Physics 256 - Syllabus, Fall 2016

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- Office Hours: MWF 12:00-13:00 and by appointment.

2 Course Objectives.

The primary purpose of this course is to teach you how to specify a problem, break it up into algorithmic pieces, and implement a program to execute those pieces. While there are hundreds of different programming languages, this class will be set around Matlab, since it has a rich toolbox of routines suitable for scientist.

Along the way, we will learn about the following essential concepts:

- Programs and algorithm basics
- Matlab as programming language
- Numerical representation and its limitation
- Graphical data presentation
- Numerical integration
- Nonlinear equation root finding
- Solving system of linear equations
- Models and simulations
- Random processes
- Solving system of ordinary differential equations
- Data analysis/post processing
- Digital filters
- Optimization problems

3 Texts.

Everything required for this class will be provided during lecture times. However, I would recommend you the following two **optional** books for your own references.

First one could be used as a short Matlab reference book: "Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers" by Rudra Pratap (ISBN-10: 0199731241, ISBN-13: 978-0199731244).

The other one for a more extended treatment of numerical algorithm with Matlab: "Numerical Methods in Engineering with MATLAB" by Jaan Kiusalaas (ISBN-10: 0521191335, ISBN-13: 978-0521191333).

4 Class Format.

We will have 2 regular lectures and one short lecture/lab per week. The short lecture/lab will take place on Friday, its main goal is to let you go through Matlab programming while I can help you with program environment related problems.

5 Homeworks/projects.

The only way to learn a new language is to talk and write using this language. A programming language is no exception. Thus you will learn by doing programming exercises during home work, midterm projects, and final project. There will be no midterms and final examination in a usual sense. Instead you will have to prepare an oral presentation complementary to your written report describing your projects (task, methods, limitations, prove that it works as expected at least for several obvious cases, and results). I expect that you will allocate 6-9 hours every week outside of the class room for the homework and projects.

6 Project/homework report key parts.

- **due date**: corresponding Monday at 1:00pm for the email submission
- report must submitted via email to me and TA of the class, as well as, its paper copy will be collected at the beginning of the Monday class
  - Report key parts
    * Written report in the pdf file, use LaTeX to generate them. **MS Word generated files**, aka doc files, **are not permitted**. If pdf file is generated by Word, I will see it and drastically reduce your points.
    * Your name in the "Author" line
      · no name = zero grade
    * Problem number and its statement (copy and paste it from the assignment)
    * Brief description of chosen method
    * Master equations (if required)
    * Solutions (numerical answer or plots)
    * **Explanation of solution validity**, the number or plot alone is not enough
    * Program listings (either in main text for short ones or as appendix to a report)
    * Font size should be no less than 12 pts
    * Any picture which is not a photo, should be originated either in png or pdf format. If I see *jpg* like picture with fussy lines, points will be heavily reduced.
  - Email should have
    * Your name in the "From" line
    * Clearly stated subject line (for example "Phys256, solutions of the homework 02")
    * Clearly labeled files with algorithms and data files (i.e. "hw01p2.m" for HW 01 part 2)
    * Some homeworks will require to write helper functions, please, make their name human readable (for example for function which looks for maximum use `FindMax` or `find_max`)

Important: if there is no listings and no algorithms/data files you will get zero points.

- it is sufficient to make one submission of the midterm/final project from the group as long as all authors are listed.

Your algorithm/program will be evaluated for

- correctness
- **examined test cases**
  - in real word environment it is important to know where is the problem spot, so **you** should be capable to see if your program produces garbage
- did I mentioned **test cases**? (there will be penalty for untested submissions)
- how easy it is to read and understand
  - stay away of cryptic names (for example write `counter` instead of `c`)
  - every constant must be accompanied with comments
  - do not use "magic numbers", i.e., define a variable with a descriptive name and the value of this constant
  - general rule: write a lot of comments explaining the algorithm (you may not need it for a short program but it will help you to work with long programs)

6.1 Late submission penalties.

For each consequent day after due date there will be a penalty (10% out of maximum possible score). Even if a submission happens 1 minute after due date, it holds 1 day penalty. You may get a submission extension if you ask in **advance**.

7 Projects homework preparation recommendation.

Do not wait till the last day to finish your assignments. Programs almost never work at the first try and require quite a lot of time to debug.

8 Collaboration.

- Collaborations are not permitted for homeworks.
- Midterm and final projects to be done in group of 2 or 3 persons. This is the time to actively discuss and cooperate. Only one report per such group is needed.
  - But everyone is expected to have a full understanding of the project.
  - Be ready to answer questions related to the project without your group support.

9 Evaluations.

Your final grade for the course will be determined from the following grading weight distribution:

- Homeworks: 15%
- Midterm projects: 60%

- Final project: 25%

Final grades will be assigned according to the following table

Grade	Score %	Grade	Score %	Grade	Score %
		A	94-100	A-	90-94
B+	87-90	B	84-87	B-	80-84
C+	77-80	C	74-77	C-	70-74
D+	67-70	D	64-67	D-	60-64
F	<60				

10 Illness.

Please notify the instructor if you are ill, so that arrangements can be made to make up missed labs.