| I018 | FIN, MR, IPM-elective-Year 2 | **Computer Laboratory** | L+P+S 1+1+1 | ECTS 3 |
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**Course objectives:** Students will learn how to create useful applications by using a GUI (Graphical User Interface) which significantly facilitates the use of the program to other users and improves the interaction between users and applications. During this course the students will have the opportunity to connect new learning to their prior knowledge acquired in computer science courses attended earlier. Throughout the lectures we will deal with commands from a graphical user interface using Matlab. Also, the commands from Mathematica that allow creation of graphical user interfaces are processed. Furthermore, we will discuss the concepts of mathematical tools in connection with the Web environment.

**Course prerequisites.** Undergraduate Studies in Mathematics (Differential Calculus, Linear Algebra I, Mathematical Tools).

**Syllabus.**
1. Introduction. Projects. Team work.
2. Handling Graphics in Matlab/Octave. Interactive programs in Matlab using the GUI (Graphical User Interface) for the corresponding mathematical models.
3. Matlab Web Server. Writing Matlab programs for WEB.
4. Graphics with Mathematica/wxMaxime. Processing commands in Mathematica that allow creation of graphical user interfaces (e.g., Button, Manipulate, Dynamic, etc.). WEB Mathematica. Writing WRI Mathematica program for the web.
5. Verification of completed projects. Methods of testing programs.

**Expected learning outcomes.**
After completing the course, students will be able to:
- use computers;
- recall the basic commands from Matlab and Mathematica;
- use Mathematica, Matlab and Octave;
- use help of the corresponding programs;
- use learned programs for the projects;
- compare similarities and differences between Matlab and Mathematica;
- make the project and show it to other students.

**Teaching methods and student assessment.** Lectures and exercises are obligatory. During the semester students' knowledge (and activity) will be checked through quizzes and homework. During the exercises, students will work in teams on the given project (case study) and post them on the web. The projects will differ with respect to students' study programme. Teacher education study programme projects include methodology units of mathematics and physics, while other programmes are dedicated to applied problems from the fields of mathematics, physics and other sciences. The exam consists of a written and an oral part, and it is taken after completion of lectures and exercises. Successful participation in mid-term exams (or homework) replaces obligatory participation in the practical part of the exam. Students can influence the final grade if they actively participate in homework assignments during the semester.

**Can the course be taught in English:** Yes.

**Basic literature:**

1. D. J. Higham, N.J. Higham, MATLAB Guide, SIAM, Philadelphia, 2000.
2. S. Wolfram, The MATHEMATICA (R) Book, Version 4, Cambridge Univ., Cambridge, 1999.
   http://www.mathworks.com/help/techdoc/index.html
   http://reference.wolfram.com/mathematica/guide/Mathematica.html

**Recommended literature:**

1. T. L. Harman, J. B. Dabney, N. J. Richert , Advanced Engineering Mathematics with MATLAB, Brooks Cole, Pacific Grove, 1999.
2. E. Don, Schaum's Outline of Mathematica, McGraw-Hill Trade, NewYork, 2000.
3. R. Pratap, Getting Started With Matlab: Version 6: A Quick Introduction for Scientists and Engineers, Oxford University Press, NewYork, 2002.
4. R.E. Maeder, Programming in Mathematica, 3/E, Addison-Wesley, Boston, 1995
5. Alfio Quarteroni i Fausto Saleri, Scientific Computing with MATLAB and Octave, 2nd Edition. Springer Verlag, Berlin. 2006.