STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Structural Dynamics		**1010102121010111035**
Field of study	Profile of study (general academic, practical)	Year /Semester
Civil Engineering Second-cycle Studies	**general academic**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Structural Engineering	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
Second-cycle studies	**full-time**	
No. of hours		No. of credits
Lecture: **30** Classes: **-** Laboratory: **30** Project/seminars: **-**		**4**
Status of the course in the study program (Basic, major, other)	(university-wide, from another field)	
major	**from field**	
Education areas and fields of science and art		ECTS distribution (number and %)
technical sciences		**4 100%**
Technical sciences		**4 100%**

Responsible for subject / lecturer:

prof. dr hab. inż. Roman Lewandowski, prof. nadzw.
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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of the integral and differential calculus and the matrix analysis. Knowledge of static analysis of structures. Knowledge of basis of dynamic analysis.
2	**Skills**	Is able to calculate integrals and derivatives. Is able to solve ordinary differential equations. Is able to do operations on vectors and matrices. Is able to perform the static analysis of structures. Is able to do the dynamic analysis of one degree of freedom systems
3	**Social competencies**	Students are able to honesty doing an analysis of structures. They are able to clearly describes and presents results of own works.

Assumptions and objectives of the course:

The aim of lectures is to acquaint students with modern methods of dynamic analysis of structures.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Students are able to write equations of motion of structures with many degrees of freedom - [[K_W01]]
2. Students are able to determine the dynamic characteristic of structures - [[K_W01]]
3. Students are able to do an analysis of steady state and transient vibration - [[K_W01]]
4. Students are able to do the dynamic analysis of seismically excited structures - [[K_W01]]

Skills:

1. Students are able to derive equations of motion of typical dynamic systems - [[K_U004]]
2. Students are able to determine dynamic characteristics of structures - [[K_U004]]
3. Students are able to do analysis of steady state and transient vibration - [[K_U004]]
4. Students are able to do dynamic analysis of seismically excited structures - [[K_U004]]

Social competencies:

1. Students are able to do the reliable dynamic calculation of structures - [[K_K0]]
2. Students are able to do the critical analysis of results of calculation - [[K_K0]]
3. Students are able to describe and presents results of dynamic analysis - [[K_K0]]

Assessment methods of study outcomes
Written tests, valuation of project, written and oral exam

Course description
Equations of motion of structures treated as discrete systems. Equations of motion written in terms of state variables. Models of chosen types of structures. Damping models. Free vibration analysis, dynamic characteristics of structures with and without damping. Sensitivities of natural frequencies and modes of vibration with respect to design parameters. Analysis of steady state vibration. Normal coordinates and theirs applications. Rayleigh quotients. Computer methods of solution of eigenvalue problems. Time integration methods. Dynamic analysis of block foundations. Tuned mass damper. Analysis of structures seismically and para-sejsmically excited. Introduction to random vibration.

Basic bibliography:

1. Dynamika konstrukcji budowlanych, Lewandowski R., Wyd. Pol. Poznańskiej, Poznań, 2006
2. Podstawy dynamiki budwli, , Chmielewski T., Zembaty Z.: , Arkady, Warszawa, 1999
3. Structural dynamics for structural engineers, Hart G.C., Wong K.: , Wiley,, New York, 2000

Additional bibliography:

1. Structural dynamics. Theory and computation, Paz M., Chapmann and Hall, New York, 1997
2. Dynamics of structures, HumarJ.L.: , Balkema,, Lisse, 2000

Result of average student's workload

Activity	**Time (working hours)**
1. Participation in lectures	45
2. Preparation of project	20
3. Preparation to the test	10
4. Preparation to the exam	20

Student's workload

Source of workload	**hours**	**ECTS**
Total workload	100	4
Contact hours	60	2
Practical activities	50	2