Name of the module/subject			ode
Numerical Analysis	3		10102121010113740
Field of study Structural Enginee	ring Second-cycle Studies	Profile of study (general academic, practical) (brak)	Year /Semester
Elective path/specialty	-	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study:		Form of study (full-time,part-time)	
Second-cycle studies		full-time	
No. of hours			No. of credits
Lecture: 30 Class	ses: 15 Laboratory: 15	Project/seminars:	4
Status of the course in the stu	dy program (Basic, major, other)	(university-wide, from another field	,
	(brak)	(bi	rak)
Education areas and fields of	science and art		ECTS distribution (number and %)
tachnical sciences			4 100%
technical sciences Technical sciences			4 100%
rechnical sc	ciences		4 100%
ul Diotrowo 5 60-065 D	οτηρή		
ul. Piotrowo 5 60-965 P Prerequisites in ter	oznań ms of knowledge, skills and	d social competencies:	
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Course grading: Lectures - end-term exam, Laboratory - evaluation of the exercises and the final test

Course description

Physical nonlinearity. Constitutive modelling in civil engineering (for concrete, steel, gum, ceramic, glass, wood). The coupling of the experiments and computer simulations in description of the dynamic behaviour of the material and structure in high strain rates condition. Using of the computer simulation to describe the behaviour of the structure for unique loadings as impacts, explosions and floods. The coupling problems (thermo-mechanical) ? the behaviour of the structure at elevated temperatures (fire). The contact conditions. The basics of the fluid mechanics ? interaction of the fluid and structure.

Basic bibliography:

1. T.Łodygowski, W.Kąkol, Metoda elementów skończonych w wybranych zagadnieniach mechaniki konstrukcji inżynierskich, Skrypt PP, 1994, Nr 1779.

2. D.Kincaid, W. Cheney, Analiza numeryczna, WNT Warszawa 2006. 3. A.P.Boresi, K.P.Chong, S.Saigal,

Approximate Solution Methods in Engineering Mechanics, John Wiley & Sons, Inc., 2003.

3. A.P.Boresi, K.P.Chong, S.Saigal, Approximate Solution Methods in Engineering Mechanics, John Wiley & Sons, Inc., 2003.

4. Czesław Cichoń, Metody Obliczeniowe - wybrane zagadnienia, Kielce 2005

5. O.C.Zienkiewicz, R.L.Taylor, Finite Element Method, Elsevier 2005

Additional bibliography:

1. An Introduction to Nonlinear Finite Element Analysis by J. N. Reddy, Oxford University Press, 2004

2. Nonlinear Finite Elements for Continua and Structures by T. Belytschko, W. K. Liu, and B. Moran, John Wiley and Sons, 2000.

3. Computational Inelasticity by J. C. Simo and T. J. R. Hughes, Springer, 1998.

Result of average student's workload

Activity	Time (working hours)	
1. Lectures		15
2. Classes		15
3. Labs		15
4. Final exam		15
Student's wo	orkload	
Source of workload	hours	ECTS
Total workload	75	4
Contact hours	60	2
Practical activities	40	2