Applied Mathematics and Numerical Methods

Syllabus

Instructors: W.Cecot, I.Jaworska, S.Milewski, M.Oleksy, M.Stojek

Course objectives

The objective of the course is to explain basic concepts of solution approximation for selected, typical in engineering practice, mathematical problems. The course outline is as follows: idea of mathematical modeling, Gauss elimination, solution of algebraic eigenvalue problems, root finding, approximation of functions, numerical differentiation and integration, local and global formulation of boundary value problems, finite difference method, Galerkin approach, integration of initial problems, basis of optimization and statistics, error, convergence, stability and conditioning of numerical methods. Besides understanding of the presented methods students are expected to code them in Matlab language as well as utilize Matlab functions to solve problems at hand. The following laboratory assignments will be graded: algebraic eigen problem, approximation, finite difference method.

Prerequisites

Algebra, Calculus, Information Technology

Text Books

- Your favorite *Algebra* text
- W. H. Press, S. Teukolsky, W. Vetterling and B. Flannery, Numerical Recipes: The Art of Scientific Computing, Cambridge University Press, 2007 (or earlier editions).
- M.Schatzman, Numerical Analysis, a Mathematical Introduction, Clarendon Press, Oxford 2002.

Attendance

Attendance at lectures (30 hours) and laboratory sessions (30 hours) is obligatory.

Grading

Cumulative grading will be based on passing grades earned in Laboratory Sessions and the Final Exam (consisting of two parts) with the following weights:

- **Laboratory**   **30%**
- **Final exam**   **70%**

Remark:

Two written tests will be given during the semester (*the 1st test will cover the first few course topics and the 2nd test the remaining topics). If the written tests are passed the average grade in tests may be treated as the final exam grade. If only one test is passed exemption from the corresponding part of the exam is possible. If none of the tests is passed both parts of the written exam should be taken. If you want to improve the passing grade earned during the written exam you have to take the oral exam. You can't take the final exam, unless you have prior credit for the lab.*

Grade Ranges:
  A (5.0) - (90 – 100] % of the highest score
  B (4.5) - (80 – 90] %
  C (4.0) - (70 – 80] %
  D (3.5) - (60 – 70] %
  E (3.0) - (50 – 60] %
  F (2.0) - [0 – 50] %

In compliance with the regulations of the Cracow University of Technology the lowest passing grade is E

Kraków, October 1, 2013