

ERASMUS+ PROJECT SENVIBE: RESULTS OF THE PREPARATION PHASE REALIZED DURING THE FIRST PROJECT YEAR

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Abstract: The SENVIBE project entitled 'Strengthening educational capacities by building competences and cooperation in the field of Noise and Vibration Engineering', No. 598241-EPP-1-2018-1-RS-EPPKA2-CBHE-JP has been approved for funding under the Erasmus call "Capacity Building in Higher Education "EAC / A05 / 2017. The project is coordinated by the University of Novi Sad during the period 15 Nov 2018 – 14 Nov 2021. The Project Coordinator is the author of this paper. The SENVIBE project is designed to improve national educational capacities as well as to build cooperation and competences in dealing with Engineering, Environmental and Occupational Noise and Vibration (No&Vib) issues in accordance with the existing EU integration strategies and the needs of Serbia. This paper provides an overview of the results achieved during the so-called preparatory phases in the first year of the project with an emphasis on the 'Report on Needs Analysis and Gaps Detected in Educational Capacities and Cooperation in the Field of Noise and Vibration Engineering' in Serbia, which is important for the continuation of the SENVIBE project, but also contains conclusions and suggestions for strengthening relevant capacities at the national level.

Key Words: Improvements of National Educational Capacities; Curriculum Development; Engineering and Engineering Disciplines; University-Enterprise Cooperation; Noise and Vibration.

1. INTRODUCTION

SENVIBE is the acronym of the project 'Strengthening educational capacities by building competences and cooperation in the field of Noise and Vibration Engineering'

<https://senvibe.uns.ac.rs/>,

which was approved for financing under the call Erasmus+ Capacity Building in Higher Education EAC/A05/2017 and will be coordinated by University of Novi Sad during the period 15 Nov 2018 – 14 Nov 2021.

The motivation behind the Erasmus+ SENVIBE project is the recognized and urgent need to improve national educational capacities and build cooperation and competences in dealing with Engineering, Environmental and Occupational Noise and Vibration (No&Vib) issues in Serbia. Chapter 27 on Environmental Protection in Serbia's EU accession negotiations [1] clearly identifies this problem as multispectral and emphasizes that 'no progress has been made in the field of noise. What is needed is strategic planning, strengthening capacities and more investments...'. This is exactly what the SENVIBE project addresses relying on the national priorities for Serbia defined by the Erasmus+ Key Action 2 Capacity Building in Higher Education for the year of application: i) Curriculum development, ii) Engineering and engineering trades, and iii) University-enterprise cooperation.

The SENVIBE project has four Specific Project Objectives (SPO s):

SPO1. To modernise existing courses in the field of No&Vib as well as to develop and implement new courses tailor-made for students of undergraduate programmes of six different engineering departments: Environmental Engineering, Occupational Safety Engineering, Mechanical Engineering, Electrical Engineering, Civil Engineering and Traffic Engineering at the Serbian Higher Education Institutions (HEIs) involved;

SPO2. To create and implement two types of Life-Long Learning (LLL) courses for practitioners in the fields of No&Vib Engineering, Environmental Protection and Occupational Safety;

SPO3. To develop and implement a new MSc programme in Vibro-Acoustic Engineering (VAE) at the University of Novi Sad;

SPO4. To establish a No&Vib Hub - a central unit launching and facilitating strategic cooperation among the key stakeholders engaged in No&Vib from academic and non-academic sectors.

In order to achieve these objectives, the SENVIBE project relies on the synergy between the partners who possess the know-how and experience in the area - the two renowned HEIs from the EU: University of Southampton, Institute of Sound and Vibration Research ISVR and Kungliga Tekniska Högskolan KTH, Marcus Wallenberg Laboratory for Sound and Vibration Research, who will transfer the knowledge to boost the practices of four HEIs from Serbia: University of Novi Sad, University of Nis, University of Kragujevac and EDUCONS University from Sremska Kamenica. The two international partners already have a good cooperation portfolio and have good understanding of the topic and joint results. Further support is secured from non-academic partners: the local authority - Provincial Secretariat for Urban Planning and Environmental Protection of Autonomous Province of Vojvodina, stakeholders from industry (Vojvodinian Association of Employers) and the Institute for Occupational Safety and Health. Their

complementarity will bring added value to the process of establishing the No&Vib Hub as well as for defining a pool of No&Vib issues for students to experience during their practical placement/internship or to analyse in their individual projects/theses. On the other hand, these non-academic partners will have some of their No&Vib issues identified and resolved, sharing their experience and gaining new ones, establishing mutual cooperation for the first time.

2. SURVEYS AND COMPARATIVE ANALYSES OF RELEVANT NO&VIB EDUCATION AND COOPERATION IN THE EU AND SERBIA

The SENVIBE project consists of nine Work Packages (WPs), all of which comprise a specific set of deliverables, indicators and their measures. The preparation activities in WP1 done during the first year of the project includes the survey and comparative analysis of relevant courses in the EU and Serbia - matching and benchmarking. Learning outcomes, contents, teaching methodologies and resources available and needed were of interest for three separate analyses: courses for undergraduate students of different engineering departments (developed and implemented in WP3 as defined by **SPO1**), LLL courses (developed and implemented in WP4 as defined by **SPO2**) and VAE MSc programmes (one of them will be developed, accredited and implemented in WP5 as defined by **SPO3**). In addition, WP1 comprises matching the EU trends with the needs in Serbia with respect to the No&Vib Hub (established in WP6 as defined by **SPO4**), compiling the list of stakeholders, analysing mutual and individual contributions to the project goals and establishing a modus operandi. The results of these activities were compiled in the following reports (**R**s), which have been published open access on the website of the SENVIBE project [2-8]:

R1 as a basis for **SP1, SP3**. Report on Survey and Comparison of Serbian and EU Education in No&Vib (96 pages) [2],

R2 as a basis for **SP3**. Review and Analysis of the Existing MSc Vibro-Acoustic Engineering Programmes in EU (62 pages) [3],

R3 as a basis for **SP1**. Report on Tailor-Made Learning Outcomes for Students of six Engineering Departments (11 pages) [4],

R4 as a basis for **SP3**. Report on Learning Outcomes for an MSc Vibro-Acoustic Engineering Programme (9 pages) [5],

R5 as a basis for **SP2**. Report on Tailor-Made Learning Outcomes for LLL Courses (34 pages) [6],

R6 as a basis for **SP4**. Report on No&Vib Hub: Matching the EU Trends with the Needs in Serbia (80 pages) [7],

R7 as a basis for **SP4**. Linking Stakeholders in the Field of No&Vib in the EU via Different Forms of Hubs: Examples of Good Practice (15 pages) [8].

An important deliverable is the final report on the needs analysis and gaps detected through comparative research:

R8. Report on Needs Analysis and Gaps Detected in Educational Capacities and Cooperation in the Field of No&Vib Engineering in Serbia (42 pages) [9].

This report is compiled based on the previously mentioned reports **R1-R7** and is seen to be a document of national interest, as this type of overviews and comparisons have never been done in Serbia in the No&Vib field so far. It is hoped that this document and the activities conducted will pave a way for the successful achievement of the project wider aim reflected by the project title.

The very first task of WP1 contained a web-based survey of No&Vib education in Serbia and EU, focusing on undergraduate education, but also including some information on higher levels of education [2]. The survey for Serbia covered only accredited universities in Serbia - members of the Conference of the Universities of Serbia KONUS in the field of technical and technological sciences, under the study programmes listed in **SPO1** above.

At the completion date of the corresponding report **R1**, 33 courses were identified within basic academic studies, which directly, or at least to a non-negligible extent, deal with or contain aspects related to No&Vib and Technical Acoustics [2]. Their numbers and distributions per universities are shown in *Figure 1* [9].

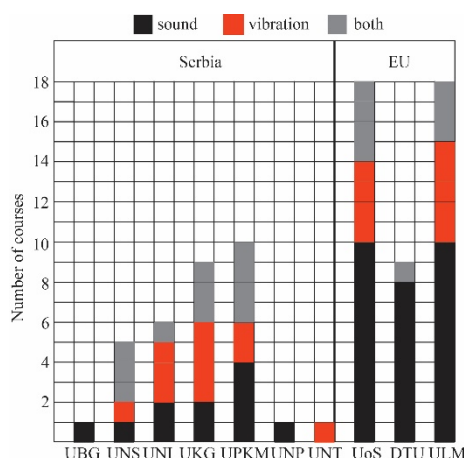


Figure 1. Distribution of No&Vib undergraduate courses per a) accredited universities (Us) in Serbia in the following order: U of Belgrade, U of Novi Sad, U of Nis, U of Prishtina with provisional headquarters in Kosovska Mitrovica, U of Novi Pazar and U 'Nikola Tesla', BG); b) selected representative Us in the EU: U of Southampton, Technical U of Denmark and U of Le Mans

In addition, three representative European undergraduate programmes in the No&Vib fields have been analysed in detail. They are from the following universities: University of Southampton, Southampton, UK; University of Le Mans, Le Mans, France; and Technical University of Denmark, Lyngby, Denmark [2]. The distribution of No&Vib undergraduate courses for these three universities is also shown in *Figure 1* [9], and two of them have a strikingly large number of these courses. An average number of them is 15, while for the seven Serbian universities shown in *Figure 1* this average number is less than 5 (note that, as mentioned above, most of them are elective).

The following related gaps were detected [9]:

- Unlike in the EU, neither a Bachelor programme for Vibro-Acoustics/Sound and Vibration, nor such a MSc programme exists in Serbia;
- A majority of students from the study programmes covered, have at their disposal only courses dealing with the very basics of No&Vib Engineering or Technical Acoustics;
- Even where courses in No&Vib Engineering or Technical Acoustics exist, most of them are elective, which implies that smaller number of students will gain knowledge in the field;
- The learning goals and outcomes that concern No&Vib courses are not harmonized in the existing subjects of different Serbian universities, which is a consequence of a lack of a systematic approach to the education in the No&Vib field in Serbia;

The following related recommendations are made [9]:

- No&Vib Engineering and Technical Acoustics courses should be introduced as compulsory, in programmes and modules in the field of technical and technological sciences;
- General courses should be used as an opportunity. Introducing modules and lessons dealing with No&Vib Engineering in those courses will be the easiest and fastest way for initial increase of knowledge and awareness of students about this topic;
- A set of tailor-made learning goals and outcomes, specific for each of the engineering departments present at Serbian universities, is a need and is related to **SPO1**;
- A formal recognition of a Vibro-Acoustic Engineer as an occupation in Serbia, designed in a way that corresponds to the existing analogous EU models, is a step of a national importance;
- This step should be followed by the design of the corresponding MSc programme which will lead to this qualification and its formal accreditation by the end of the SENVIBE project (as defined by **SPO4**).

To set the basis for the new MSc programme on Vibro-Acoustics in Serbia, a study was conducted on the topic ‘Review and Analysis of the Existing MSc Vibro-Acoustics Engineering Programmes in the EU’ [3]. The related report provides an overview of the structure and content of four representative MSc programmes in Sound and Vibrations offered at two SENVIBE partner institutions: MSc in Acoustical Engineering, University of Southampton, Southampton, UK; MSc in Engineering Mechanics with specialization in Sound and Vibration; KTH Royal Institute of Technology, Stockholm, Sweden, and two other representative EU universities: MSc in Engineering Acoustics, Technical University of Denmark, Lyngby, Denmark; and MSc in Electroacoustics, University of Le Mans, Le Mans, France. It is important to note that most of the courses taught at these four universities comprise a practical component, such as various measurements and laboratory work, practical demonstrations and assignments, problem solving tasks and project work. An overview of the courses mentioned above is given in *Figure 2* [9].

When it comes to the links between stakeholders in the No&Vib field in Europe, report **R7** [8] showed that there is a diversity of ‘hubs/network/centres’ established for this purpose, and there is no single model or ‘one-size-fits-all approach’. Each of them has its own set of key drivers, specific objectives, approaches and expected outcomes. They have a form of a strategic network or platform with a critical core of actors/stakeholders undertaking diverse activities to achieve their individual objectives as well as collective goals. Based on the analysis for Serbia presented in **R6** [7] and **R8** [9], certain recommendations are outlined for the establishment of the SENVIBE No&Vib Hub. First, the stakeholders engaged in No&Vib fields should be from the following sectors: Education and research sector; Government sector; Business sector; Professional sector and expert services groups; and Non-governmental sector. Second, they should develop effective mechanisms for cooperation, including: Student internship programme; Industrial scholarship/fellowship programme; Providing practical subjects for students’ MSc theses; Realization of joint projects; Exchange of knowledge on the related topics and legislation; Monitoring of reform policies; Presenting *results* of No&Vib monitoring; Development and implementation of professional training courses, seminars and workshops for various types of trainees; Educational activities for wider community; Dissemination activities, etc.

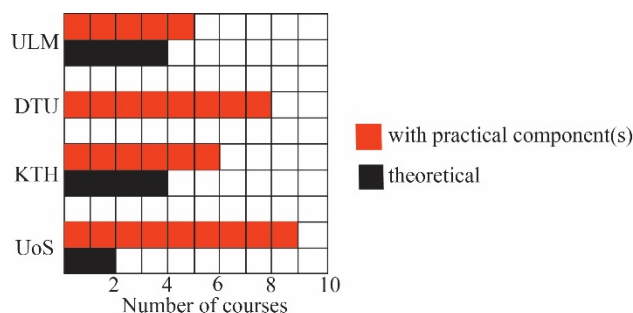


Figure 2. The number of MSc level courses on No&Vib at four EU universities: theory vs. practice

3. CONCLUSIONS

During the first implementation year of the SENVIBE project, certain overviews have been made related to the education in the EU in the No&Vib fields, including HE and LLL course as well as different ways of the formalized cooperation between academic and non-academic stakeholders. The analogous surveys have been carried out for Serbia, which have been then compared with the findings for the EU. This enabled the partners engaged on these activities to draw some conclusions in the form of gaps detected as well as to point out some recommendations for short-term or long-term impacts and improvements. Some of the recommendations are expected to be implemented during the SENVIBE project. However, some findings and *recommendations* for addressing *identified gaps* need the support and action plans from higher national, regional and local authorities, and the final report **R8** [9] will be translated into Serbian and distributed to those relevant for the issues in question.

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