4600/5700. Computational Physics.

Instructor and office hours
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Office hours: TuTh 2PM-3PM or by appointment.

Schedule
TuTh 11:00AM - 12:20PM PHYS 204 Computer Lab.

Textbook
Rubin H. Landau, Manuel J. Paez, Cristian C. Bordeianu
Computational Physics: Problem Solving with Python
Wiley-VCH

Outline
A course in modern physics specialized in the use of computers as virtual scientific laboratories. Among topics included are: Introduction to Python (the language of choice for the course); The basics of computer hardware, such as memory and CPU architecture and the basics of scientific computing: algorithms, precision, elementary numerical analysis and associated approximation and round-off errors, and parallel computing; Examples from physical systems in multiple dimensions (including topics in Quantum Mechanics, Statistical Physics, Solid State Physics and more). Each topic is studied in the context of a simple, but realistic project.
A lab report format will be used for each project where the student should indicate the equations solved, the computational method, the results, and a critical discussion.

Syllabus
Any chapter listed implies that the entire chapter should be read from the book.
Python Basics/Syntax
* Logic flow, loops, functions and data structures
Algorithms & Complexity
* Big O - Program performance analysis
* Computational Tradeoffs - Speed vs
Number Representation, Errors, & Uncertainties
* Floating point overflow and underflow
* Summing series
* Types of Errors
Monte Carlo Methods
* Randomness and uniformity
* Random walk
Differentiation & Integration
* Trapezoid rule, Simpson rule, & Gaussian quadrature with error analysis
* Monte Carlo integration
Matrix Computing
* Matrices in NumPy

* Matrix operations and properties
* Two/Three masses on a string
Trial & Error Searching
* Bisection searching
* Central difference searching
Solving ODEs and ODE Applications
* Runge-Kutta Rule
Parallel Computing
* Parallel computing
* Performance & Amdahl's
* Message passing and scalability
Fourier Transforms
* Discrete transforms
* Fast Fourier Transform

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time, however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information see the Office of Disability Accommodation website at http://www.unt.edu/oda. You may also contact them by phone at 940.565.4323.

UNT's policy on Academic Dishonesty can be found at:
 http://www.vpaa.unt.edu/academic-integrity.htm

Drop information is available in the schedule of classes at:
http://registrar.unt.edu/registration/schedule-of-classes

The Student Perceptions of Teaching (SPOT) is a requirement for all organized classes at UNT. This short survey will be made available to you on-line at the end of the semester and will provide you with an opportunity to provide feedback to your course instructor. SPOT is considered to be an important part of your participation in this class. In addition to SPOT, there will be a brief in-class course survey during the last two weeks of the semester.

Near the end of the Fall 2017 semester you will receive an email on from "UNT SPOT Course Evaluations via *IASystem* Notification" (no-reply@iasystem.org) with the survey link. Please look for the email in your UNT email inbox. Simply click on the link and complete your survey.

After logging in to the my.unt.edu portal, students can access the SPOT survey site by clicking on the SPOT icon. A list of their currently enrolled courses will appear. Students complete each course evaluation independently. During the long terms, the SPOT is open for students to complete two weeks prior to final exams. During the Fall term, the SPOT is open for students to complete six days preceding their final exam. See https://spot.unt.edu/content/fall-2017-8w1-calendar for specific dates and deadlines.