Strengthening Educational Capacities by Building Competences and Cooperation in the Field of Noise and Vibration Engineering S E N V I B E

Report on Tailor-Made Learning Goals and Outcomes

Learning goals and outcomes for students of six engineering departments

Activity 1.2

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Content:

1. Introduction

The project SENVIBE 'Strengthening Educational Capacities by Building Competences and Cooperation in the Field of Noise and Vibration Engineering' (598241-EPP-1-2018-1-RS-EPPKA2-CBHE-JP):

https://senvibe.uns.ac.rs/

has been approved for financing under the call Erasmus+ Capacity Building in Higher Education EAC/A05/2017, and will be coordinated by University of Novi Sad (UNS) during the period 15 November 2018 – 14 November 2021.

The wider aim of the SENVIBE project is to improve and build national educational capacities, cooperation and competences in dealing with environmental and occupational Noise and Vibration (No&Vib) engineering issues in accordance with ongoing EU integration strategies and the needs identified in Serbia.

One of the specific objective of the SENVIBE project is to modernise four existing courses in the field of No&Vib, as well as to develop and implement two new courses tailor-made for students of undergraduate programmes of different engineering departments (existing: Environmental Engineering, Occupational Safety Engineering, Mechanical Engineering, Electrical Engineering; new: Civil Engineering and Traffic Engineering).

Work package (WP) 'Development of modules and courses for different engineering departments' (WP3) is concerned with the redesign of four existing courses on No&Vib for students of undergraduate programmes of four engineering departments and the development of two new ones.

In order to carry out the redesign/development of these courses, the corresponding tailor-made outcomes need to be defined. These tailor-made outcomes represent the main aim of the second task of the SENVIBE project (Task 1.2[1]) and this Report is its deliverable. Four partnering higher education institutions from Serbia contain all of the courses: UNS includes all of them; University of Nis (UNI) contains only one of them but with a considerable number of students; University of Kragujevac (UniKG) has two of them, but with smaller number of students; and EDUCONS University (UESK) includes only one of them with a smaller number of students. These outcomes will be available after the redesign of existing courses (Task 3.1) and the design of new ones (Task 3.2) on the web-site of each Serbian higher education institutions, where all of the courses are published on-line with clear indication of novelty and the project graphical identity. The outcomes will also be shared with other higher education institutions in Serbia during dissemination events.

This report contains:

    a) Tailor-made learning goals and outcomes for students of six engineering departments (Section 2);

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[1] The task can be seen at the website of the SENVIBE project, web-site https://senvibe.uns.ac.rs/about/#Outcomes.

b) Tailor-made learning goals and outcomes for short modules for students of different engineering departments (Section 3).

Tailor-made learning goals and outcomes for students of six engineering departments are given in two parts:

a) common learning goals and outcomes for all six engineering departments; these common learning outcomes cover 60% of all outcomes;

b) specific learning goals and outcomes for all six engineering departments; these specific learning outcomes cover the rest of 40% of all outcomes.

The learning outcomes clearly state the outcomes of theoretical parts, and especially of lab exercises, taking into account the possibility to acquire them through e- or b-teaching/learning methodologies.

The Report is made based on the Report 'Survey and comparison of Serbian and EU education in Noise and Vibration' developed within the scope of the second task of the SENVIBE project (Task 1.2) and the analysis of:

a) information about the higher education system in Serbia and education in the No&Vib fields in Serbia, at both public and private universities;

b) information about the higher education system in EU and education in Acoustics and Vibration Engineering, as well as three representative undergraduate programmes in Sound and Vibration in EU.

Learning goals and outcomes are also developed based on general and subject-specific competencies that students should acquire by completing the undergraduate study programme at the appropriate engineering departments. The student competencies are specified by regulation on standards and procedures for study programmes accreditation in Serbia[2] as follows:

a) general competencies

   – analysis, syntheses and forecasting solutions and consequences;

   – mastering methods, procedures and research processes;

   – development of critical and self-critical judgement and approach;

   – application of knowledge in practice;

   – development of communication skills and proficiencies, as well as cooperation with a narrower social and international environment;

   – professional ethics.

b) subject-specific competencies

   – basic knowledge and understanding of the discipline of the relevant profession;

   – solving specific problems using scientific methods and procedures;

- connecting basic knowledge obtained from different fields and their applications;

- monitoring news and trends in the field and applying them in the profession;

- development of skills and proficiencies for using the knowledge in appropriate field;

- use of the informational-communication technologies in mastering the knowledge of the respected area.

- Practical use of instrumentation and subsequent data analysis for courses involving practical exercises

2. Tailor-made learning goals and outcomes for students of six engineering departments

REMARK 1: It is assumed that each course is taught during a semester that lasts 15 weeks.
REMARK 2: The activities for defining separate parts of each course are led by different universities: Noise (UNI, UniKG) and Vibration (UNS).
REMARK 3: Besides defining learning outcomes, the following tables also clearly state the outcomes of theoretical parts, and especially of lab exercises, taking into account the possibility to acquire them through e- or b-teaching/learning methodologies.

Engineering Department	All
Educational goals	To equip students with the knowledge, understanding and application of noise and vibration principles and phenomena that underpin prudent use of the corresponding theoretical framework, computer software and experimental techniques.
Educational outcomes	By the end of the course, students should be able to: • identify and examine real noise and vibration issues; • recognize noise and vibration sources and phenomena and evaluate them through measurements; • suggest measures to solve noise and vibration problems.
Teaching methods (follow the format given)	Lectures; Tutorial classes; Laboratory classes; Assignments.
Notes on course content and appropriate teaching/learning methodologies	E- or b-teaching/learning methodologies should be used to enable students not only to achieve the Educational outcomes defined but also to acquire Transferable and Generic Skills described in the Comments below.
Comments	The following Transferable and Generic Skills should be developed: • translate mathematical formulations into computer codes; • question the validity of modeling assumptions in the light of experimental data.

Engineering Department	Occupational Safety Engineering	
Educational goals	To enable students to comprehend knowledge of: human responses to noise and vibration in working environment and their effects on human body, as well as to integrate this knowledge into relevant practical applications in the field of Occupational Safety Engineering.	
Educational outcomes	By the end of the course, students should be able to: • understand the human responses to whole-body vibration, hand-arm vibration, as well as human responses to occupational noise; • recognize and select appropriate standards, recommendations, or regulations that apply to working environments. Identify practical measures for human protection and their implementation.	
Teaching methods (follow the format given)		As in **All**
Notes on course content and appropriate teaching/learning methodologies		As in **All**
Comments		As in **All**

Engineering Department	Environmental Engineering	
Educational goals	To enable students to comprehend knowledge of: human and structural responses to vibration in environmental engineering, human responses to environmental noise and the effects of noise and vibration on environment, as well as to integrate this knowledge into relevant practical applications and noise control in the field of Environmental Engineering.	
Educational outcomes	By the end of the course, students should be able to: • understand the principal human and structural responses to vibration, as well as human responses to environmental noise; • recognize and select appropriate standards, recommendations, or regulations that apply to particular environments.	
Teaching methods (follow the format given)		As in **All**
Notes on course content and appropriate teaching/learning methodologies		As in **All**
Comments		As in **All**

Engineering Department	Electrical Engineering
Educational goals	To enable students to comprehend knowledge of electro-mechanical analogies and to learn about different ways to control noise and control vibration passively or use them to benefit people or engineering systems.
Educational outcomes	By the end of the course, students should be able to: • construct electro-mechanical analogies and understand their oscillatory responses; • recognize the possibilities for the design of systems that control noise and control vibration passively in different ways.

Teaching methods (follow the format given)	As in **All**
Notes on course content and appropriate teaching/learning methodologies	As in **All**
Comments	As in **All**

Engineering Department	Civil Engineering
Educational goals	To enable students to comprehend knowledge of: structural responses to vibration and the effects of vibration on civil structures, as well as to integrate this knowledge into relevant practical applications with respect to the control of structural response to vibration. To enable students to comprehend knowledge of buildings acoustics and to integrate this knowledge into relevant practical applications and solutions.
Educational outcomes	By the end of the course, students should be able to: • understand the principal structural responses to vibration and building acoustics; • recognize and select appropriate standards, recommendations, or regulations in structural engineering.

Teaching methods (follow the format given)	As in **All**
Notes on course content and appropriate teaching/learning methodologies	As in **All**
Comments	As in **All**

Engineering Department	Traffic Engineering	
Educational goals	To enable students to comprehend knowledge of human and structure responses to traffic-induced vibration, human responses to traffic noise, the effects of noise and vibration on residential environment, as well as to integrate this knowledge into relevant practical applications in the field of Traffic Engineering	
Educational outcomes	By the end of the course, students should be able to: • understand the principal human and structure responses to traffic-induced vibration, as well as human responses to traffic noise; • recognize and select appropriate standards, recommendations, or regulations that apply to particular transport environments.	
Teaching methods (follow the format given)		As in **All**
Notes on course content and appropriate teaching/learning methodologies		As in **All**
Comments		As in **All**

Engineering Department	Mechanical Engineering	
Educational goals	To enable students to comprehend knowledge of: typical responses of mechanical systems to vibration, their effects on these systems and correlation between mechanical excitations and noise emission of mechanical systems, as well as to integrate this knowledge into relevant practical applications in the field of Mechanical Engineering.	
Educational outcomes	By the end of the course, students should be able to: • understand the principal responses of mechanical systems to vibration and correlation between mechanical excitations and noise emission of mechanical systems; • recognize and select appropriate standards, recommendations, or regulations that apply to industrial environments.	
Teaching methods (follow the format given)		As in **All**
Notes on course content and appropriate teaching/learning methodologies		As in **All**
Comments	The content of the course should vary depending on the fact whether student previously attended the course on Theory of Oscillation/Advanced Vibration, or the course on Engineering Dynamics only.	

3. Tailor-made learning goals and outcomes for short modules of students of different engineering departments

REMARK 1: It is assumed that each course is taught during a 2 week period in a semester.
REMARK 2: The activities for defining separate parts are led by different universities: Noise (UNI, UniKG) and Vibration (UNS).

Engineering Department	All
Educational goals	To introduce the physics of vibration with a combination of practical examples and mechanical modeling as well as to provide basic knowledge of a noise physical concept.
Educational outcomes	By the end of the module, students should be able to: • explain the meaning of the main characteristics of noise and vibration, and associated phenomena; • recognize examples where/when they appear, identifying their positive or negative aspects.
Teaching methods (follow the format given)	Lectures; Tutorial classes plus a practical exercise.
Notes on course content and appropriate teaching/learning methodologies	-
Comments	-

4. Summary and conclusion

This report gives tailor-made learning goals and outcomes for students of six engineering departments with a common part of 60% for all six engineering departments and specific parts of 40% for each of them (Section 2). The learning outcomes state the outcomes of theoretical parts, but especially of lab exercises, taking into account the possibility to acquire them through e- or b-teaching/learning methodologies.

This report also contains tailor-made learning goals and outcomes for short modules for students of different engineering departments (Section 3), such as courses on Physics, for example, which are usually given to freshers, whose number is usually significantly larger than the number of students who attend courses on later years of their study programmes. Thus, these courses are seen as appropriate to educate a larger pool of engineers-to-be and make them be interested in the subject of Noise and Vibration.

The tailor-made learning goals and outcomes given in this report will be used in the scope of the Work Package 'Development of modules and courses for different engineering departments' (WP3) concerned with the redesign of four existing courses on No&Vib for students of undergraduate programmes of four engineering departments (Mechanical Engineering, Environmental Engineering, Occupational Safety, Electrical Engineering) and the development of two new ones (Civil and Traffic Engineering).

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