**COURSE OUTLINE**

1. **GENERAL**

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| **SCHOOL** | SCHOOL OF ENGINEERING |
| **ACADEMIC UNIT** | DEPARTMENT OF CIVIL ENGINEERING  |
|  | UNIVERSITY OF PATRAS |
| **POSTGRADUATE PROGRAM: TITLE** | Master’s Degree "Design of Resilient, Sustainable and Intelligent Infrastructures". Tracks:(A) Resilient Materials, Structures and Geotechnical Infrastructures,(B) Hydraulic and Environmental Engineering for Sustainable Infrastructures, and (C) Intelligent Systems in Transportation and Construction Project Management |
| **LEVEL OF STUDIES** | POSTGRADUATE PROGRAM |
| **COURSE CODE** | Α16011 | **SEMESTER** | AUTUMN (A’) |
| **COURSE TITLE** | Advanced Materials and Retrofitting Techologies |
| **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** |
|  | 3 | 7.5 |
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| *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* | Special background |
| **PREREQUISITE COURSES:** |  |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | Yes |
| **COURSE WEBSITE (URL)** | https://eclass.upatras.gr/courses/CIV1507/ |

1. **LEARNING OUTCOMES**

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| **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*
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| Upon successful completion of the course, the student will:* Learn the basic mechanical behavior characteristics of materials (concrete, steel, masonry, timber), with an emphasis on extreme actions.
* Learn the technological and mechanical properties of advanced structural materials (advanced cement-based materials, high-performance steel, composites), with a focus on extreme actions.
* Learn the pathology, damage mechanisms, and non-destructive testing techniques for existing concrete, masonry, steel and timber structures.
* Learn materials and techniques for strengthening and seismic retrofitting of structures, with a focus on recent developments.
* Learn the detailing and practical execution aspects related to the application of advanced composites as strengthening materials of concrete, masonry and timber structures.
* Apply analytical models in the design of retrofitting for concrete, masonry and timber structures, with a focus on advanced composites (polymer-based or cementitious).
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| **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* *Adapting to new situations* *Decision-making* *Working independently* *Team work**Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*  | *Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking**……**Others…**…….* |
| * Search for analysis and synthesis of data and information, with the use of the necessary technology.
* Work independently.

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1. **SYLLABUS**

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| 1. Basic mechanical behavior characteristics of materials (concrete, steel, masonry, timber), with an emphasis on extreme actions.
2. Technological and mechanical properties of advanced structural materials (advanced cement-based materials, high-performance steel, composites), with a focus on extreme actions.
3. Pathology, damage mechanisms, and non-destructive testing techniques for existing concrete, masonry, steel and timber structures.
4. Materials and techniques for strengthening and seismic retrofitting of structures, with a focus on recent developments.
5. Detailing and practical execution aspects related to the application of advanced composites as strengthening materials of concrete, masonry and timber structures.
6. Analytical models in the design of retrofitting for concrete, masonry and timber structures, with a focus on advanced composites (polymer-based or cementitious).
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1. **TEACHING and LEARNING METHODS - EVALUATION**

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| **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* | Support of the learning process through the electronic platform “eclass”. Use of .pptx presentations and videos. Computer programming for the solution of problem sets. |
| **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* |

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| ***Activity*** | ***Semester workload*** |
| Lectures | 40 |
| Problem sets | 45 |
| Self-study | 102.5 |
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| *Course total*  | ***187.5*** |

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| **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.* | Language of evaluation: GreekEvaluation algorithm: F = 0.7\*FE + 0.3\*PSFE = Final examPS = Average grade in Problem Sets |

1. **ATTACHED BIBLIOGRAPHY**

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| Triantafillou, T. C. (2006) «Strengthening of Reinforced Concrete and Masonry Structures with Composite Materials», Class Notes in electronic format (uploaded in eclass).Extensive series of journal papers and reports in electronic format (uploaded in eclass).  |