STRUCTURAL OPTIMIZATION

Course code: **06.4-WILŚ- BUD- OPKO- KC13**

Type of course: optional

Entry requirements: knowledge of computational methods, strength of materials and structural mechanics

Language of instruction: Polish

Director of studies: dr hab. inż. Mieczysław Kuczma prof. UZ
Department of Structural Mechanics

Name of lecturer: dr hab. inż. Mieczysław Kuczma prof. UZ,
prof. dr hab. Inż. Romuald Świtka

Form of instruction	Number of teaching hours per semester	Number of teaching hours per week	Semester	Form of receiving a credit for a course	Number of ECTS credits allocated
Full-time studies					1
Lecture	15	1	II	Grade	
Class					
Laboratory					
Seminar					
Workshop					
Project					
Part-time studies					
Lecture	10	1	II	Grade	
Class					
Laboratory					
Seminar					
Workshop					
Project					

COURSE CONTENTS:

Lecture

Foundations of technical design. Measures of reliability and safety of structures. Criteria of structural optimization. Optimal shaping of columns and arches of uniform strength. Linear programming problem (LPP). Dual problem of LPP. Simplex method for LPP. Optimal design of trusses, beams and frames by limit load theory. Quadratic programming problem (QPP). Extremum of a function on a convex set and necessary conditions for an optimal solution. Karush-Kuhn-Tucker conditions for elasto-plastic problems. The method of Lagrange multipliers.

LEARNING OUTCOMES:

Competence and skill to understand and use (i) principles of optimal design of structures, concerning their shape and load carrying capacity, and (ii) methods and algorithms of mathematical optimization for advanced problems in engineering practice.

ASSESSMENT CRITERIA:

Lecture – *to receive a credit for final test.*

RECOMMENDED READING:

1. Brandt A.M. (red.), Kryteria i metody optymalizacji konstrukcji. PWN, Warszawa 1977.
2. Brandt A.M. (red.), Podstawy optymalizacji elementów budowlanych. PWN, Warszawa 1978.
3. Majid K.I., Optymalne projektowanie konstrukcji. PWN, Warszawa 1981.
4. Szymczak C., Elementy teorii projektowania. PWN, Warszawa 1998.
5. Wasiutyński Z., Pisma, tom II: O zagadnieniach optymalizacji konstrukcyj i o rozwijaniu tych zagadnień. PWN, Warszawa 1978.

OPTIONAL READING:

1. Borkowski A., Statyczna analiza układów prętowych w zakresach sprężystym i plastycznym. IPPT PAN, Warszawa – Poznań 1985.
2. Findeisen W., Szymanowski J., Wierzbicki A., Teoria i metody obliczeniowe optymalizacji. PWN, Warszawa 1980.
3. Rakowski G., Kacprzyk Z.: Metoda elementów skończonych w mechanice konstrukcji. Wyd. PW, Warszawa 2005.