

Course: Mathematical Methods in Engineering

Teaching hours: 15h

Prerequisites: The course is primarily open to all PhD students at Gdansk University of Technology. This course is compulsory for PhD students assigned to Civil Engineering and Transport as well as Environmental Engineering, Mining and Power Engineering tracks at Doctoral School of GUT.

Course outline

Content

The course presents some numerical methods used in engineering calculations. The methods are selected due to their necessity in scientific work. The idea of the course is not only to show the basic equations but also to present examples of their applications. The participants will have the opportunity to discuss some important details and assumptions of the methods. The course is based on presentation and application of codes, mainly created in MATLAB environment [4].

General topics coverage:

1. Numerical method of solving systems on linear equations
2. Methods of eigen problem solution
3. Solution of nonlinear equations
4. First order differential equations
5. Second order differential equations
6. Interpolation
7. Approximation
8. Numerical integration
9. Introduction to finite differences method
10. Introduction to boundary element method

Teaching mode

There will be 15 hours of lectures presenting background of each method. The basic equations will be shown and examples of application of each method in solving of particular problem will be presented.

Examination

Each participant will be assigned to the certain numerical method to be presented during lectures. The participant will be obligated to present the method in details and prepare the presentation of its application. During examination, the participant should present his/her report on the method and answer some oral questions.

Fundamental readings:

1. Chapra S.C., Canale R.P.: *Numerical Methods for Engineers*. MCGraw-Hill Book Company, New York 2015
2. Björck Å., Dahlquist G.: *Numerical Methods (Dover Books on Mathematics)*. Dover Publications, Dover 2013
3. Ralston A. Rabinowitz P.: *A First Course in Numerical Analysis*. Dover Publications, Dover 2001.
4. Kłosowski P., Ambroziak A.: *Metody numeryczne w mechanice konstrukcji z przykładami w programie MATLAB*. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2011.