Physics 442 Course Syllabus
Fall 2020

Course Description:
Physics 442 is intended to provide the student experience in using a variety of numerical methods to solve problems of interest to physicists. The course will draw examples from many branches of physics to illustrate how problems are modeled and solved numerically. The computer language that will be used in the course is `MATLAB`. If you do not have much experience using `MATLAB` you should secure a `MATLAB` reference such as *Matlab: A Practical Introduction to Programming and Problem Solving*, by Stormy Attaway. The text we will be using also have examples of `MATLAB`.
The course will cover 5 general techniques

1. Numerical Interpolation and curve fitting
2. Monte Carlo Techniques
3. Numerical solutions to ordinary differential equations and some techniques in numerical integration
4. Numerical Fourier Analysis
5. Numerical solutions to partial differential equations

Each topic will have its own set of learning goals that you are expected to master. In addition, two general goals will be a part of all topics covered. The first is that you master how the numerical methods work and what their limitations are, and second, that you learn how to apply these methods to solve problems of interest to physicists.

Text: *Notes on Computational Physics*
Jesús Pando. Required and supplied free of charge

Matlab: A Practical Introduction to Programming and Problem Solving, Stormy Attaway. Suggested if you are new to MatLab.

Instructor:
Dr. Jesús Pando
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Web Page:
`https://d2l.depaul.edu/` (*D2L site*) Useful information will be found on this page, including assignments and homework hints.

Office Hours:
F 9:00 - 10:00 TTH 9:30 – 10:30 a.m. and after 1:00 p.m.
and by appointment.
I will be *Microsoft Teams* during office hours. I will also be on at other times and as along as I'm on you are welcomed. The one exception is the hour before class time. You are strongly encouraged to take advantage of office hours.

Course Requirements
Letter grades will be assigned as follows

A- to A	90 – 100 %
B- to B+	75 – 89 %
C- to C+	65 – 74 %
D- to D+	55 – 64 %
F	0 – 55 %

Your grade will consist of the following 5 factors weighted as shown. More information on each factor is provided below.

Homework/In-class assignments	30%
Computational Project	15%
Warm up exercises	5%
In-class exams (1)	20%
Final* (cumulative)	30%

*Final must be passed to receive a passing grade.

Homework and In-class assignments. A set of problems will be assigned regularly, usually about once a week. All homework problems assigned will be graded and no credit will be given for simply writing down an answer, even if the answer is correct. That is, *show your work.* **No late homework will be accepted.**

Each problem is worth 20 points with partial credit awarded by

- Application of the correct physical principle.
- Deductive reasoning from the general physical principle to the specific problem at hand.
- Mathematical manipulation.

- Numerical accuracy.
- Clarity of presentation.

Almost all homework will be begun in class as part of the in class assignments. It is anticipated that a lot of progress towards completing the assignment can be done in class. You are expected to work with other students in the class and take advantage of the instructor. However each student will turn in their own assignments. Some assignments will be more involved and may require a more formal presentation. Details will be provided as appropriate.

Computational Project. Each graduate student will have to complete a computational project. The project will be chosen from a set of projects whose description is provided in another document. The project may be chosen anytime before the mid-term exam. A detailed written report on the results, techniques, etc. will be required. Depending on time, an oral presentation may also be required.

Warm up Exercises. There will be reading assignments each week. Almost all the reading assignments will be from the text. Lecture is minimized in this course, so **it is essential that you complete the reading on time and that you read as thoroughly as can.** Associated with each reading assignment, there will be warm exercises due an hour before class time. Each warm up assignment will include one or two free response questions related to the material in the reading. Each assignment will also include a section in which you are to ask any questions you had about the reading assignment.

In–class Exam. One in-class exam will be given in the quarter. The exam will be closed book and closed notes. The exam will have an attached information sheet that may contain useful formulas, constants, etc. Usually, constants and conversions need not be memorized unless otherwise stated. The exam will take place after we have finished the section on ordinary differential equations.

Final Exam. A cumulative final exam is tentatively scheduled for **November 18, 2020**, from 2:30 to 4:45 p.m.. final will be given only on the one date, please make your holiday travel plans accordingly.

Statement on Plagiarism. As stated in the Student Handbook, no form of plagiarism involving the presentation of the work of another as one's own, shall be allowed or accepted in this class.

Tentative topics:

Topic	Chapter	Week
Numerical Interpolation and curve fitting	1	2 – 3
Monte Carlo	2	2–3
Numerical Solutions to ODEs	3	3 – 6
EXAM I		
Numerical Fourier Analysis	4	7 – 8
Numerical Solutions to PDES	5	8 – 10
Final, November 20, 2020	2:30 - 4:45	