POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Structural Mechanics

Course

Field of study	Year/Semester
Sustained Building Engineering	**2 / 4**
Area of study (specialization)	Profile of study
–	**general academic**
Level of study	Course offered in
First-cycle studies	**English**
Form of study	Requirements
full-time	**compulsory**

Number of hours

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

Number of credit points
4

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Przemysław Litewka, prof. PP

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Faculty of Civil and Transport Engineering

ul. Piotrowo 5, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Student has the basic knowledge in: mathematics, foundations of mechanics, strength of materials in the scope from the current course, as well as the structural mechanics from the 3rd semester

Student can use the possessed knowledge and gain new abilities from accessible literature. Student can apply the known theory to solve practical problems

Student is aware of necessity to expand knowledge so that he can find the justification for its application to practical problems. Student undestands the necessity of constant education.

Course objective

Solution of frames using the classical version of stiffness method and beams - in the classical and matrix

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versions. Calculation of critical loading for elastic frames. Fundamental knowledge in structural dynamics, computation of natural frequencies and dynamic coefficients.

Course-related learning outcomes

Knowledge

1. Student knows the relations between displacements and loading in statics, stablility and dynamics of straight beams

2. Student knows the methods to build computational models for structures with concentrated masses

3. Student knows the influence of the large axial forces on plane bar structures.

Skills

1. Student can find the distributions of internal forces and compute displacements due to external loading, temperature change and imposed displacements in plane bar structures.

2. Student can formulate equilibrium conditions for plane frames according to second order theory and can compute the critical loading.

3. Student can compute natural frequencies and amplitudes of harmonically forced vibrations for bar structures with concentrated masses

Social competences

1. Student can work individually and in a team

2. Student has the responsibility for the correctness of the obtained solutions and can give their interpretation

3. Student has the consciousness fo necessity of continuous expansion of knowledge.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1) lecture

written examintation (2.5h) - the mark yields from the total sum of points obtained - 50% for positive mark (3.0)

2) tutorial - 2 test during the semester

3) projects - 2 individual projects for each student - individual consultations, the marks based on the current verification of knowledge at the submission date

Programme content

Lecture

Slope-deflection formulae for straight beams (2h)

Kinematically indetermnate systems - stiffness method (2h)

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Matrix version of stiffness method for beams (2h)

Dynamics of systems with concentrated masses. System with 1 degree of freedom. Free and forced vibrations - undamped and damped (2h)

Dynamics of systems with distributed mass - undamped vibrations (2h)

Influence of large axial forces on bending of beams. Initial stability of frames. Examples (4h)

Tutorials

Stiffness method - non-sway and sway frames - external loading and imposed displacements (6h)

Matrix version of stiffness method for beams (2h)

Free and harmonic forced vibrations of frames with concentrated masses (4h)

Exercises (projects)

1.Classical and matrix stiffness method

2. Dynamics of bar structures with concentrated masses - free and harmonically forced undamped vibrations

Teaching methods

Lecture - monographic lecture, tutorials, exercices - exercise and project method

Bibliography

Basic

1. Electronic textbook http://www.ikb.poznan.pl/przemyslaw.litewka/str-me-w.html

2. M. Guminiak, J. Rakowski, Zbiór zadań z mechaniki budowli, Wydawnictwo PWSZ, Piła 2008

3. M. Guminiak, J. Rakowski, Mechanika budowli. Zbiór zadań z elementami ujęcia komputerowego, Wydawnictwo PWSZ, Piła 2011

4. Z. Cywiński, Mechanika budowli w zadaniach (t.I+II), PWN, Warszawa 1976

5. J. Rakowski, Mechanika budowli, Zadania cz.1, Wydawnictwo PP, Poznań 2007

Additional

1. Internet textbook, Mechanika budowli, www.ikb.put.poznan.pl/node/49

2. W. Nowacki, Mechanika budowli, PWN, Warszawa 1974

3. Z. Dyląg i in., Mechanika budowli (t.I+II), PWN, Warszawa 1989

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Breakdown of average student's workload

	Hours	ECTS
Total workload	120	4,0
Classes requiring direct contact with the teacher	50	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	70	2,0

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[1] delete or add other activities as appropriate