individuals, crowds and self-organization
- Commons and sharing
- Agent based simulations
- Markets and social networks

Assignment

Each team will identify a human-machine ecosystem, a NetLogo model that describes it, and a sustainability question that relates to it. The model may constitute the starting point but students are expected to modify its code according to their topic and question. The team must identify a metric, explore what parameters and how influence the metric, and propose scenarios and policies through the computer program.

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 ICT in teaching and communication with students. Support of learning through the e-learning platform e-class. Demonstration of use of software for system dynamics modeling and simulation.</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>20</td></tr>
<tr><td>Seminars - Educational visits</td><td>10</td></tr>
<tr><td>Presentations - Discussions</td><td>30</td></tr>
<tr><td>Independent study - Bibliographical research - Project</td><td>40</td></tr>
<tr><td>Course total
(25 hours = 1ECTS)</td><td>100</td></tr>
</table>
</td></tr>
<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>Language of evaluation: Greek, English.

Evaluation of students will be based on weekly responses to the readings (20%), two interim project presentation (30%) and a final project presentation (30%).

The evaluation procedure and criteria are presented to students in the first lecture and in the assignment descriptions that are being distributed. Any changes are announced in advance and are included in the course website and in the assignment descriptions.</td></tr>
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(4) ATTACHED BIBLIOGRAPHY

Readings

Mitchell, William J. 2012. “Boundaries / Networks.” In *Constructing a New Agenda: Architectural Theory 1993-2009*, edited by A. Krista Sykes. Princeton Architectural Press. https://monoskop.org/media/text/CNA/#filepos521087.

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Waldrop, M. Mitchell. 2018. “Free Agents.” *Science* 360 (6385): 144–47. https://doi.org/10.1126/science.360.6385.144.

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Wilensky, Uri. 2001. “Modeling Nature’s Emergent Patterns with Multi-Agent Languages.” In *Proceedings of the EuroLogo 2001*. Linz, Austria. https://ccl.northwestern.edu/2013/mnep9.pdf.

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Pentland, Alex (Sandy). 2010. "To Signal is Human." American Scientist 98 (3): 204-211.

Papanikolaou, D. and Larson K. Constructing Intelligence in Point-to-Point Mobility Systems. In Proceedings of the 9h International Conference of Intelligent Environments (Athens, Greece, 18-19 July 2013)

Forrester, Jay Wright. 1969. Urban Dynamics. Cambridge, Mass.: M.I.T. Press.

Sterman, John. 2002. "All Models are Wrong: Reflections on Becoming a Systems Scientist." System Dynamics Review 18 (4): 501.

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