IPS Instituto Politécnico de Setúbal
Escola Superior de Tecnologia do Barreiro

Curriculum Unit Sheet

Structural Safety Evaluation of Buildings

Academic Year:

2018/2019

Course	Master's degree in Conservation and Rehabilitation								
Scientific Area	Conservation and Rehabilitation								
ECTS Credits	6	**Curriculum Unit code**	ASEE	**Year**	1	**Semester**	1	**Type**	Compulsory
Prerequisites									

Contact Hours:

Lecture Sessions		**Lecture-Practical Sessions**	45	**Practical and Laboratory Sessions**	
Tutorial		**Placement**		**Seminar**	
Fieldwork		**Other**	7,5	**Autonomous Study**	109,5

Responsible	Cristina Cruz Ferreira de Oliveira	**Position**	Adjunct Professor
Lecturers		**Position**	

Learning Outcomes

It is intended to initiate the students in the basis of structural analysis of buildings, with identification of the existing actions and definition of the combinations of actions to consider in the design. Additionally, an introduction to the dynamics of structures and seismic engineering is given, in order to be able to provide an estimate of the seismic action to be considered in the design. This curricular unit aims for the students to be able to define methodologies and calculation models to be used in the verification of the safety and analysis of an existing structure.

Syllabus

1. Introduction. Need for intervention. Definition of intervention level and basis for analysis and design
2. Structural Safety. Actions and combinations of actions in existing structures.
3. Dynamics of Structures. Characterization of a dynamic problem. Introduction to the formulation of the equations of motion. Natural frequency of vibration and resonance
4. Introduction to Seismic Engineering. Basic concepts of seismology. Definition of the seismic action. Simplified methods of seismic analysis
6. Analysis and Security Check of Existing Structures. Geometry. Topology. Materials and their properties. Simplified modeling and analysis of old structures

Teaching Methodologies

General demonstrations using presentations (with images and animations) in Power Point. Presentation of solved examples. Resolution in class and autonomous of proposed theoretical-practical problems

Evaluation

The evaluation performed throughout the operation of the CU is composed of two practical works and one test. For students who do not achieve achievement during continuous assessment, a final exam will be conducted. Test / Exam Normal Season - minimum score 8.0 values, weight 40%. Works - minimum grade 9.50 values, weight 60%. Special season and interim season: minimum score 9.50 values, weight 100%.

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Evidence of the syllabus coherence with the curricular unit's intended learning outcomes	Firstly, the basis of the analysis of structures are exposed, after which structural dynamics is introduced, for any dynamic action. Students will study the linear dynamic response of a structure corresponding to an oscillator of a single degree of freedom, in the time domain, and assimilate the concepts of frequency, natural vibration, damping and dynamic amplification. The problems of Seismic Engineering are also discussed. The seismic action and the phenomena influenced by it are studied, so that the student can gain a global view of the problem. Particular attention is given to the problems involved in the seismic behavior of buildings, particularly regarding the rehabilitation of existing structures, indicating solutions to be recommended in the rehabilitation / seismic protection of structures
Evidence of the teaching methodologies coherence with the curricular unit's intended learning	The presentation of the subjects with animations and photographs, besides the presentation of the mathematical expressions (with the deduction thereof), allows to motivate the students. The manual resolution of problems allows the connection between the theoretical subjects and their practical application, which belongs to the context of polytechnic teaching. The laboratory classes, using physical didactic models, aim to facilitate the assimilation of basic concepts of structure dynamics (natural frequency of vibration and resonance). The realization of individual practical work aims to facilitate the acquisition of the previously stipulated competences. In this way, the student is encouraged to autonomously learn, individually, at home, and in small groups, or individually, in tutorial sessions in the classroom.
Bibliography	EN 1990 – Eurocode: Basis of Structural Design. EN 1998-1 Eurocode 8: Design of structures for earthquake resistance – Part 1 – General rules, seismic actions and rules for buildings. Beer, F. P.; Johnston, E. R.; Eisenberg, E. R. – Mecânica Vectorial Para Engenheiros. Estática. McGraw-Hill de Portugal, Sétima edição, 2006. Neto, P. – Análise da Estatia de uma Estrutura, 28 pp, ESTBarreiro/IPS, Julho de 2005. Ferreira, P. – Equilíbrio de Estruturas no Plano e no Espaço, ESTBarreiro/IPS, Fevereiro de 2007. Brito, A. - Análise de Estruturas Isostáticas. Ferreira, P. – Diagramas de Esforços Internos em Peças Lineares, ESTBarreiro/IPS, Fevereiro de 2007. Bibliografia adicional: Chopra, A. K. (2006) – Dynamics of Structures – Theory and applications to earthquake engineering, 3rd edition. Prentice Hall. Clough, R. W.; Lopes, M. – Coordenador (2008) – Sismos e Edifícios. Edições Orion.
Observations	