

DESCRIPTION OF THE COURSES

- Course code: ELR1303
- Course title: NUMERICAL METHODS
- Language of the lecturer: Polish

<i>Course form</i>	<i>Lecture</i>	<i>Classes</i>	<i>Laboratory</i>	<i>Project</i>	<i>Seminar</i>
<i>Number of hours/week*</i>	2		1		
<i>Number of hours/semester*</i>	30		15		
<i>Form of the course completion</i>	test		problem tasks		
<i>ECTS credits</i>	2		1		
<i>Total Student's Workload</i>	60		30		

- Level of the course (basic/advanced): basic.
- Prerequisites: informatics fundamentals.
- Name, first name and degree of the lecturer/supervisor: Jarosław Szymańda, DSc., PhD.
- Names, first names and degrees of the team's members:
 1. Leszek Woźny, PhD.,
 2. Jacek Rezmer, PhD.
- Year:.....II..... Semester:.....3.....
- Type of the course (obligatory/optional): obligatory.
- Aims of the course (effects of the course):

The course acquaints students with theoretical bases and the numeric technicians of engineering calculations in the range of analysis and mathematical statistics. Purchase of the skill of building effective and correct computational algorithms used in engineering projects is the basic effect of the education.

- Form of the teaching (traditional/e-learning): traditional.
- Course description:

The elements of the theory of mistakes - the transfer of the mistakes. Arithmetic it stood and the floating-point numbers with the finiteness binary presentation layer. The analysis of apparent disorders. Coefficients of the condition of algorithms. The algebra of the matrix and linear equations. The method of the smallest squares. Algorithms iterative Richardson and Gauss-Seidel. Numbers joint and linear equations about coefficients joint. Adding up finiteness and infinite numerical series. Series alternant and convergent. Technique of accelerating the convergence of series. Integration and differentiating given discreet. The harmonic analysis of periodical signals. Solving shore questions. The acquisition and processing of given in electrical engineering – the chosen elements of the statistical analysis.

- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. The introduction. The elements of the theory of mistakes - the transfer of the mistakes. Arithmetic it stood and the floating-point numbers about	2.0

the finiteness binary presentation layer. Positional arrangements. The planning of the numeric experiment.	
2. Mistakes of curves. The analysis of apparent disorders. Coefficients of the uwarunkowania of algorithms. Examples of algorithms conditioned bad, correct and stable numerycznie. Machine Epsilon.	2.0
3. Basic notions of linear algebra. Effective techniques of the programming of matric operations. The examples of the programming basic in Delphi, Java – the comparison with procedures built-in in the language Matalb.	2.0
4. Elimination Gaussa. Strategies of the choice of the main elements. Calibrating linear arrangements.	2.0
5. Coefficients of the uwarunkowania of the matrix. The triangular schedule. The calculation of determinants	2.0
6. Wskaźniki uwarunkowania macierzy. Rozkład trójkątny. Obliczanie wyznaczników.	2.0
7. Iterative methods of solving the arrangements of algebraical equations. Arrangements updefinite.	2.0
8. The example: the differential equation of Laplace'a with Dirichlett conditions.	2.0
9. Aproximation, interpolation and the extrapolation of the function -the review of more important methods and algorithms.	2.0
10. Adding up finite and infinite rows. Technique of accelerating the convergence of series. The algorithm Gilla-Molera. Adding up with the averaging of partial sums.	2.0
11. Chosen techniques integration and differentiating given discreet. Examples of algorithms bad conditioned.	2.0
12. Solving differential equations ordinary. One-prostate methods..	2.0
13. . The numeric aspects of the search of the extremum of the function	
14. Practical examples of the construction of program interfaces for function and contained procedures in binary libraries. (dll). Simple computational applications (Delphi, Java, VBA-Excel)	2.0
15. Test	2.0

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:

Students individually realising, under leader control, tasks amount to illustrations of the topic lecture and in the two-person group laboratory compile chosen problem. Each topic comprises consecutive realization stage: theoretical working-out, algorithmization and programming, start-up and acceptance testing with documenting. Students group choose one wide topic. Themes are changed in each academic year and not are repeated.

Problem tasks:

Algorithm Gaussa of solving the arrangements of linear equations. The technique of the reversal of the matrix of conditioned well and bad. Polynomial aproximation of measuring signals. Problems discretization of analog signals. Electrostatic and termokinetics equations Laplace'a and Poissona in reticular methods. Visualization of numeric calculations. The analysis of dynamic arrangements in the systems of steering and diagnostics

- Project – the contents:
- Basic literature:

1. Metody numeryczne, G.Dahlquist, A.Bjork, PWN 1983
2. Przegląd metod i algorytmów numerycznych - cz.1 i 2, J.i M. Jankowscy, WNT 1981
3. Wstęp do programowania systematycznego, N.Wirth, WNT 1978
- Additional literature:
 1. Algorytmy + struktury danych..., N. Wirth, WNT 1980
 2. Macierze w automatyce i elektrotechnice, T.Kaczorek, WNT 1984
 3. Równania różniczkowe cząstkowe, E.Kącki, WNT 1989
 4. Elektroniczna technika obliczeniowa, E.Kącki, PWN 1986
 5. Wstęp do metod numerycznych, J.Stoer, R.Bulirsch, PWN 1980
 6. Metody rozwiązywania równań siatkowych, A.Samarski, J.S. Nikołajew, PWN 1988
 7. Metody statystyczne i obliczeniowe analizy danych, S.Brandt, PWN 1975
 8. Handbook of mathematical functions, M. Abramowitz, I.Stegun, Washington 1964,
 9. (Wydanie rosyjskie dostępne w czytelni Biblioteki Głównej PWi)
- Conditions of the course acceptance/creditation: Derivation affirmative grade of lecture test and laboratory tasks.

* - depending on a system of studies