DOCTORAL SCHOOL OF WROCŁAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE: Prof. Andrzej Dobrucki
DEPARTMENT: Faculty of Electronics W4
SCIENTIFIC DISCIPLINE: Automation, Electronics and Electrical Engineering

COURSE CARD

Course name in Polish: Zaawansowane metody teorii fal akustycznych i pola akustycznego
Course name in English: Advanced methods in the theory of acoustical waves and fields
Course language ~~Polish /~~ English*
University-wide general course type*:
The course is intended for all PhD students: YES / NO
1~~) BASIC COURSE~~
2) SPECIALIST COURSE
3~~) SEMINAR~~
~~4) HUMANISTIC COURSE~~
~~5) LANGUAGE~~

Subject code: AEQ100236W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30			
Grading	Exam	Exam	Oral presentation	Exam, inspection, evaluation classes
Number of ECTS points	**0**			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1.
2.
3.

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COURSE OBJECTIVES

C1 Acquisition of advanced knowledge, including application aspects, in the field of acoustic waves in gases, liquids and solids as well as sound source properties

PROGRAM CONTENTS

Form of classes – lecture (Lec)		Number of hours
Lec1	Derivation of the wave equation in gas and liquid media	1
Lec2	Parameters of the acoustic wave: sound speed, damping factor, B / A parameter. Intensity and level of sound intensity	2
Lec3	Linear acoustic waves in loss and dispersion media	2
Lec4	Non-linear acoustic waves in loss and lossless media. Burgers' equation	2
Lec5	Non-linear acoustic waves in dispersion media. Korteweg-de Vries equation. Solitons	**2**
Lec5	The KZK equation. Parametric antennas	**2**
Lec6	Point source and acoustic dipole. Acoustic antennas	**2**
Lec7	Sources with spherical symmetry. Radiation impedance	**2**
Lec8	Sources with cylindrical symmetry.	**2**
Lec9	Integral formulas of Kirchhoff and Rayleigh. Radiation of the piston in an infinite baffle	**2**
Lec10	The boundary integral method as a tool for calculating acoustic fields of sound sources based on Kirchhoff's integral formula	**2**
Lec11	Derivation of wave equations in solids	**2**
Lec12	Types of waves in a three-dimensional continuum of solids	**2**
Lec13	Geometric simplifications of wave propagation in solids. Waves in rods, beams and plates	**2**
Lec14	Transition of waves in solids across the boundaries of the media. Rayleigh surface waves and plate Lamb waves	**3**

Form of classes – foreign language course (Lng)		Number of hours
Lng1		
Lng2		
Lng3		
..		
	Total hours:	

Form of classes – seminar (Sem)		Number of hours
Sem1		
Sem2		
Sem3		
…		
	Total hours:	

Form of classes – mixed forms (mix)		Number of hours
Mix1		
Mix2		
Mix3		
…		
	Total hours	

TEACHING TOOLS USED
N1. Lecture with the use of a blackboard and slides N2. Consultations N3. Own work - independent study and preparation for the exam.

ACHIEVED SUBJECT LEARNING OUTCOMES		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8S_WG	Student knows the equation of acoustic wave in gases and liquids and ways to solve it for specific boundary conditions
Knowledge	P8S_WG	Student knows the equation of non-linear propagation of one-dimensional acoustic waves in loss and dispersion media and the characteristic effects associated with this propagation
Knowledge	P8S_WG	Student knows the properties and parameters of sound sources
Knowledge	P8S_WG	Student knows the equations of propagation of elastic waves in solids and detailed solutions of these equations

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] A. Dobrucki – Podstawy akustyki, Politechnika Wrocławska 1992
[2] A. Dobrucki – Przetworniki elektroakustyczne, WNT Warszawa 2007

SECONDARY LITERATURE:

[1] E. Skudrzyk – The foundation of acoustics, Springer 1971
[2] L. Beranek, T. Mellow – Acoustics: Sound Fields and Transducers, Academic Press 2012
[3] M. Bruneau, T. Scelo, Fundamentals of Acoustics, ISTE 2006

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Prof. Andrzej Dobrucki (Andrzej.Dobrucki@pwr.edu.pl)