Course file

Study cycle	BACHELOR IN CIVIL ENGINEERING		
Course	Physics for Civil Engineers	Mandatory	☒
		Optional	☐
Course scientific area	CIVIL ENGINEERING	Category	B

Course category: B - Basic; C - Core Engineering; E - Specialization; P - Complementary.

Year: 2nd	Semester: 3rd		ECTS: 4		Total: 108
Contact time	T:	TP: 45	PL:	S:	OT:

T - Lectures; TP - Theory and practice; PL - Lab Work; S - Seminar; OT - Tutorial Guidance.

Course Director	**Title**	**Position**
Maria Ana Viana Baptista	Agregado	Professor Coordenador

Learning objectives (knowledge, skills and competences to be developed by students)
(max. 1000 characters)
To help students to acquire knowledge on Mechanical Vibrations, Waves, and Fundamentals of Acoustics and Optics. The student must be able to: identify / characterize different types of oscillatory motion of systems with one degree of freedom, compute natural frequencies and resonance frequencies. Concerning wave motion the students must be able to determine the fundamental characteristics of the waves: amplitude, wavelength, period/frequency and speed; calculate wave functions. The students must acquire knowledge on the fundamental concepts of acoustic; they must calculate the intensity of a sound, they must be familiar wuth the decibel scale, and understand the Doppler effect. Finally, they must understand the phenomena of reflection and refraction of light, and improve their knowledge on the optical properties of materials;

Syllabus
(max. 1000 characters)
Oscillatory motion: oscillator with one degree of freedom, damped free and forced oscillations; study of resonances Wave Motion: Mechanical waves; Transverse and longitudinal waves; Inteference reflexion and transmission of waves; Energy transport in a wave. Stationary waves. Acoustics: sound waves; inensity and power of sound; Decibel scale; Threshold of human hearing, audible

frequencies; Doppler effect.

Optics: Nature of light; Geometrical optics. Reflexion, Refraction and Dispersion of light. Huygens principle.

Demonstration of the consistency between the syllabus and the course objectives

(max. 1000 characters)

The purpose of the disciplines of physics is to provide engineering students knowledge on concepts and basic principles that enable them to understand a wide variety of applications in the real world . The mechanical oscillations are of paramount importance to civil engineering to study the behavior of buildings, bridges etc subject to the action of periodic agents (wind induced oscillations or seismic action), and understand disasters caused by resonance phenomena. The wave motion is closely related to the phenomenon of vibration. There are many phenomena whose explanation requires the understanding of the concepts of vibration and wave. The study of propagation of water waves is important for hidraulic studies. Understanding the propagation of sound is important for acoustic building isolation. The nature of light and its properties is a crucial topic for any engineering student.

Teaching methodology (evaluation included)

(max. 1000 characters)

The course has mainly theoretical/pratical (TP) lessons and two lab experiments. In TP classes the subjects are presented and discussed, using examples and problem solving. Laboratory experiments of application of selected topics facilitate the full understanding of concepts. Students can choose between final exam or continuous assessment.

Final grade:

Continuous: 10% (laboratory) + 90% (average of tests)

Final exam: Classification of the examination

Demonstration of the consistency between teaching methodology and the course learning objectives

(max. 3000 characters)

Lectures are intended to provide students with the necessary tools for describing and predicting events and / or sequences of events. Their discussion and examples aimed at understanding the assumptions underlying a particular theory or formalism and what their limitations. In this context, laboratory classes play a key role.

The training in the rigorous formulation and problem solving is acquired in practical classes. Among the proposed problems, some include simple engineering devices, which tend to arouse more interest in students, and exemplify the relevance of physics in engineering.

Main Bibliography

(max. 1000 characters)

Serway, R.A., Beichner, R.J., 2000. Physics – For Scientists and Engineers with Modern Physics. Saunders College Publishing.

Some materials and solved problems available on Moodle