**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** | \*\*\*\* | **SEMESTER** | SPRING (B’) |
| **COURSE TITLE** | New Technologies and Monitoring for Designing Resilient Geotechnical Structures. |
| **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 and Tutorials | 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* | Specialised General Knowledge  |
| **PREREQUISITE COURSES:** | There are no prerequisite courses. It is anticipated, however, that students should have background of Soil Mechanics and foundations |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | Greek. |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | Yes |
| **COURSE WEBSITE (URL)** | \*\*\* new web site \*\*\* |

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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| At the end of this course the students will be able to:1. Select new materials and methodologies for the optimal design of geotechnical structures.
2. Choose an optimal and cost effective monitoring system during the construction or operation phase of geotechnical structures.
3. Will be able to develop finite element models for decision making based on the observed behavior during the construction phase of high performance geotechnical structures (embankments, deep excavation supports, etc.)
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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* Production of new research ideas
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1. **SYLLABUS**

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| **1. INTRODUCTION**Introduction to the basic concepts of the course and in particular to the presentation of new materials and methods of monitoring of reinforced - light embankments**2. NEW MATERIALS IN GEOTECHNICAL ENGINEERING**Introduction of new materials (geofoams, geosynthetics) and their engineering properties for the construction of Resilient earth fills (reinforced, lightweight).**3. NEW TECHNOLOGIES FOR MONITORING**New technologies for monitoring the behavior of geotechnical structures (inclinometers, tilt meters, piezometers, load cells, etc.) **4. UTILIZATION OF MONITORING RESULTS**Utilization of monitoring results for the evaluation & optimization of resilient geotechnical structures (deep excavations, earth fills, etc.).**5. FINITE ELEMENT MODELING**Incorporation of monitoring results in decision making process during construction of resilient geotechnical structures using Finite Element modeling. |

1. **TEACHING and LEARNING METHODS - EVALUATION**

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| **DELIVERY***Face-to-face, Distance learning, etc.* |  |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY** *Use of ICT in teaching, laboratory education, communication with students* |  |
| **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 & Tutorials | 39 |
| Project | 100 |
| Hours for private study | 48.5 |
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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.* | 1. Written exams which include problem solving (20%)2. Project evaluation (80%) |

1. **ATTACHED BIBLIOGRAPHY**

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| *- Suggested bibliography:*1. Koerner, R. M., (2012), “Designing with geosynthetics”, 6th edition, Xlibris Corporation, 2012
2. NCHRP, (2004),”Guideline and Recommended Standard for Geofoam Applications in Highway Embankments”, Report 529, Transportation Research Board, Washington, D. C., 2004
3. Dunnicliff, J. (1993) “Geotechnical Instrumentation for Monitoring Field Performance”, John Wiley & sons, 1993
4. Lees, A., (2016),” Geotechnical Finite Element Analysis: A Practical Guide”, ICE Publishing, 2016
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