Course code **Course item**

1. INFORMATION ABOUT THE COURSE

a. Basic information

Course title	***Dynamics of Machines***
Field of study	*Mechanical Engineering*
Cycle	*First degree*
Study profile	*General academic*
Study mode	*Full-time or part-time*
Specialization	
Unit responsible for the field of study	*Department of Mechanics and Computer Methods*
Lecturer	*Mariusz Kukliński, PhD*
Introductory courses	*Mathematics, basic physics*
Prerequisites	*No prerequisites*

b. Semester/ weekly timetable

Semester	Lectures (W)	Classes (C)	Laboratories (L)	Project classes (P)	Seminars (S)	Fieldwork (T)	ECTS credits ECTS*
	15	15	15				4

C. Assumed outcomes and aims - aims bind the course programme with the study programme and are referred to in learning outcomes point 2

2. LEARNING OUTCOMES (acc. to National Qualifications Framework)

No.	Description of learning outcomes	Reference to learning outcomes for the field of study	Reference to learning outcomes for the area of study
KNOWLEDGE			
K1	has knowledge of technical mechanics, especially in the field of vibration analysis	K_W04	P6S_WG
K2	has knowledge of constructing vibroinsulating fasteners	K_W07	P6S_WG
Skills			
S1	is able to plan and carry out measurements of geometric features of machine elements	K_U04	P6S_UW
S2	is able to design simple machines and devices, taking into account given technical, operational and economic criteria	K_U05	P6S_UW
SOCIAL COMPETENCES			

SC1	is aware of the importance and understands the non-technical aspects and effects of mechanical engineer's activities, including their impact on the environment and the related responsibility for decisions made	K_K04	P6S_KO

3. TEACHING METHODS

Multimedia lectures, computational exercises and laboratories

4. METHODS OF EXAMINATION

Lectures: class attendance and/or test,
Exercises: computational test or project;
Laboratories: reports

5. COURSE CONTENT

Specify the content separately for each type of classes in accordance with point I.B.	*LECTURES* 1. *Harmonic force, free vibrations of one degree of freedom, simple and physical pendulum, energy of harmonic motion.* 2. *Harmonic damped vibrations, logarithmic decrement.* 3. *Forced damped vibrations.* 4. *Transient and steady state harmonic vibrations, resonance.* 5. *Superposition of vibrations.* 6. *Rumbling phenomenon.* 7. *Free vibrations of many degrees of freedom, natural frequencies.* 8. *Vibration reduction methods, dynamic undamped vibration reducer.* 9. *The inertia tensor* 10. *Dynamic reactions of rotating body.* 11. *Types of unbalance.* 12. *Rotor balancing methods.* 13. *Nonlinear vibrations of one degree of freedom.* 14. *Self-excited vibrations.* 15. *Preparation for the computational test or project.* *EXERCISES* *Computational exercises scheduled according to the lecture's pace.* *LABORATORIES* 1. *Introductory classes.* 2. *Six practical or numerical experiments available in dynamic's laboratory room e.g.: measurements of friction torque and braking torque in bearings, test of dynamic vibration reducer, determination of natural frequencies of a frame using numerical simulation codes, measurement of natural frequencies of a frame and comparison with numerical simulation results, balancing a rotating shaft, measurement of gyroscopic moment.* 3. *Final classes and issuing final grades in laboratories.*

6. VALIDATION OF LEARNING OUTCOMES

(Each learning outcome from the list requires validation methods to ensure that it was achieved by a student.)

Learning outcome	Form of assessment (for example:)					
	Oral examination	Written examination	Test	Project	Report	Class attendance
K1-K2			x	x	x	x
S1-S2			x	x	x	x
SC1			x	x	x	x

7. LITERATURE

Basic literature	1. *Hendzel Z., Żylski W., General mechanics: dynamics, Rzeszów, 2016.* 2. *Żółtowski B., Żółtowski M., Vibration signals in mechanical engineering and construction, Bydgoszcz, 2015.* 3. *Kolovsky M. Z., Belyaev A. K., Nonlinear dynamics of active and passive systems of vibration protection, Berlin, 1999.*
Supplementary literature	1. *Wen Jeng Chen, Gunter E. J., Introduction to dynamics of rotor-bearing systems.*

8. TOTAL STUDENT WORKLOAD REQUIRED TO ACHIEVE EXPECTED LEARNING OUTCOMES EXPRESSED IN TIME AND ECTS CREDITS

Student's activity		Student workload– number of hours (for example:)
Classes conducted under a direct supervision of an academic teacher or other persons responsible for classes	Participation in classes indicated in point 2.2	45
	Supervision hours	5
Student's own work	Preparation for classes	15
	Reading assignments	15
	Other (preparation for exams, tests, carrying out a project etc)	20
Total student workload		100
	Final number of ECTS credits	4