Co-funded by the Erasmus+ Programme of the European Union

Erasmus + Project No598241-EPP-1-2018-1-RS-EPPKA2-CBHE-JP

Strengthening Educational Capacities by Building Competences and Cooperation in the Field of Noise and Vibration Engineering

SENVIBE

Quality Report for WP3

Activity 7.2

Date: 05/10/2022

DESCRIPTION OF THE WORK PACKAGE (WP)

This WP is the first out of four Development WPs. It was concerned with the redesign of nine existing course on No&Vib for students of undergraduate programmes of six engineering departments and the development of three new ones (all in all, for ~1394 students). Besides their contents, the associated learning materials were developed and these courses were implemented at the partnering Serbian HEIs.

ACTIVITIES AND THEIR REALIZATION

2.1. Assessment per task

SENVIBE activities		State		
No.	**Title**	**Fully Completed**	**Partially Completed**	**Not Completed**
WP3.T1.	Redesign of existing courses	✓		
WP3.T2.	Design of new courses	✓		
WP3.T3.	Development of learning materials	✓		
WP3.T4.	Implementation of modernised and new courses	✓		

2.2. Description of the implemented activities

In the scope of first task, 6 study programmes were covered. Within them, 9 existing modules on No&Vib for students of undergraduate study programmes of different engineering departments were redesigned. These include Mechanical (UNS, UniKg), Environmental (UNS), Occupational Safety (UNS, UNI), Electrical (UNS) and Traffic Engineering (UNS). Also short module for 9 modules for undergraduate programmes of Environmental, Occupational Safety(UNS), Electrical (UNS), Mechanical (UNS, UniKg), Civil (UNS, UniKg) and Traffic (UNS) Engineering were redisigned. All courses have a common part of 60%, and then the additional 40% tailor-made to the specific engineering disciplines. The developed curricula contain theoretical lectures and also lab exercises with direct measurements or the data downloaded from the ICT platform uploaded by the partners. Report on Redisign of Existing Courses was created.

In the scope of second task, 3 new modules on No&Vib for students of undergraduate study programmes of Environmental (Educons), Occupational Safety (UNS), and Civil (UNS, UniKg) Engineering were developed, and also 1 as an added value at UNS for a specialized programme in Mechanical Engineering (Technical Mechanics and Technical Design). All courses have a common part of 60% as those from the activity 3.1., and then the additional 40% tailor-made to the specific engineering disciplines. The developed curricula contain theoretical lectures and lab exercises. Report on Design of New Courses was created.

In the scope of third task, the learning materials were developed for the common 60% for all six courses, as well as for the additional 40% for each of them, including the design of lab exercises. Teaching and learning materials developed, include: contain 15 mulimedia presentations, 4 HTML applications, 1 instruction manual, 3 video presentation, 1 short-term noise measurement examples, 12 simulations and examples, 5 self-evaluation tests and quizzes, 22 PDF files, 1 textbook and 16 files of other/mixed type. All deliverable uploaded to a

In the scope of fourth task, updated and devloped SENVIBE courses were implemented during the third and fourth year of the project. 1394 undergraduate students are engaged in them. Information about the aforementioned SENVIBE courses (modules) are given in Table. 2.1.

Involvement of people with fewer opportunities

Not applicable.

Refugees

Not applicable.

Innovation

New courses, modernized courses, new teaching and learning materials.

2.3. Impact

Short term impact: Improved competences of the students of undergraduate study programmes of six engineering departments, i.e. six types of study programmes (1394 of them); Equipment purchased, and 4 new labs established or enhanced; New teaching & learning materials available in e-SENVIBE, including e- and b-lectures.

Long term impact: Possibility for developing and updating other courses for undergraduate study programmes in No&Vib field at beneficiary HEI`s and other Serbian HEI`s; Possibility for developing and updating courses for graduate programmes in No&Vib field at Serbian HEI`s; High employability rate of engineers of six engineering study programmes with improved competences (all stay in Serbia, no brain drains).

2.3.1. Unexpected outcomes/ spin-off effects

NA

Table 2.1 Information about new and updated **courses (module)**

University / link with visible CBHE grant	Course title (Study programme)	Level of education (Bachelor or Master)	ECTS	New or updated	% of course update compared to the previous version	Mandatory or optional course	Name of teacher	Number of students enrolled	Link to the Learning outcomes	Link to textbook	Comments
University of Nis Link	Noise and Vibration (Occupational Safety)	Bachelor	6	Updated	20%	Mandatory	Darko Mihajlov Momir Praščević	82 (2020/21) 78 (2021/22)	Link1	Link1 Link2 Link3	Updated course "Noise and vibrations", adjusted to the learning goals defined by SENVIBE project, and extended with laboratory exercises to use the equipment provided by the project (2/15 weeks of lectures + 4 weeks of exercises ≈ 20% of the course updated)
University of Kragujevac Link1 Link2	Technical Physics (Mechanical Engineering)	Bachelor	6	Updated	20%	Mandatory	Zlatan Šoškić	46 (2020/21) 64 (2021/22)	Link1	Link3	Revised course "Physics" (renamed to "Technical Physics" after re-accreditation in 2020/2021) by introduction of a short module (topics) dedicated to sound and vibrations adjusted to common learning goals of the project, which required revision of the part of the course dedicated to wave phenomena (3/15 weeks ≈ 20% of the subject revised)
University of Kragujevac Link1 Link2	Technical Physics (Civil Engineering)	Bachelor	6	Updated	20%	Mandatory	Zlatan Šoškić	49 (2020/21) 47 (2021/22)	Link1	Link3	Revised course "Technical Physics" by introduction of a short module (topics) dedicated to sound and vibrations adjusted to common learning goals of the project, which required revision of the part of the course

											dedicated to wave phenomena (3/15 weeks ≈ 20% of the subject revised)
University of Kragujevac Link1 Link2	Maintenance and Diagnostics (Mechanical Engineering)	Bachelor	6	Updated	20%	Optional	Branko Radičević	23 (2020/21) 27 (2021/22)	Link1	-	Revised optional course "Maintenance and diagnostics", adjusted to the learning goals defined by SENVIBE project, and laboratory exercises updated to use the equipment provided by the project (2/15 weeks of lectures + 2/6 weeks of exercises ≈ 20% of the subject revised)
University of Kragujevac Link1 Link2	Noise and vibrations protection (Mechanical Engineering)	Bachelor	6	Updated	30%	Optional	Branko Radičević	13 (2020/21) 14 (2021/22)	Link1	-	Revised optional course "Noise protection" in VI semester, the name changed to "Noise and vibration protection" adjusted to the learning goals defined by SENVIBE project, and laboratory exercises extended to include measurement of vibrations and to include the measurement of use the equipment provided by the project (3/15 weeks of lectures + 4/6 weeks of exercises ≈ 30% of the subject revised)
University of Kragujevac Link1 Link2	Noise and vibrations in Civil Engineering (Civil Engineering)	Bachelor	6	New	-	Optional	Branko Radičević	0	Link2	-	New course developed according to the learning goals defined by SENVIBE project

University of Educons Link Link	Environmental Noise and Vibration (Environmental Safety)	Bachelor	8	New	-	Optional	Ivana Kovačić	6 (2021/22)	Link1	Link3	New course developed according to the learning goals defined by SENVIBE project
University of Novi Sad Link	Monitoring and noise protection/Acoustic and audiotechnic (Power, Electronic and Telecommunication Engineering: Information and Communica-tion Technologies and Signal Processing)	Bachelor	5	Updated	20%	Optional	Vlado Delić Sinisa Suzic	5 (2021/22) 2 (2022/23)	Link1	Link3	Access given to the new teaching and learning material on the existing course. Access given to the A-SENVIBE Lab (mini-anechoic chamber)
University of Novi Sad Link	Noise and vibration (Environmental Engineering)	Bachelor	4	Updated	20%	Optional	Ivana Kovačić Livija Cvetićanin	0 (2021/22)	Link1	Link3	Revised course by introduction of enhanced topics dedicated to sound and vibrations. In addition, the new teaching and learning material developed for these topics is available vi the e-SENVIBE platform, which assures sustainability.
University of Novi Sad Link	Occupational noise and vibration (Occupational Safety Engineering)	Bachelor	4	Updated	20%	Optional	Ivana Kovačić	0 (2021/22)	Link1	Link3	Revised course by introduction of enhanced topics dedicated to sound and vibrations. In addition, the new teaching and learning material developed for these topics is available vi

											the e-SENVIBE platform, which assures sustainability.
University of Novi Sad Link	Acoustics and Audio Technique in Traffic (Traffic Engineering – Postal Traffic and Telecommunication)	Bachelor	4	Updated	20%	Optional	Vlado Delić	7 (2021/22)	Link1	Link3	Access given to the new teaching and learning material on the existing course.
University of Novi Sad Link	Human Response to Noise and Vibration (Occupational Safety Engineering)	Bachelor	6	New	-	Optional	Ivana Kovačić	0 (2021/22)	Link2	Link3	New course developed according to the learning goals defined by SENVIBE project.
University of Novi Sad Link	Noise and Vibration Protection (Technical Mechanics and Technical Design)	Master	4	New	-	Optional	Ivana Kovačić	0 (2021/22)	Link2	Link3	New course developed according to the learning goals defined by SENVIBE project
University of Novi Sad Link	Physics (Electrical Engineering)	Bachelor	4	Updated	20%	Mandatory	Dragana Štrbac Dušan Ilić	134 (2021/22)	Link1	Link3	Revised course "Physics" by introduction of a short module (topics) dedicated to sound and vibrations adjusted to common learning goals of the project. Outcome: innovated course with increased period dedicated to the theme of sound and vibration.
University of Novi Sad Link	Technical Physics (Traffic Engineering)	Bachelor	6	Updated	20%	Mandatory	Dragana Štrbac Uranija Kozmidis Luburić	114 (2021/22)	Link1	Link3	Revised course "Technical Physics" by introduction of a short module (topics) dedicated to sound and

											vibrations adjusted to common learning goals of the project. Outcome: innovated course with increased period dedicated to the theme of sound and vibration.
University of Novi Sad Link	Physics for Civil Engineering (Civil Engineering)	Bachelor	5	Updated	20%	Mandatory	Livija Cvjetićanin Milica Vučinić Vasić	133 (2021/22)	Link1	Link3	Revised course "Physics for Civil Engineering" by introduction of a short module (topics) dedicated to sound and vibrations adjusted to common learning goals of the project. Outcome: innovated course with increased period dedicated to the theme of sound and vibration.
University of Novi Sad Link	Physics (Mechanical Engineering)	Bachelor	5	Updated	20%	Mandatory	Dragana Štrbac Ivana Lončarević	342 (2021/22)	Link1	Link3	Revised course "Physics" by introduction of a short module (topics) dedicated to sound and vibrations adjusted to common learning goals of the project. Outcome: innovated course with increased period dedicated to the theme of sound and vibration.
University of Novi Sad Link	Selected Chapters in Physics (Evironmental Engineering / Occupational Safety Engineering)	Bachelor	6	Updated	20%	Mandatory	Dragana Štrbac Ivana Kovačić Selena Samardžić	74 (2021/22)	Link1	Link3	Revised course "Selected Chapters in Physics" by introduction of a short module (topics) dedicated to sound and vibrations adjusted to common learning goals of the project. Outcome: innovated course with increased period dedicated to the theme of sound and vibration.

STATISTICS AND INDICATORS

For Training/Mobility Activities

Number of partner country "HEIs' students" trained

1394

Number of partner country "HEIs' academic staff" trained

NA

Number of partner country "HEIs' administrative staff" trained

NA

Number of partner country "non-HEI individuals" trained (priv. sector, NGOs, civil servants, etc.)

NA

Impact at individual level

Extent of attention given to vulnerable groups

NA

Number of direct beneficiaries in the Partner country(ies) per year: academic staff from HEIs

20

Number of direct beneficiaries in the PCs (/year): administrative staff from HEIs

0

Number of direct beneficiaries in the PCs (/year): HE students

1394

Number of direct beneficiaries in the PCs (/year): non HE individuals

0

QUALITY ASSURANCE MEASURES

3.1. Reviews conducted in a descriptive form

Reviewed activity	Internal/External review	Reviewer	Description
WP3.T1. Redesign of existing courses	External	Nikola Lilic	The review was written based on a series of reports which have been made within the Erasmus + Project No 598241-EPP-1-2018-1-RS-EPPKA2-CBHE-JP, to name some of them: Report on Tailor-Made Learning Goals and Outcomes, Report on Redesign of Existing Courses, Report on Design of New Courses etc., as well as based on the reviewer experience and syllabus review guides widely accepted.
WP3.T2. Design of new courses			The reports produced in the WP3.T2 were approved by internal review before they were published: first by the project coordinator then by the quality assurance group leader and later on by the Steering committee.
WP3.T3. Development of learning materials	External	Miomir Mijic	The review was written based on documents from E-SENVIBE learning platform at address: https://www.e-senvibe.senvibe.uns.ac.rs/course/view.php?id=8&lang=en, part for Undergraduate Courses on NOISE AND VIBRATION: - Neil Ferguson PowerPoint presentation "Sound and Noise", - its translation, also in pptx, - documents and software for reverberation time calculation, - all available information available at the address.

WP3.T3. Development of learning materials	Internal	Ivana Kovacic, Branko Radicevic	The book by Professor Momir Prascevic and Professor Darko Mihjlov was reviewed. The book can be used as a handbook for laboratory exercises in the area of Noise and Vibration.
WP3.T3. Development of learning materials	2 Internal	EUSK team members	The review of the learning and teaching materials was written based on lecture via power point presentation, 1/13/2022 at the Faculty of Civil Engineering, the University of Kragujevac Subject Theoretical Physics, Department of Civil Engineering, the topic of the lecture was: Vibration and noise; The review of the learning and teaching materials was written based on lecture via power point presentation. 12/27/2021 at the Faculty of Occupational Safety, the University of Nis (the topic of the lecture was: Noise in the work environment - evaluation, assessment and effects;
WP3.T3. Development of learning materials	External	Dragana Sumarac Pavlovic	The review was written based on materials available on the website of the courses: Fundamentals of Technical Acoustics and Electroacoustic. The review refers to the available presentations, the offered literature and the structure of the exam requirements.

Work package 3 (WP3) was supposed to deal with the redesign of four existing courses on No&Vib for undergraduate students of six engineering departments, i.e. study programmes and the development of two new ones for a total of ~750 students. The results achieved considerably exceed the ones expected and promised in the proposal, both with respect to the number of courses (modules) and with the respect of number of students engaged

(1394 of them). In addition to the content, accompanying learning materials were developed and these courses were implemented in partner higher education institutions in Serbia.

The tasks in this WP are fully completed. The results achieved considerably exceed the ones expected and promised in the proposal.

ANNEXES:

1. ANNEX 1
Evaluation reports

Evaluation report template

Erasmus + Project No598241-EPP-1-2018-1-RS-EPPKA2-CBHE-JP

Strengthening educational capacities by building competences and cooperationin the field of Noise and Vibration Engineering

SENVIBE

Reviewer:	Nikola Lilić
Executive summary	This document provides the review of the **Syllabus of redesign courses on Noise and Vibration for students of undergraduate programmes of five different engineering departments**
External /Internal Evaluation Methodology	What has been done and how? *The review was written based on a series of reports which have been made within the Erasmus + Project* No 598241-EPP-1-2018-1-RS-EPPKA2-CBHE-JP*, to name some of them: Report on Tailor-Made Learning Goals and Outcomes, Report on Redesign of Existing Courses, Report on Design of New Courses etc., as well as based on the reviewer experience and syllabus review guides widely accepted.*
Work Packages	
Deliverable/ Activity Ref. No	3.1. Redesign of existing courses https://senvibe.uns.ac.rs/2021/02/03/redesign-of-existing-courses-12-december-2020/ 7.2. Internal and external reviews processes and outcomes.
Syllabus of redesign courses on Noise and Vibration for students of undergraduate programmes of five different engineering departments	
Syllabus review is an opportunity for structured inquiry and reflection, providing a safe space to assess aspects of teaching as reflected in syllabi, for example, course goals, class norms and rules, expectations for and evaluations of student learning, and forms of assistance and support. This Report has been concerned with the redesign of five existing courses that have been updated by the SENVIBE team from	

various viewpoints (learning goals, learning outcomes, content, teaching methodologies, new teaching & learning material) as well as with four courses accredited or taught by teachers outside the SENVIBE team.

Goals of all the courses for students of undergraduate programmes of five different engineering departments can be assessed as competent and – from the point of view of didactics – extensive and complete.

Comparing to the previously existed courses the updated ones have been thoroughly redesigned and extended in content and well structured. It is obviousthat students will satisfy from the educational outcomes regardless of the engineering department.

Well-structured courses are supposed to be both appropriate tools for teachers inreaching the educational goals of the courses and appropriate platform for studentin reaching the educational outcomes of the courses.

By the end of the courses, students are supposed to acquire the knowledge and the competences necessary for a contemporary engineer in the field of interest.

Suggestions for improvements:

Suggestions are mainly directed at the literature. As for the literature, the suggestionsrefer to its innovation, for certain courses, as well as to its internationalization.

EVALUATION

Occupational Safety Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Are the syllabus of each course detailed enough?	+				
Are the educational goals of each course clear, realistic, and achievable?	+				
Are the educational outcomes of each course clearly formulatedin accordance with the educational goals?	+				
Whether the educational outcomes include the acquisition of competencies and skills?	+				
Are the course structure and content of each course precisely described and harmonized with the educational goals and outcomes?	+				

Occupational Safety Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Are the educational goals/outcomes, course structure and content of each course harmonized with the modern directions of the development of the appropriate scientific discipline in the world?	+				
Are the teaching methods appropriate for each course?	+				
Are the references/literature written for each course appropriate?		+			

Environmental Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Are the syllabus of each course detailed enough?	+				
Are the educational goals of each course clear, realistic, and achievable?	+				
Are the educational outcomes of each course clearly formulatedin accordance with the educational goals?		+			
Whether the educational outcomes include the acquisition of competencies and skills?		+			
Are the course structure and content of each course precisely described and harmonized with the educational goals and outcomes?		+			
Are the educational goals/outcomes, course structure and content of each course harmonized with the modern directions of the development of the appropriate scientific discipline in the world?		+			
Are the teaching methods appropriate for each course?		+			
Are the references/literature written for each course appropriate?		+			

Mechanical Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Are the syllabus of each course detailed enough?	+				
Are the educational goals of each course clear, realistic, and achievable?	+				
Are the educational outcomes of each course clearly formulatedin accordance with the educational goals?		+			
Whether the educational outcomes include the acquisition of competencies and skills?		+			
Are the course structure and content of each course precisely described and harmonized with the educational goals and outcomes?		+			
Are the educational goals/outcomes, course structure and content of each course harmonized with the modern directions of the development of the appropriate scientific discipline in the world?		+			
Are the teaching methods appropriate for each course?		+			
Are the references/literature written for each course appropriate?		+			

Electrical Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Are the syllabus of each course detailed enough?	+				
Are the educational goals of each course clear, realistic, and achievable?	+				
Are the educational outcomes of each course clearly formulatedin accordance with the educational goals?	+				

Electrical Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Whether the educational outcomes include the acquisition of competencies and skills?	+				
Are the course structure and content of each course precisely described and harmonized with the educational goals and outcomes?	+				
Are the educational goals/outcomes, course structure and content of each course harmonized with the modern directions of the development of the appropriate scientific discipline in the world?	+				
Are the teaching methods appropriate for each course?	+				
Are the references/literature written for each course appropriate?		+			

Traffic Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Are the syllabus of each course detailed enough?	+				
Are the educational goals of each course clear, realistic, and achievable?	+				
Are the educational outcomes of each course clearly formulatedin accordance with the educational goals?		+			
Whether the educational outcomes include the acquisition of competencies and skills?		+			
Are the course structure and content of each course precisely described and harmonized with the educational goals and outcomes?		+			

Traffic Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Are the educational goals/outcomes, course structure and content of each course harmonized with the modern directions of the development of the appropriate scientific discipline in the world?		+			
Are the teaching methods appropriate for each course?		+			
Are the references/literature written for each course appropriate?		+			

Place, date: Name and signature:

Nikola Lilić Belgrade, 27.06.2022.

Evaluation report template

Erasmus + Project No 598241-EPP-1-2018-1-RS-EPPKA2-CBHE-J P

Strengthening educational capacities by building competences and cooperationin the field of Noise and Vibration Engineering

SENVIBE

Reviewer:	Miomir Mijić
Executive summary	This document provides the review of the **Learning and teaching materials for undergraduate courses in Noise & Vibration at different engineering departments** *PLEASE DO NOT CHANGE*
External /Internal Evaluation Methodology	What has been done and how? *The review was written based on d*ocuments fromE-SENVIBE learning platform at address: https://www.e-senvibe.senvibe.uns.ac.rs/course/view.php?id=8&lang=en, part for Undergraduate Courses on NOISE AND VIBRATION: - Neil Ferguson PowerPoint presentation " Sound and Noise", - its translation, also in pptx, - documents and software for reverberation time calculatio n, - all available information availa ble at the address.
Work Packages	
Deliverable/ ActivityRef. No	3.3. Development of learning materials 7.2. Internal and external reviews processes and outcomes. *PLEASE DO NOT CHANGE*

Learning and teaching materials for undergraduate courses in Noise & Vibration at different engineering departments

PLEASE WRITE HERE YOUR OPINION IN A DESCRIPTIVE FORM IN ENGLISH:

E-SENVIBE is an interesting concept that enables education and self -evaluation in the field of acoustics . Acoustics is an important, a lthough neglected area in the system of formal education, at all levels . That is why the introductory lecture was made in a popular way, which is undoubtedly important. It is not clear who will be the participants in the courses and with unk nown previous knowledge, so it is difficult to give a more precise evaluat ion of the course content appropriateness .But the presented form will certainly correspond to the largest number of course participant s.

Suggestions for improvement s:

A. General remark

Introductory presentation "Sound and Noise" is too short (only 14 slides). Therefore, it does not provide enough knowledge to understand following parts of the cours e and the level of knowledge p resentation applied in them. Thus, one can recogniz e a serious misalliance between introduct ory presentation and other parts of the cours e.

B. Logical and terminological weaknesses

1. The title of the entry-level presentation "Sound and Noise" is confusing. Noise is also sound, but in subjective, i.e., psychol ogical domain it is specially marked as unwanted . Title "sound and noise" is wrong in the same sense as for example "sound and music ".

2. At slide "Frequency analysis of the car sounds " title of the first diagram is "SPL (pressure) versus time ". That is wrong, because the diagram represents sound pressure (i.e., voltage from microphone' s output) and not SPL (which mea ns Sound Pressure Level). The same is in next slide.

3. At the same slide title of the second diagram is "Time and spectrogram (frequency content) ". Term " Spectrogram " means time vs frequency pr esentation, thus include time and fr equency as its definition. So, indication "Time and spectrogram " in title is wrong. The same is in next slide.

4. In summary the first sentence is " We hear sound – in a vacuum (in space) there would be no fluid or gas so no sound! (**Some hearing is by bone conduction.**)" Thisimply that in vacuum there is no sound, but som ething can be heard by bone conduction! !! That is omitted in Serbian translation, which means that interpreter recognized the problem in original presentation.

C. Weaknesses of pptx presentation translation from English to Serbian

1. For the word "annoyance" in Serbian documents word "uznemiravanje", and not "nerviranje" is used.

2. "Large range of pressure amplitudes " have to be translated as "veoma veliki **opseg** amplitude pritiska ", and not " veoma veliki **spektar** amplitude pritiska ".

3. Copy/paste error produces " buka unutar nepokretnog vozila na 120 km/h" which in Serbian means "noise inside a stationary vehicle at 120 km/h". That is simple copy/paste mista ke

EVALUATION

Occupational Safety Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Will the L&T materials be valuable for the students/teachers?		X			
Is the content of the L&T materials appropriate for thelevel of the undergraduate study?		X			
Is the content of the L&T materials relevant to the learning outcomes of the engineering departments ?		X			
Is the content of the L&T materials detailed enough ?			X		
Is the content of the L&T materials appropriate for the topic ?	X				

Does the content of L&T materials have the appropriate scope and content ?		X			
Is the content of the L&T materials up-to date ?	X				
Does the content of the L&T materials have a logical structure		X			
Does the content of the L&T materials avoid repetition and includes introduction to the irrelevant the topics?		X			
Are L&T materials realized at the appropriate technical level ?		X			

Environmental Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Will the L&T materials be valuable for the students/teachers?		X			
Is the content of the L&T materials appropriate for thelevel of the undergraduate study?		X			
Is the content of the L&T materials relevant to the learning outcomes of the engineering departments ?		X			
Is the content of the L&T materials detailed enough ?			X		
Is the content of the L&T materials appropriate for the topic ?	X				
Does the content of L&T materials have the appropriate scope and content?		X			
Is the content of the L&T materials up-to date ?	X				

Does the content of the L&T materials have a l ogical structure		X			
Does the content of the L&T materials avoid repetition and includes introduction to the irrelevant the topics?		X			
Are L&T materials realized at the appropriate technical level ?		X			

Mechanical Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Will the L&T materials be valuable for the students/teachers?		X			
Is the content of the L&T materials appropriate for thelevel of the undergraduate study?		X			
Is the content of the L&T materials relevant to the learning outcomes of the engineering departments ?		X			
Is the content of the L&T materials detailed enough ?			X		
Is the content of the L&T materials appropriate for the topic?	X				
Does the content of L&T materials have the appropriate scope and content?		X			
Is the content of the L&T materials up-to date ?	X				
Does the content of the L&T materials have a l ogical structure		X			
Does the content of the L&T materials avoid repetition and includes introduction to the irrelevant the topics?		X			

Are L&T materials realized at the appropriate technical level ?		X			

Electrical Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Will the L&T materials be valuable for the students/teachers?		X			
Is the content of the L&T materials appropriate for thelevel of the undergraduate study?				X	
Is the content of the L&T materials relevant to the learning outcomes of the engineering departments ?		X			
Is the content of the L&T materials detailed enough ?				X	
Is the content of the L&T materials appropriate for the topic ?		X			
Does the content of L&T materials have the appropriate scope and content?				X	
Is the content of the L&T materials up-to date ?		X			
Does the content of the L&T materials have a l ogical structure		X			
Does the content of the L&T materials avoid repetition and includes introduction to the irrelevant the topics?		X			
Are L&T materials realized at the appropriate technical level ?		X			

Traffic Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree

Will the L&T materials be valuable for the students/teachers?		X			
Is the content of the L&T materials appropriate for thelevel of the undergraduate study?		X			
Is the content of the L&T materials relevant to the learning outcomes of the engineering departments ?		X			
Is the content of the L&T materials detailed enough ?			X		
Is the content of the L&T materials appropriate for the topic ?	X				
Does the content of L&T materials have the appropriate scope and content?		X			
Is the content of the L&T materials up-to date ?	X				
Does the content of the L&T materials have a l ogical structure		X			
Does the content of the L&T materials avoid repetition and includes introduction to the irrelevant the topics?		X			
Are L&T materials realized at the appropriate technical level ?		X			

Civil Engineering	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Will the L&T materials be valuable for the students/teachers?		X			
Is the content of the L&T materials appropriate for thelevel of the undergraduate study?		X			

Is the content of the L&T materials relevant to the learning outcomes of the engineering departments ?		X			
Is the content of the L&T materials detailed enough ?			X		
Is the content of the L&T materials appropriate for the topic ?	X				
Does the content of L&T materials have the appropriate scope and content?		X			
Is the content of the L&T materials up-to date ?	X				
Does the content of the L&T materials have a l ogical structure		X			
Does the content of the L&T materials avoid repetition and includes introduction to the irrelevant the topics?		X			
Are L&T materials realized at the appropriate technical level ?		X			

Place, d ate:
Belgrade, 1.05.2022.

Name and signature:
Miomir Mijić

prof. dr Ivana Kovačić
Fakultet tehničkih nauka
Novi Sad

RECENZIJA PUBLIKACIJE BUKA I VIBRACIJE – PRIRUČNIK ZA LABORATORIJSKE VEŽBE AUTORA PROF. DR MOMIRA PRAŠČEVIĆA I PROF. DR DARKA MIHAJLOVA

Publikacija Buka i vibracije – priručnik za laboratorijske vežbe, autora prof. dr Momira Praščevića i prof. dr Darka Mihajlova sa Univerziteta u Nišu je originalna i sadržajem bogata publikacija posvećena laboratorijskim vežbama iz oblasti Buke i vibracija.

Publikacija je napisana na 166 strane, a obuhvata šest poglavlja – svako posvećeno po jednoj od šest laboratorijskih vežbi: pet ih je usmereno na teme iz oblasti Buke, a jedna na oblast Vibracija. U oblasti Buke obrađene su teme: 1. Određivanje izolacije od vazdušnog zvuka u terenskim uslovima (sa 21 numerisanom slikom, šest numerisanih tabela i sedam navoda literature); 2. Određivanje izolacije od zvuka udara u terenskim uslovima (sa šest numerisanih slika, pet numerisanih tabela i sedam navoda literature); 3. Merenje vremena reverberacije u slušaonicama (sa četiri numerisane slike, tri numerisane tabelei četiri navoda literature); 4. Određivanje zvučne snage izvora buke (sa četiri numerisane slike, šest numerisanih tabela i sedam navoda literature) i 5. Merenje i ocena buke u radnoj sredini (sa četiri numerisane slike, pet numerisanih tabela i pet navoda literature), dok je iz oblasti Vibracija obrađena tema Merenje i ocena vibracija šaka-ruka (sa 14 numerisanih slika, dve numerisane tabele i pet navoda literature).

Vredan doprinos autora, koji proističe iz njihovog dugogodišnjeg nastavnog i praktičnog ekspertskog iskustva, predstavlja unificiranost metodologije. Naime, svaka laboratorijska vežba je predstavljena i organizovana tako da sadrži: teorijske osnove tretiranog problema, kratak prikaz standardizovanih mernih postupaka, opise mernog lanca, povezivanja i podešavanja instrumenata, pregled literature, definisan zadatak za studenta, adekvatnu formu za beleženje mernih rezultata, a na samom kraju su dati i obrasci za proračun potrebnih veličina. Na ovaj način autori pomažu čitaocu da se detaljno upozna sa problematikom tretiranja i izvođenja merenja, obrade i analize podataka, ali i da stekne veštine vezane za ovaj proces, uopšteno posmatrano.

Publikaciju odlikuje bogat i vizuelno aktraktivan ilustracijski sadržaj koji se odnosi na instrukcije za postavljanje, podešavanje i korišćenje merne opreme, kao i na podatke koji se sa njom dobijaju ili sa nje očitavaju. Publikacije nanašem jeziku koja na ovakav način pomaže čitaocu da stekne znanje u ovojoblasti, do sada nije bilo. U ovom smislu autori daju vredan doprinos pomeranjustanja u oblasti na nacionalnom nivou. Navedeni kvalitet ide u prilog činjenici da je publikacija urađena u okviru Erazmus+ projekta „Jačanje obrazovnih kapaciteta kroz izgradnju kompetencija i saradnje u oblasti inženjerstva buke ivibracija", čiji je akronim SENVIBE, finansira ga Evropska komisija, a koordiniraUniverzitet u Novom Sadu. Vodeći se ciljem SENVIBE projekta da se poboljšaju i izgrade nacionalni obrazovni kapaciteti i kompetencije u rešavanju inženjerskih pitanja vezanih za buku i vibracije u životnoj i radnoj sredini, autori ovom publikacijom daju značajan doprinos ostvarenju navedenog cilja.

Autori navode da je pisanje publikacije proisteklo nakon modifikacije predmeta Buka i vibracije koji se realizuje na Fakultetu zaštite na radu u Nišu na studijskom programu Inženjerstvo zaštite na radu, u okviru kog su po prvi put od njegovog uspostavljanja uvedene i laboratorijske vežbe i to sa laboratorijskom opremom nabavljenom u okviru projekta SENVIBE. Publikaciju, osim studenata ovog studijskog programa, mogu koristi i studenti i nastavnici drugih fakulteta i studijskih programa koji žele da se upoznaju i steknu znanja iz navedenih oblasti.

Recenzent čestita autorima na ostvarenom kvalitetu publikacije u pogledu originalnosti njenog sadržaja, osmišljenoj i dosledno sleđenoj metodologiji, kao i na kreativnosti ostvarene pri kreiranju vizuelnog sadržaja. Kako publikaciju odlikuje visok naučno-stručni kvalitet i ispunjenost svih standarda kvaliteta u pogledu sadržaja, obima, strukture i jezika, recenzent predlaže Senatu Univerziteta u Nišu da publikaciju odobri za štampu u kategoriji pomoćni udžbenik.

Novi Sad, 8. aprila 2022.

prof. dr Ivana Kovačić

СЕНАТУ УНИВЕРЗИТЕТА У НИШУ

Предмет: *Рецензија рукописа „Бука и вибрације – приручник за лабораторијске вежбе“ аутора професора др Момира Прашћевића и професора др Дарка Михајлова*

На седници Сената одржаној 28.02.2022. године према Одлуци о именовању рецензената СНУ број: 8/16-01-001/22-038, одређан сам за једног од двоје рецензената за рукопис „Бука и вибрације – приручник за лабораторијске вежбе“ аутора професора др Момира Прашћевића и професора др Дарка Михајлова. Након детаљне анализе поднетог рукописа подносим Сенату следећи

ИЗВЕШТАЈ

Рукопис има укупно 166 страна. Илустрован је са 53 слике и 25 табела, од којих се 21 односи на извештаје о резултатима мерења и прорачуна. Поред тога у рукопису су дата 103 приказа екрана мерних инструмената приликом подешавања, мерења и обраде резултата мерења. Преглед актуелне и релевантне стручне и научне литературе (укупно 35 јединица) дат је после сваког поглавља што значајно олакшава праћење текста рукописа. У наведеној литератури налазе се референце које су коришћене у рукопису, али и оне које дају шири увид у материју која се разматра.

Рукопис је написан на српском језику и садржи 6 поглавља:

- Одређивање изолације од ваздушног звука у теренским условима
- Одређивање изолације од звука удара у теренским условима
- Мерење времена реверберације у слушаоницама
- Одређивање звучне снаге извора буке
- Мерење и оцена буке у радној средини
- Мерење и оцена вибрација шака-рука

Публикација БУКА И ВИБРАЦИЈЕ – приручник за лабораторијске вежбе је настала у оквиру пројекта „Јачање образовних капацитета кроз изградњу компетенција и сарадње у области инжењерства буке и вибрација“, чији је акроним SENVIBE. Пројекат SENVIBE припада групи Erasmus+ пројеката намењених јачању капацитета у високом образовању, финансира га Европска комисија, а координира Универзитет у Новом Саду.

Публикација БУКА И ВИБРАЦИЈЕ – приручник за лабораторијске вежбе представља резултат пројектне активности на пројекту SENVIBE. Потреба за оваквом публикацијом је проистекла након модификације предмета „Бука и вибрације“ који се реализује на Факултету заштите на раду у Нишу на студијском програму „Инжењерство заштите на раду“. Модификацијом предмета „Бука и вибрације“ су по први пут од његовог успостављања као облик наставе предвиђене лабораторијске вежбе и то применом лабораторијске опреме која је набављена у оквиру програмске активности пројекта SENVIBE.

Значајан допринос у креирању ове публикације су имале обуке аутора публикације на Институту за истраживање звука и вибрација у Саутемптону (ISVR – Institute of Sound and Vibration Research – University of Sauthampton) и на Краљевском технолошком институту у Стокхолму (KTH Royal Institute of Tehnology in Stockholm), реализоване у оквиру пројектне активности пројекта SENVIBE.

Полазећи од теоријских основа, аутори су у првом поглављу објаснили звучну изолацију и изолациону моћ и изражавање изолационе моћи једним бројем према стандарду SRPS ISO 717-1. Описан је поступак за за одређивање изолације од ваздушног звука кроз положај извора звука, положај микрофона, дефинисање времена усредњавања и мерење времена реверберације. Приказан је мерни ланац, калибрација мерног система и начин повезивања мерне опреме за мерење изолационе моћи преградног зида. Приказана су детаљна подешавања мерача нивоа звука Brüel&Kjaer tipa 2270, кроз слике мерних екрана инструмента. На крају поглавља су дати извештаји о резултатима мерења и прорачуна, који представљају водич за студенте у поступку реализације мерења и потребних прорачуна.

У другом поглављу аутори детаљно анализирају теоријске основе звука удара и одређивање изолације од звука удара, као и изражавање изолације од звука удара једним бројем према стандарду SRPS ISO 717-2. Представљен је поступак за за одређивање звука удара кроз дсефинисање положаја извора звука удара, положај микрофона, дефинисање времена усредњавања и мерење времена реверберације пријемне просторије применом класичних методаописаних у SRPS EN ISO 3382-2, или новом методом описаном у SRPS EN ISO 18233. На крају поглављасу дати извештаји о резултатима мерења нивоа звука у пријемној просторији, мерење нивоа позадинске буке и времена реверберације и резултати прорачуна стандардизованог нивоа звучногпритиска удара.

У трећем поглављу аутори разматрају проблематику мерења времена реверберације у слушаоницама. Начин и брзина опадања енергије звука у просторији је један од основних критеријума за оцену акустичког квалитета просторије. Стандард SRPS EN ISO 3382-2 утврђује две методе мерења: методу искључења извора буке и методу интегрисаног импулсног одзива. Задатак за одређивање времена реверберације је приказан за случај амфитеатра са и без слушалаца.

Појам звучне снаге и начини њеног одређивања су приказани у оквиру четвртог поглавља. Не постоји инструмент који би омогућио директно мерење звучне снаге, већ се она одређује индиректно – на основу мерења звучног притиска или интензитета звука, као и других одговарајућих величина које дефинишу окружење у коме се одређује звучна снага: слободно звучно поље; дифузно или реверберационо поље; актуелно окружење у коме је смештен извор звука. Постоје две групе стандарда које утврђују методе за одређивање звучне снаге: серија стандарда SRPS EN ISO 3740, заснована на мерењу звучног притиска и серија стандарда ISO 9614 заснована на мерењу интензитета звука. На конкретном примеру приказан је поступак одређивања звучне снаге извора применом: инжењерске методе; информативне методе; методе реверберационе просторије. Звучна снага је веома важна карактеристика звучног извора и у много случајева је услов за добијање различитих сертификата о квалитету производа као што су CE знак и слично.

Мерење и оцена буке у радној средини, сагледана је кроз буку као професионалну штетност, што је приказано у оквиру петог поогављња. Граничне и акционе вредности нивоа дневне изложености буци и критеријуми за оцену су приказане према Правилнику о превентивним мерама за безбедан и здрав рад при излагању буци. Приказане су величине за оцену слабљења личне заштитне опреме за заштиту слуха, као и процена ефективности коришћења личне заштитне опреме. Основни циљ мерења буке у радној средини је одређивање нивоа изложености радника буци на радном месту и оцену стања буке поређењем са дозвољеним граничним и акционим вредностима утврђених стандардом SRPS EN ISO 9612:2016. Извештаји са резултатима мерења и прорачуна су приказани

кроз дневни ниво изложености буци за номинални радни дан са применом личне заштитне опремеза заштиту слуха.

У шестом поглављу је приказано мерење и оцена вибрација шака-рука. Дате су теоријске основе врста вибрација које се преносе на човека и величине за оцену вибрација шака-рука. Граничне и акционе вредности вибрација шака-рука дефинисане су Правилником о превентивним методама забезбедан и здрав рад при излагању вибрацијама. Одређивање изложености вибрацијама шака-рука је описано поступно од монтирања акцелерометра, његове локације и оријентације и временског интервала мерења. Мерни ланац, повезивање система и његова калибрација, поступак мерења и очитавања мерења детаљно су приказани и објашњени.

ЗАКЉУЧАК

Публикација обухвата шест поглавља која су заснована на савременим научним и стручним достигнућима из области којој припада. Свако поглавље обухвата теоријске и практичне смернице за реализацију лабораторијских вежби. Свака лабораторијска вежба садржи: теоријске основетретираног проблема, кратак приказ стандардизованих мерних поступака, описе мерног ланца, повезивања и подешавања инструмената, преглед литературе, дефинисан задатак за студента, адекватну форму за бележење мерних резултата и обрасце за прорачун потребних величина.

Рукопис *„Бука и вибрације – приручник за лабораторијске вежбе“ аутора професора др Момира Прашћевића и професора др Дарка Михајлова,* написан је по свим стандардима уџбеничке и научно-стручне публицистике. Имајући у виду све напред наведено, са задовољством препоручујем Сенату Универзитета у Нишу да поменути рукопис прихвати за штампање као приручник за лабораторијске вежбе за предмет „Бука и вибрације“ који се реализује на Факултету заштите на раду у Нишу на студијском програму „Инжењерство заштите на раду“. Публикација се препоручује као додатна литература и студентима из осталих области инжењерских наука који изучавају проблеме буке и вибрација.

У Краљеву, 01.04.2022. године

РЕЦЕНЗЕНТ

Др Бранко Радичевић, ванредни професор Факултета за машинство и грађевинарство у Краљеву Универзитета у Крагујевцу (ужа научна област: Производно машинство)

Evaluation report

Erasmus + Project No598241-EPP-1-2018-1-RS-EPPKA2-CBHE-JP

Strengthening educational capacities by building competences and cooperation in the field of Noise and Vibration Engineering

SENVIBE

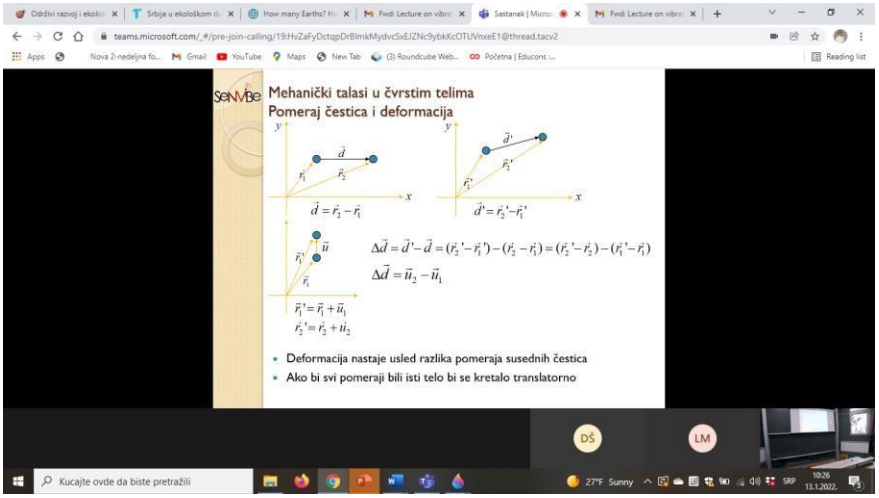
Author:	EUSK, Linda Mitić, Ljiljana Ćurčić
Executive summary	This document provides the review of the **Learning and teaching materials for undergraduate courses in Noise & Vibration at different engineering departments**
External /Internal Evaluation Methodology	What has been done and how? The review of the learning and teaching materials was written based on lecture via power point presentation, **1/13/2022 at the Faculty of Civil Engineering, the University of Kragujevac Subject Theoretical Physics, Department of Civil Engineering, the topic of the lecture was: Vibration and noise;**
Work Packages	
Deliverable/ Activity Ref. No	5.2. Development of e-learning, and b-learning materials for BSc Development of the BSc VAE studies 7.2. Internal and external reviews processes and outcomes.

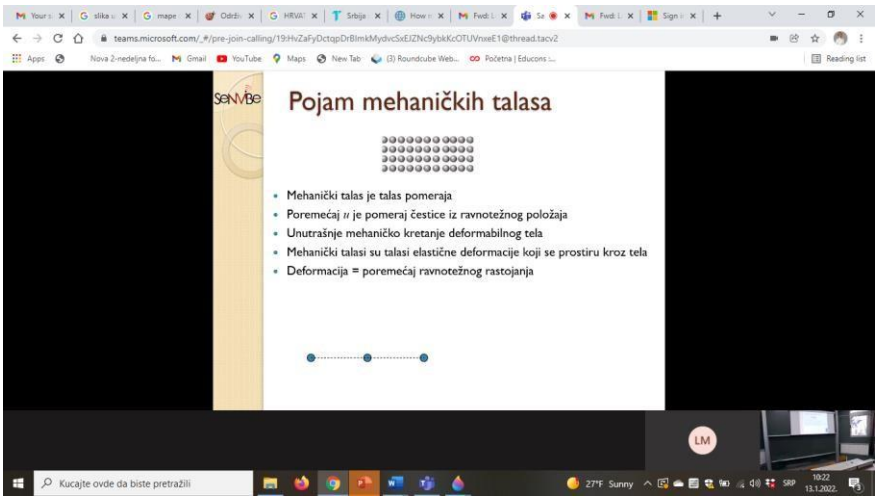
Review of Learning and teaching materials for undergraduate courses in Noise & Vibration at different engineering departments
Please write here your opinion in a descriptive form in English: The undergraduate courses in various engineering areas of noise and vibration are well designed. The given examples during the course enable students to learn the course materials more easily. In the PowerPoint presentations, students are given literature from which they can expand their knowledge in the given areas.
Suggestions for improvement in English: • Offer more practical examples to improve students' understanding of the course materials on noise and vibration • Enhance the interactive level of teaching by setting frequent short assignments for students (Problem-solving questions with sample answers)

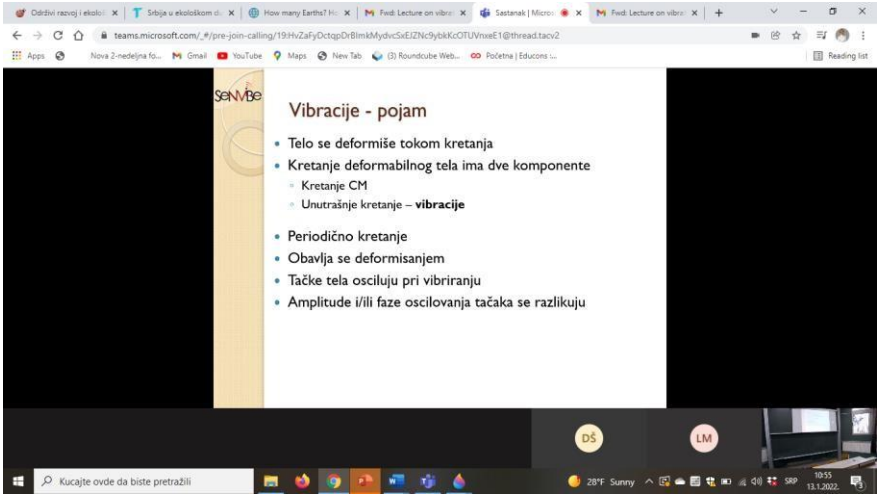
BSc Learning and teaching materials EVALUATION

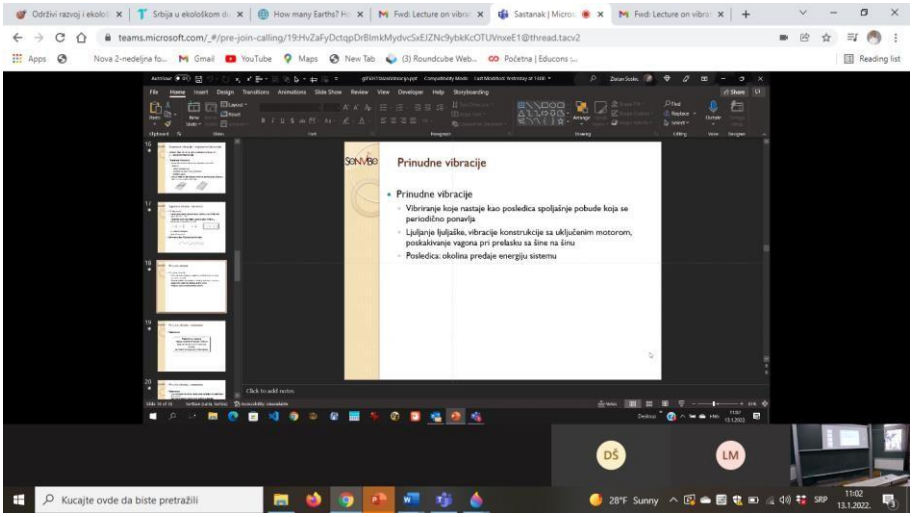
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
All learning and teaching materials are selected in such a way as to contribute to the achievement of the educational goals of the study program		X			
Each lecture has a clear structure of presenting certain content.	x				
All learning materials have the same graphic identity consistently implemented	x				
The proposed material is representative of the way of thinking presented in a given discipline.		X			
Learning materials are optimal and rational		X			

The materials cover the basic scope of knowledge in the field of Noise and Vibration			x		
The contents of the learning materials are harmonized and connected with other related materials			x		
Learning materials are arranged in a logical order		X			
The way the learning materials are presented is appropriate		X			
Learning materials contain relevant examples with explanations	x				
Learning materials contain special sequences of knowledge integration	x				
There are self-assessment materials	x				
Learning materials are interconnected through hypertext and thus reflect the inherent structure of the field		X			
There is interactivity in learning materials		X			


Mehanički talasi u čvrstim telima
Pomeraj čestica i deformacija
$\vec{d} = \vec{r}_2 - \vec{r}_1$
$\vec{d}' = \vec{r}_2' - \vec{r}_1'$
$\Delta\vec{d} = \vec{d}' - \vec{d} = (\vec{r}_2' - \vec{r}_1') - (\vec{r}_2 - \vec{r}_1) = (\vec{r}_2' - \vec{r}_2) - (\vec{r}_1' - \vec{r}_1)$
$\Delta\vec{d} = \vec{u}_2 - \vec{u}_1$
$\vec{r}_1' = \vec{r}_1 + \vec{u}_1$
$\vec{r}_2' = \vec{r}_2 + \vec{u}_2$
Deformacija nastaje usled razlika pomeraja susednih čestica
Ako bi svi pomeraji bili isti telo bi se kretalo translatorno


Pojam mehaničkih talasa
Mehanički talas je talas pomeraja
Poremećaj u je pomeraj čestice iz ravnotežnog položaja
Unutrašnje mehaničko kretanje deformabilnog tela
Mehanički talasi su talasi elastične deformacije koji se prostiru kroz tela
Deformacija = poremećaj ravnotežnog rastojanja


Vibracije - pojam
Telo se deformiše tokom kretanja
Kretanje deformabilnog tela ima dve komponente
Kretanje CM
Unutrašnje kretanje – vibracije
Periodično kretanje
Obavlja se deformisanjem
Tačke tela osciluju pri vibriranju
Amplitude i/ili faze oscilovanja tačaka se razlikuju



In Sremska Kamenica 26.1. 2022.

Co-funded by the Erasmus+ Programme of the European Union

Evaluation report

Erasmus + Project No598241-EPP-1-2018-1-RS-EPPKA2-CBHE-JP

Strengthening educational capacities by building competences and cooperation in the field of Noise and Vibration Engineering

SENVIBE

Author:	EUSK, Linda Mitić, Ljiljana Ćurčić
Executive summary	This document provides the review of the **Learning and teaching materials for undergraduate courses in Noise & Vibration at different engineering departments**
External /Internal Evaluation Methodology	What has been done and how? The review of the learning and teaching materials was written based on lecture via power point presentation. 12/27/2021 at the Faculty of Occupational Safety, the University of Nis (the topic of the lecture was: Noise in the work environment - evaluation, assessment and effects;
Work Packages	
Deliverable/ Activity Ref. No	5.2. Development of e-learning, and b-learning materials for BSc Development of the BSc VAE studies 7.2. Internal and external reviews processes and outcomes.
Review of Learning and teaching materials for undergraduate courses in Noise & Vibration at different engineering departments	

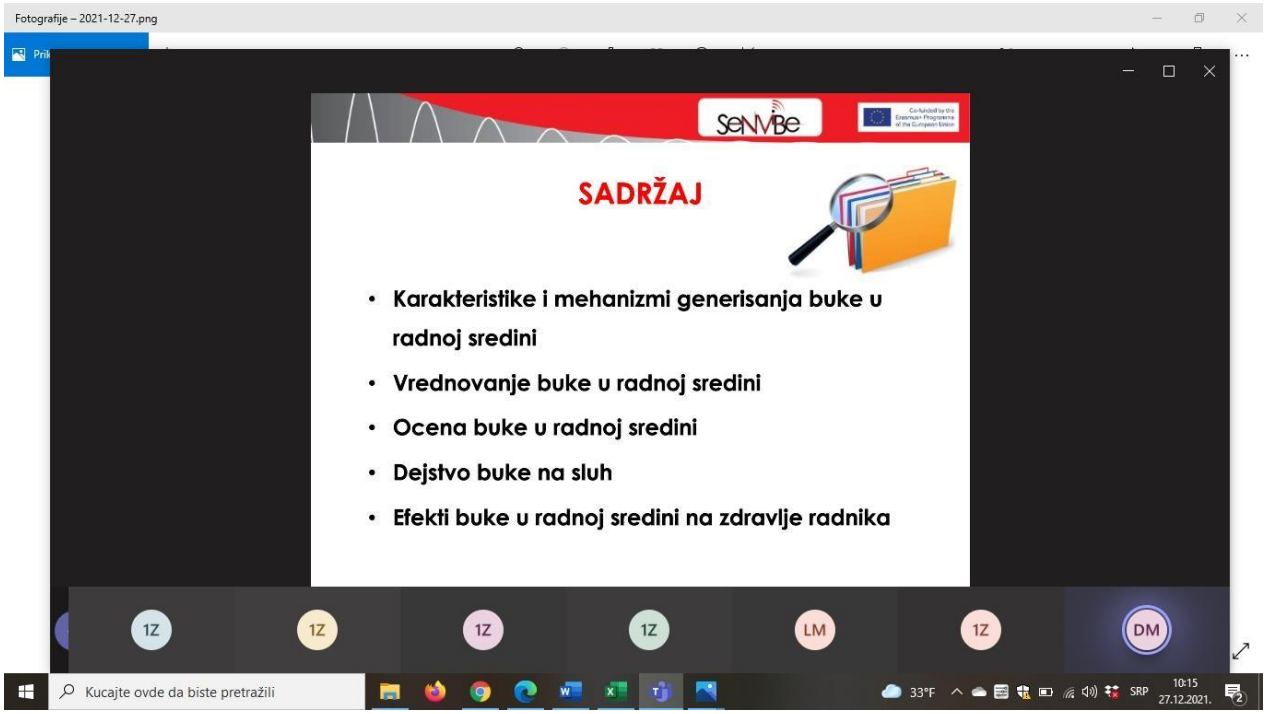
Please write here your opinion in a descriptive form in English: The undergraduate courses in various engineering areas of noise and vibration are well designed. The given examples during the course enable students to learn the course materials more easily. In the PowerPoint presentations, students are given literature from which they can expand their knowledge in the given areas.
Suggestions for improvement in English: • Offer more practical examples to improve students' understanding of the course materials on noise and vibration • Enhance the interactive level of teaching by setting frequent short assignments for students (Problem-solving questions with sample answers)

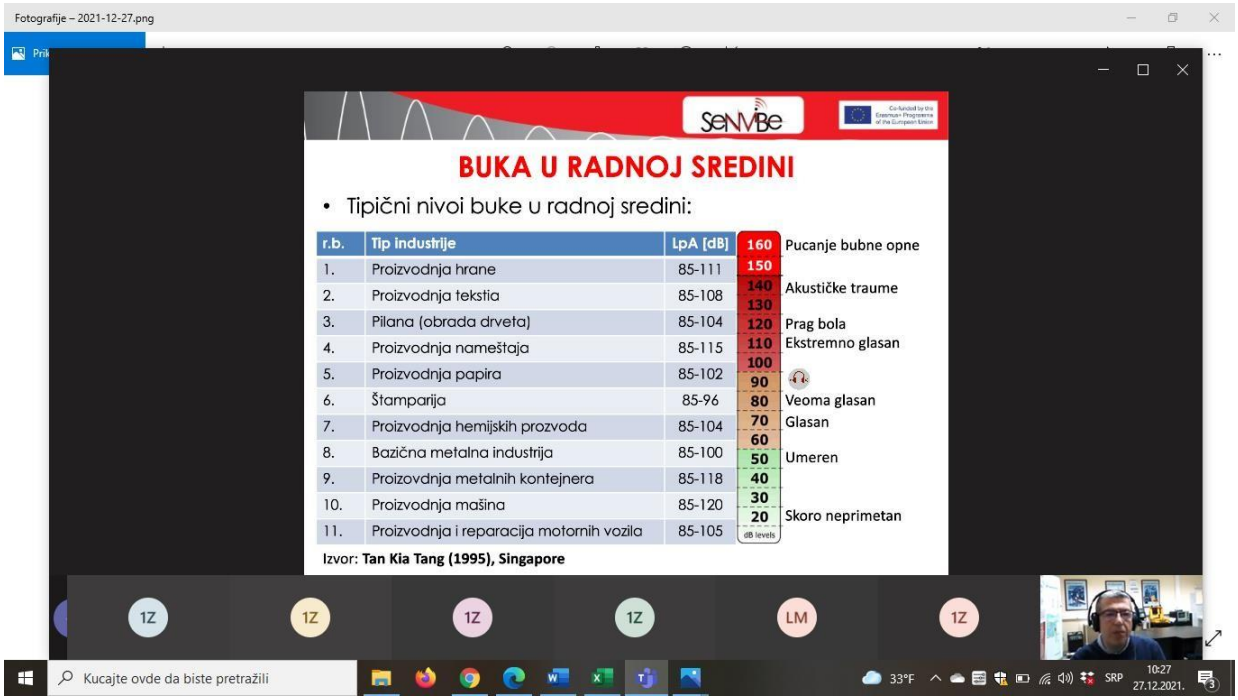
BSc Learning and teaching materials EVALUATION

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
All learning and teaching materials are selected in such a way as to contribute to the achievement of the educational goals of the study program		x			
Each lecture has a clear structure of presenting certain content.	x				
All learning materials have the same graphic identity consistently implemented	x				
The proposed material is representative of the way of thinking presented in a given discipline.	x				
Learning materials are optimal and rational	x				
The materials cover the basic scope of knowledge in the field of Noise and Vibration		x			

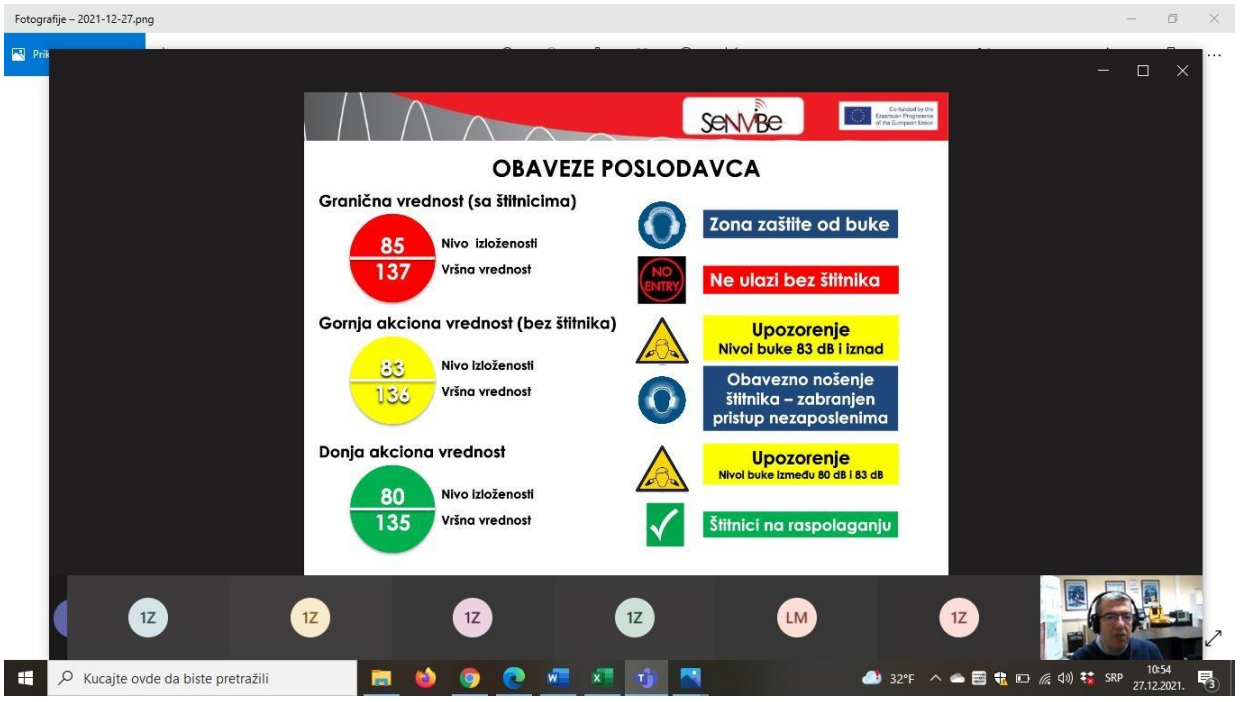
The contents of the learning materials are harmonized and connected with other related materials			X		
Learning materials are arranged in a logical order	x				
The way the learning materials are presented is appropriate	x				
Learning materials contain relevant examples with explanations	x				
Learning materials contain special sequences of knowledge integration		x			
There are self-assessment materials				x	
Learning materials are interconnected through hypertext and thus reflect the inherent structure of the field		x			
There is interactivity in learning materials		x			

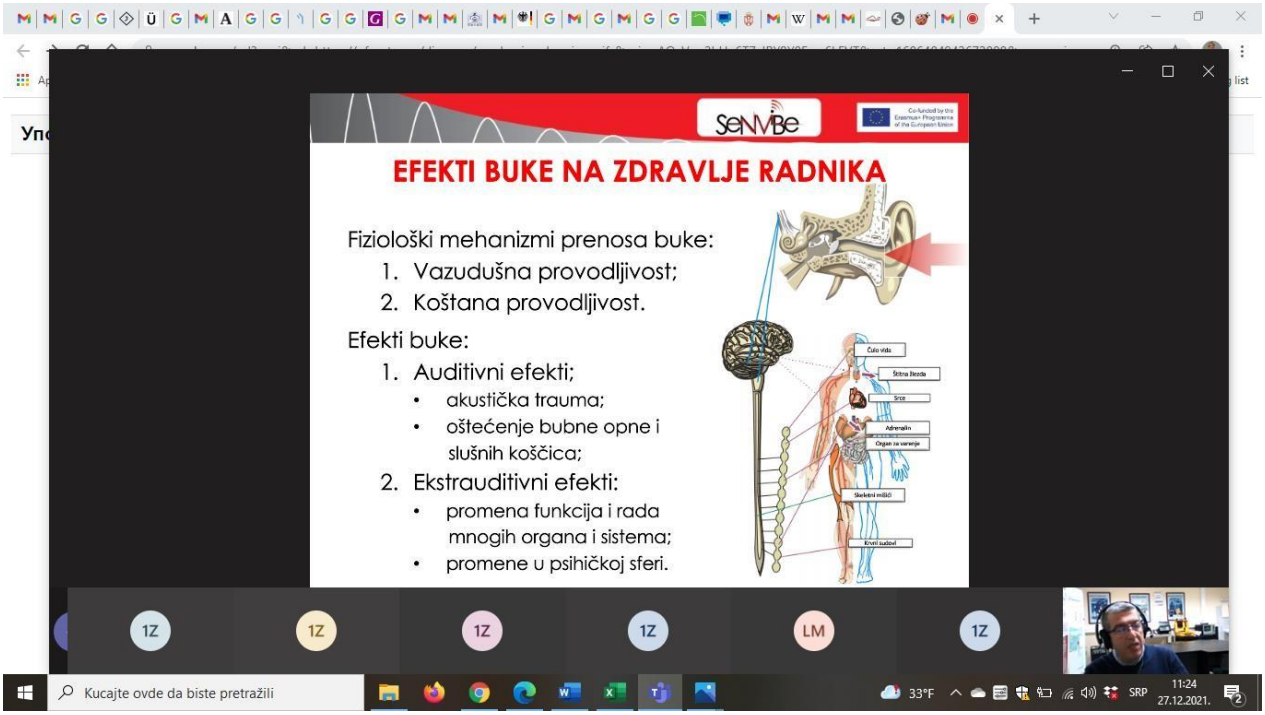
Monday 27/12/2021, 9:15 am - 11am (UTC) Faculty of Occupational Safety in Nis - online lecture lasting 1 hour and 45 minutes)


Fotografije – 2021-12-27.png
SADRŽAJ
• Karakteristike i mehanizmi generisanja buke u radnoj sredini
• Vrednovanje buke u radnoj sredini
• Ocena buke u radnoj sredini
• Dejstvo buke na sluh
• Efekti buke u radnoj sredini na zdravlje radnika
Kucajte ovde da biste pretražili


Fotografije – 2021-12-27.png
BUKA U RADNOJ SREDINI
• Tipični nivoi buke u radnoj sredini:
r.b. | Tip industrije | LpA [dB]
1. Proizvodnja hrane 85-111
2. Proizvodnja tekstila 85-108
3. Pilana (obrada drveta) 85-104
4. Proizvodnja nameštaja 85-115
5. Proizvodnja papira 85-102
6. Štamparija 85-96
7. Proizvodnja hemijskih prozvoda 85-104
8. Bazična metalna industrija 85-100
9. Proizovdnja metalnih kontejnera 85-118
10. Proizvodnja mašina 85-120
11. Proizvodnja i reparacija motornih vozila 85-105
160 Pucanje bubne opne
150
140 Akustičke traume
130
120 Prag bola
110 Ekstremno glasan
100
90
80 Veoma glasan
70 Glasan
60
50 Umeren
40
30
20 Skoro neprimetan
dB levels
Izvor: Tan Kia Tang (1995), Singapore
Kucajte ovde da biste pretražili


Fotografije – 2021-12-27.png
SeNVBe
KRITERIJUMI ZA OCENU IZLOŽENOSTI BUCI
Nivo izloženosti
Vršni nivo (za impulsnu buku)
OCENA
$L_{A,EX,8H} \leq 80$ dB
$L_{Cpeak} \leq 135$ dB
NE PREKORAČUJE DONJE AKCIONE VREDNOSTI
Nisu potrebne dodatne mere zaštite
$80 < L_{A,EX,8H} < 83$ dB
$135 < L_{Cpeak} < 136$ dB
PREKORAČUJE DONJE AKCIONE VREDNOSTI
Lična zaštitna sredstva na raspolaganju
$L_{A,EX,8H} \geq 83$ dB
$L_{Cpeak} \geq 136$ dB
PREKORAČUJE GORNJE AKCIONE VREDNOSTI
Obavezno korišćenje ličnih zaštitnih sredstva
$L_{A,EX,8H} > 85$ dB
$L_{Cpeak} > 137$ dB
PREKORAČUJE GRANIČNE VREDNOSTI
Ocenu izloženosti vršiti uzimajući u obzir slabljenje ličnih zaštitnih sredstava
1Z
1Z
1Z
1Z
LM
1Z
Kucajte ovde da biste pretražili
33°F
SRP
10:47
27.12.2021.


Fotografije – 2021-12-27.png
SeNVBe
OBAVEZE POSLODAVCA
Granična vrednost (sa štitnicima)
85
137
Nivo izloženosti
Vršna vrednost
Gornja akciona vrednost (bez štitnika)
83
136
Nivo izloženosti
Vršna vrednost
Donja akciona vrednost
80
135
Nivo izloženosti
Vršna vrednost
Zona zaštite od buke
NO ENTRY
Ne ulazi bez štitnika
Upozorenje
Nivoi buke 83 dB i iznad
Obavezno nošenje štitnika – zabranjen pristup nezaposlenima
Upozorenje
Nivoi buke između 80 dB i 83 dB
Štitnici na raspolaganju
1Z
1Z
1Z
1Z
LM
1Z
Kucajte ovde da biste pretražili
32°F
SRP
10:54
27.12.2021.



In Sremska

Kamenica

26.1. 2022.

Evaluation report template

Erasmus + Project No598241-EPP-1-2018-1-RS-EPPKA2-CBHE-JP

Strengthening educational capacities by building competences and cooperation in the field of Noise and Vibration Engineering

SENVIBE

Reviewer:	D. Šumarac Pavlović
Executive summary	This document provides the review of the **Learning and teaching materials for MSc course in Vibro acoustic engineering** *PLEASE DO NOT CHANGE*
External /Internal Evaluation Methodology	What has been done and how? *The review was written based on materials available on the website of the courses: Fundamentals of Technical Acoustics and Electroacoustics. The review refers to the available presentations, the literature offered and the structure of the exam requirements.*
Work Packages	
Deliverable/ Activity Ref. No	Development of learning and teaching materials for MSC VAE - **Acoustics** 7.2. Internal and external reviews processes and outcomes. *PLEASE DO NOT CHANGE*

Learning and teaching materials for master courses in VAE

The course Fundamentals of Technical Acoustics covers a wide range of topics, starting with understanding the mechanism of the creation and propagation of sound, sound waves. All relevant phenomena that follow the propagation of sound waves through different media are covered.

The time and frequency analysis of various audio signals (speech and music) as

well as the basis for understanding the complex mechanism of human sound perception are covered in detail. The acquired knowledge was applied in specific areas: room acoustics and building acoustics. The topic related to different disciplines in the field of ultrasound was specially addressed. This course covers the broad application of sound in various engineering disciplines. The Electroacoustics course introduces students to the working principles of electroacoustic transducers, and the physical quantities used to characterize them. Microphones, speakers and headphones, which represent the basis of all complex audio systems, are covered. Within the course, various concepts of speaker and microphone systems are analysed in detail. Students are introduced to measurement techniques for measuring and characterizing audio devices and acoustic environments. Both courses are covered by suggested literature that provides additional knowledge from all thematic areas covered by the mentioned courses
Suggestions for improvements in the proposed courses relate primarily to the introduction of more practical classes in which students would directly learn about different measurement techniques and thus gain a clearer insight into the nature of the physical phenomena discussed. Also, the courses could be improved by introducing specialized software tools that are used in engineering practice to design different systems, as well as software tools for measurement in different areas of acoustics.

EVALUATION

MSC Course in VAE	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Will the L&T materials be valuable for the students/teachers?	x				
Is the content of the L&T materials appropriate for the level of the master study?		x			
Is the L&T materials enable the expansion of knowledge acquired in undergraduate studies?		x			
Is the content of the L&T materials relevant to the learning outcomes of the engineering	x				

departments?					
Is the content of the L&T materials detailed enough?		x			
Is the content of the L&T materials appropriate for the topic?		x			
Does the content of L&T materials have the appropriate scope and content?		x			
Is the content of the L&T materials up-to date?		x			
Does the content of the L&T materials have a logical structure	x				
Does the content of the L&T materials avoid repetition and includes introduction to the irrelevant the topics?	x				
Are L&T materials realized at the appropriate technical level?		x			

Place, date: Name and signature:

Belgrade, 03.10.2022 D. Šumarac Pavlović

D Šumarac Pavlović

Prepared by Momir Prascevic and Darko Mohajlov
Nis, 05/10/2022

Enhanced by Zlatan Soskic
Kraljevo, 10/10/2022

Enhanced by Dragana Strbac and Ivana Kovacic
Novi Sad, 21/10/2022

Approved by the Quality Assurance Group Leader, Natasa Stojic
Sremska Kamenica, 24/10/2022

Approved by Project Coordinator
Novi Sad, 25/10/2022

"This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein"