COURSE DESCRIPTION CARD - SYLLABUS

Course name
Digital signal processing

Course

Field of study
Biomedical Engineering

Year/Semester
4/7

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	15	
Tutorials	Projects/seminars	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Basics of acoustics, vibration theory, basics of electrical engineering and metrology. The ability to self-educate and acquire knowledge on the basis of library resources (including e-resources) and Internet resources (e.g. eKursy).

Course objective

Getting the students acquainted with the specificity of sources of noise and vibrations occurring in the living environment and workplaces. Making the students aware of the negative impact of vibrations and noise on the human body. Demonstrating the possibility of using vibrations and sounds in medical therapy. Getting the students acquainted with the methods of measuring and analyzing of vibroacoustic signlals. Mastering the ability to measure and assess vibrations and noise affecting humans in accordance with the methodology specified in standards and regulations. Getting the students acquainted with methods of minimizing vibrations and noise.

Course-related learning outcomes

Knowledge

After completing the course, the student knows how noise and vibrations affect the human body,the student also knows the harmful effects of such an impact. The stunent knows the apparatus, equipment, methods and principles of measuring, analyzing and registering vibrations and noise. The student has specialist knowledge of the methods of measuring and assessing vibrations affecting humans (hand-arm vibrations, whole-body vibrations). The student knows selected issues related to the measurement, analysis and evaluation of noise affecting humans (including noise in the audible band, infrasounds and ultrasouds). The student knows about the possibility of using sounds and vibrations in medical therapy. The student knows the methods of minimizing vibrations and noise and how to reduce the impact of these factors on the human body.

Skills

After completing the course, the student is able to choose the methods and techniques of vibration and noise measurement. The student knows how to configure measuring devices and perform measurements and analyzes of vibroacoustic signals. The student is able to carry out vibration and noise tests in accordance with standards or measurement procedures. The student is able to evaluate the test results by relating them to the criteria Inclouded in standards and / or regulations. The student is able to assess the influence of vibration and noise on the human body. The student is able to determine the specificity and parameterize the sources of vibrations and noise occurring in the living environment and workplaces. The student is able to propose methods of minimizing vibrations and define measures of human protection against vibrations and noise.

Social competences

The student is aware of the importance of engineering activities and responsibility in terms of human protection against the negative effects of vibrations and noise in the living and working environment. The student is aware of the need to learn and deepen knowledge and skills. The student can organize teamwork and actively cooperate in the scope of performed tasks.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratory classes:

Short entry tests before each laboratory exercise. Assessment of knowledge and skills during carried out experiments. Evaluation of mastery of course content, skills and acquired competencies based on the quality of prepared reports. Necessary condition to pass the laboratory: passing a set of laboratory exercises and getting the required number of points from entry tests and reports.

Lecture

Written or remote tests (via eKursy platform): 10-20 issues covering the entire lecture material and issues indicated for own studies (self-studying).

Grading scale both laboratory and lecture (exam): below 60% unsatisfactory; 60-67% satisfactory, 68-75% satisfactory plus; 76-83% good; 84- 91% good plus; 92 -100% very good.

Programme content

Lectures:

Sources of noise and vibrations affecting humans in the living and workplace environment. Human perception of sound. The impact of noise on the human body (audible range of sounds, ultrasounds and infrasound). The influence of noise on the hearing organ and psychophysical efficiency. Acoustic measurements. Microphones, amplifiers, filters (A, B, C, D, G, Z), sound meters and sound analysers. Methodology of noise measurement, analysis and evaluation at workplaces. Audiometry. TRT therapy (Tinnitus Retraining Therapy). Vibro-therapy and music therapy. Measurements of mechanical vibrations. Vibration transducers, measuring amplifiers, filters (H-A, WB), vibration meters and analyzers. Hand-arm vibrations and whole-body vibrations. Methodology of measuring and evaluating vibrations affecting humans body. Methods of reducing vibrations and noise. Individual measures of human protection against vibrations and noise.

Laboratory classes:

Introduction to vibroacoustic measurements (determination of noise and vibrations parameters). Spectral analysis of noise and vibrations in terms of its impact on the human body. Measurements and evaluation of noise at workplaces. Study of the impact of noise on speech intelligibility. Measurements and evaluation of the impact of hand-arm vibrations on a human - operator of hand held tools. Research of the whole body vibrations in the means of transport. Determination of acoustic properties of rooms (determination of acoustic absorption, reverberation time, average sound absorption coefficient). Testing the properties of soundproofing materials, acoustic screens. Determination of the acoustic power level of machines and devices.

Teaching methods

Lectures - multimedia presentations. The content of lectures is available in electronic form before the start of classes, which enables comfortable and active participation in lectures. Lectures are supported on the Moodle e-learning platform. There are: presentations, multimedia, off-line webinars, source materials (magazines, selected publications, technical notes), sets of tasks and a set of examination issues. Laboratories: experiments are performed on laboratory stands on the basis of instructions, photo and video tutorials and individual data sets .

Bibliography

Basic

1. Up-to-date publications of the directive's regulation related to the subject of the course.
2. Engel Z., Ochrona środowiska przed drganiami i hałasem, PWN, 2001.
3. Renowski J., Hałasy i wibracje. Wyd. Politechniki Wrocławskiej 1979.
4. Jurczak M., Wibracje, PWN Warszawa 1974.

Additional

1. Cempel C., Wibroakustyka stosowana, PWN Warszawa 1989.
2. Żyszkowski Z., Miernictwo akustyczne WNT Warszawa 1987.
3. Harazin B., Skutki zdrowotne zawodowego narażenia na drgania miejscowe Warszawa, CIOP 2000.
4. Puzyna Cz., Ochrona środowiska przed drganiami i hałasem, Wyd. AP. 1993.
5. Barczewski R., Vibroacoustic measurements and tests - set of tasks - electronic version (eKursy)
6. Supplementary materials available on the eKursy e-learning platform.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	40	1,5
Student's own work (literature studies, self-education based on e-learning resources, preparation for laboratory classes, reports, preparation for tests/exam) [1]	35	1,5

[1] delete or add other activities as appropriate