|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. Course:Programming in MATLAB laboratory | | | | |
|  | | | | |
|  | | | | |
| 2.Code: | | **3. Course type:** laboratory exercise | | |
|  | | | | |
| **4. Contact hours:** 4 hours/week | | 5. Credits:4 | | |
|  | | | | |
| 6. Preliminary requirements (max 3): | | | | |
|  | | | | |
| 7. Offered:fall,  spring, both | | | | |
|  | | | | |
| 8. Maximum number of attendees (if relevant): | | | | |
|  | | | | |
| **9. Responsible instructor (Faculty, Institute):**  Dr. Mátyás Mechler (MTA-PTE High-Field Terahertz Research Group) | | | | |
|  | | | | |
| 10. Instructor(s), (participation, %): | | Dr. Mátyás Mechler | | 100 % |
|  | | % |
|  | | | | |
| 11. Tuition language:English | | | | |
|  | | | | |
| 12. Learning objectives:  The aim of the course is to provide an overview of the Matlab computing language and to learn the usage of the functions relevant for physical calculations and data processing. The course lays special emphasis on the independent work of the students.  After completing the course, the students will become   * familiar with and able to apply the programming principles and functions of Matlab; * able to write optimalized Matlab scripts; * able to solve physical problems related to research and data analysis independently with the aid of Matlab; * confident to apply the acquired knowledge for the solution of physical problems. | | | | |
|  | | | | |
| 13. Detailed programme for 13 tuition weeks:   1. **Running MATLAB.** MATLAB basics; variables; matrices; basic calculations; MATLAB functions. 2. **Scripts.** Script files, input and output, file IO. 3. **Programming elements and debugging.** Loops and logic; tips for writing readable codes; debugging. 4. **Plotting.** Line plots; surface plots; contour plots; vector field plots. 5. **Functions.** Inline functions; anonymous functions; M-file functions; multiple-output functions. 6. **Linear algebra.** Vector operations; matrix operations; solving linear systems. 7. **Fitting functions to data.** Polynomial fitting; general fits with fminsearch. 8. **Solving equations.** Transcendental equations; systems of nonlinear equations. 9. **Interpolation ad extrapolation.** Manual inter-/extrapolation; MATLAB’s built-in interpolaters (1D, 2D) 10. **Elements of analysis.**  Differentiation; integration; MATLAB’s built-in integrators. 11. **Ordinary differential equations (ODEs).** General form of ODEs; solving ODEs manually; MATLAB’s built-in differential equation solvers; event finding. 12. **Fast Fourier Transform (FFT).** The concept of FFT; MATLAB’s fft command; aliasing and critical frequency; using fft to compute Fourier transform 13. **Final test** | | | | |
|  | | | | |
| 14. Assignments (if applicable): | | | | |
|  | | | | |
| 15. Detailed description of the evaluation:  The semester ends with a test. This is split to a theoretical and a practical part, their contribution to the result of the test are 30 and 70 %, respectively. In case of failure the test must be rewritten.  Grading:  *0-40%: fail (1)*  *40-55%: pass (2)*  *55-70%: satisfactory (3)*  *70-85%: good (4)*  *85-100%: excellent (5)*  Beside the test students have to submit a Matlab code solving some physical problem. If this is missing no grade can be given to the student. The test and the submitted code contribute to the final grade as 80 and 20 %, respectively. | | | | |
|  | | | | |
| **16. Compulsory reading**:   1. Spencer R.L., Ware M.: Introduction to MATLAB. Brigham Young University, 2013. | | | | |
| **17. Suggested reading**:   1. Kattan P.I.: MATLAB for Beginners: A Gentle Approach. CreateSpace Independent Publishing Platform, 2008. ISBN-10: 1438203098, ISBN-13: 978-1438203096 2. Hahn B., Valentine D.: Essential MATLAB for Engineers and Scientists, 5th edition, Academic Press, 2013. ISBN-13: 978-0123943989, ISBN-10: 0123943981 3. Attaway S.: MATLAB: A Practical Introduction to Programming and Problem Solving, 3rd edition, Butterworth-Heinemann, 2013. ISBN-13: 978-0124058767, ISBN-10: 0124058760 | | | | |
|  | | | | |
| **Date:**  **Pécs, 2017.01.20.** | Dr. habil Gábor Almási associate professor  person in charge for the programme |  | Dr. Mátyás Mechler | |
| research fellow, instructor in charge | |