**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** | | AUTUMN (A’) | |
| **COURSE TITLE** | STOCHASTIC DYNAMICS OF 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** |
|  | | | 3.0 | | 7.5 |
|  | | |  | |  |
| *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* | Strong background in Applied Mathematics (Advanced Calculus, Linear Algebra, Ordinary Differential Equations)  Theory of Probability | | | | |
| **PREREQUISITE COURSES:** | DYNAMICS OF STRUCTURES  THEORY OF PROBABILITY  ADVANCED CALCULUS – LINEAR ALGEBRA – ORDINARY DIFFERENTIAL EQUATIONS | | | | |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | English | | | | |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | YES | | | | |
| **COURSE WEBSITE (URL)** | https://eclass.upatras.gr/courses/CIV1549/ | | | | |

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* | |
| The course objective is to familiarize students with the elegant and powerful theory of Random Vibrations of Structural Systems (with discrete degrees of freedom) with particular emphasis on the analysis of such systems to earthquake excitations. | |
| **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…*  *…….* |
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1. **SYLLABUS**

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| Topics covered by the course include:   * Theory of Random Processes [Specification of Random Processes; Stationary (Homogeneous) Random Processes; Expected Values: Moments; Differentiation and Integration of a Random Process; Spectral Representation of a Random Process; Non-stationary (evolutionary) Random Processes] * Some Important Random Processes [Gaussian, Poisson, and Markov Random Processes] * Further Properties of Random Processes [Threshold Crossings; Peak Distribution; Envelope Distribution; First-Passage Time; Maximum Value of a Random Process in a Time Interval] * Linear Structures with Single Degree of Freedom (SDOF) [System Response to Random Excitation; Weakly Stationary Excitations; Non-stationary Excitations] * Linear Structures with Multiple Degrees of Freedom (MDOF) [General Analytical Framework] * Structural Failures Resulting from Dynamic Response and Related Topics [First-Excursion Failures; Fatigue Failures] * Response of Nonlinear Structural Systems [Method of Equivalent Linearization – Hysteretic Systems] |

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

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| **DELIVERY** *Face-to-face, Distance learning, etc.* | In-class teaching |
| **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* | |  |  | | --- | --- | | ***Activity*** | ***Semester workload*** | | Reading | 130 | | Homework | 60 | | Take-home Exam |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | | *Course total* | 190 | |
| **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 are evaluated based on their HW performance (40%) and their Take-Home Exam performance (60%) |

1. **ATTACHED BIBLIOGRAPHY**

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| *- Suggested bibliography:*  Complete set of NOTES posted on the site of the course  TEXTBOOK:  *NIGAM, N.C. (1983), Introduction to Random Vibration*, MIT Press.  For a detailed Reading List see the course syllabus posted at the site of the course. |