

DESCRIPTION OF THE COURSE

Course code

MMM 2010

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Course title

<i>Technical Mechanics (EL)</i>
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Name, first name of the lecturer/supervisor

Degree

<i>Jerzy KALETA</i>	<i>Ph.D., Dr. Sc., Eng.</i>
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Names, first names of the teams/members

Degrees

Mirosław Bocian	<i>Ph.D., Eng</i>
Grażyna Ziętek	<i>Ph.D., Eng</i>

I. Form in which the courses should be completed

Course form	Lecture	Exercises	Laboratory	Project	Seminar	Points
Liczba godz.	20	10	0	0	0	4
Number of hours/week	Final examination	Examination				

II. Prerequisites

Analysis (calculus), linear algebra, physics.

Results of Education:

The course gives basic knowledge in statistics, kinematics and dynamics. It allows evaluation of external forces (reactions) as well as internal ones in mechanical problems (trusses, beams, rod systems). Having completed this course one is able to solve problems in kinematics of point and rigid body as well as problems in dynamics of material point (rotational movement, plane movement)

III. COURSE DESCRIPTION (50 words)

Force acting on rigid body. Moment of force. Reduction of force systems. Equilibrium conditions for plane and spatial force systems. Internal forces. Models and elements of mechanical systems. Kinematics of material point. Rigid body kinematics. Dynamics of systems of material points. Mass center principle. Moment and angular moment of discrete system. Mechanical systems. Rigid body dynamics. General movement. Plane rotations. Rotation about a fixed point. Dynamical reactions. Kinetic energy of rigid body. d'Alembert principle. Lagrange equations.

IV. LECTURE

Particular lectures contents	Number of hours (<=2)
1. Force acting upon rigid body. Moment of force relative to point and pole. Shift of pole.	2
2. External forces, active and passive ones. Internal forces Systems of rods. Trusses	2
3. Forces and moments. Main moment and force vectors. Shifts of moment poles. Reduction of arbitrary spatial force system.	1
4. Straight beams. Evaluation of internal forces Schwedler theorem	2
5. Allowable stresses	2

6. Kinematic of moving point, trajectory, velocity, acceleration	2
7. Models and elements of mechanical systems. . Rigid body kinematics	2
8. Translational and rotational movement around fixed axis. Plane movement, velocity field, center of rotation at given moment of time. Rotation about a fixed point	2
9. Centroids, acceleration in plane movement	2
10. Mechanical systems. Composition of equations of movements	2
11. Basic problems in dynamics. One degree of freedom oscillations	1
12. Dynamics of systems of material points. Momentum and angular momentum of systems of points.	2
13. Dynamics of rigid body. Euler equations.	2
14. Work of elementary force, gravity force, elasticity forces, power, energy.	2
15. d'Alembert principle	2
16. Generalized forces, the second type Lagrange equations	2

V. EXERCISES, SEMINARS contents (50 words)

Evaluation of internal forces in rod system. Trusses. Beams, internal forces. Allowable stresses. Exemplary calculations of kinematics of moving point and kinematics of rigid body. Dynamics of moving point in free motion and constrained motion. Evaluation of velocity from equation of momentum and angular momentum. Typical calculations related to vibrations of conservative systems with one degree of freedom. Application of energy conservation law in potential field. Using of angular momentum principle for deriving of differential equation of simple mechanical systems motion. Calculations related to dynamics of rigid body rotary and plane motions

VI. LABORATORY, PROJECT contents (50 words)

VII. Basic literature

1. B.Gabryszewska, A.Pszonka, „Mechanika”, cz. II, Kinematyka i dynamika, PWr , 1986
2. J.Zawadzki, W.Siuta, „Mechanika ogólna”, WNT, Warszawa 1971
3. J. Misiak, „Mechanika ogólna. Dynamika”. Tom 2, WNT, Warszawa 1993
4. M. Klasztorny, Mechanika. Statyka, kinematyka, dynamika, DWE, Wrocław 2000
5. Misiak J., „Zadania z mechaniki ogólnej. Dynamika, część III, WNT, Warszawa 1992
6. Nizioł J., „Metodyka rozwiązywania zadań z mechaniki”, WNT, Warszawa 1983
7. Witkowski Cz., Zbiór zadań z mechaniki, cz. I, Kinematyka, OW PWr, Wrocław 1999
8. Witkowski Cz., Zbiór zadań z mechaniki, cz. II, Dynamika, OW PWr, Wrocław 2003
9. M. Kulisiewicz, S. Piesiak, Dynamika układów mechanicznych w zadaniach technicznych, PWr, 2002
10. A. Gronowicz, Podstawy analizy układów kinematycznych, OW PWr, Wrocław 2003.

VIII. Additional literature

1. B. Skalmierski, „Mechanika”, WNT, Warszawa 1982.

IX. Conditions of the course acceptance/ credition

Lecture– Final examination (on the basis of exercise rating).
Exercises – written examination