



PHYS 319.01E – Computational Physics with Python

COURSE SYLLABUS: Spring 2024

INSTRUCTOR INFORMATION

Instructor: Dr. Heungman Park

Office Location: Science Building room 240

Office Hours: [Tuesday, Wednesday: 9:30 AM - 12:00 PM] or by appointment

Office Phone: 903-886-8654

Fax: 903-886-5480 (Department of Physics and Astronomy)

University Email Address: heungman.park@tamuc.edu

Preferred Form of Communication: email

Communication Response Time: within 48 hours

COURSE INFORMATION

This course requires face-to-face physical classroom attendance.

Materials – Textbooks, Readings, Supplementary Readings

Textbook(s) Required: Computational Physics by Mark Newman. ISBN-10: 1480145513, ISBN-13: 978-1480145511

Software Required: Anaconda Python 3.x package. Anaconda3-5.1.0 version is recommended.

Optional Texts and/or Materials: none

Course Description

This self-contained course introduces the student to the Python programming language before exploring applications including finite difference methods, solving linear and nonlinear equations, Fourier transforms, simulating physical systems governed by ordinary and partial differential equations, random processes and the Monte Carlo method. Prerequisites: PHYS 2425 or PHYS 211 (programming experience will be helpful, but is not required).

Student Learning Outcomes

1. To understand the basics of scientific, numerical simulation and modeling
2. To learn to use the graphical capabilities of Matplotlib to visualize numerical solutions into highly interpretable forms
3. To gain intuition for the quality of simulations results (just because a program runs without error does not guarantee the results are correct)

COURSE REQUIREMENTS

Minimal Technical Skills Needed

Basic computer skills such as internet surfing and installing programs. Programming experience will be helpful, but is not required.

Hardware for the class

A decent computer (desktop or laptop) is required to run the Python programming language package (Anaconda package). Minimum computer specification: a dual core CPU above 2.0 GHz and 4 GB memory.

Instructional Methods

Today computational physics is a powerful approach to probing natural phenomena. In this course, students will learn first how to program in Python programming language and to make plots with Matplotlib. The remainder of the course will introduce students to several of the main computational tools, techniques, and methods of computational physics. This is a practical course, meaning students will be learning mostly by doing: writing programs, running them, debugging, etc., until they get answers that are physical and plausible. The knowledge of how to implement numerical solutions to problems, and the limits of these simulations, should be useful for the future study of students.

Student Responsibilities or Tips for Success in the Course

Students must check a course website. All assignments are posted on the course website.

GRADING

Final grades in this course will be based on the following scale:

A = 90%-100%

B = 80%-89%

C = 70%-79%

D = 60%-69%

F = 59% or Below

Grading Procedure

- Attendance: 5%, Quiz: 5%, Homework: 10%
- Term project: 20%
- Midterm exams: 30%
- Comprehensive final exam: 30%

* The scales can be adjusted by the instructor. The final grading policy will be announced before the final exam.

TECHNOLOGY REQUIREMENTS

LMS

All course sections offered by Texas A&M University-Commerce have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are technical requirements

LMS Requirements:

<https://community.brightspace.com/s/article/Brightspace-Platform-Requirements>

LMS Browser Support:

https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm

YouSeeU Virtual Classroom Requirements:

<https://support.youseeu.com/hc/en-us/articles/115007031107-Basic-System-Requirements>

ACCESS AND NAVIGATION

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or helpdesk@tamuc.edu.

Note: Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

COMMUNICATION AND SUPPORT

If you have any questions or are having difficulties with the course material, please contact your Instructor.

Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:

<https://community.brightspace.com/support/s/contactsupport>

Interaction with Instructor Statement

The instructor will respond within 24 hours by email. Each graded assignment and test will be returned within a week.

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Course Specific Procedures/Policies

General Classroom

No food is allowed during class except for beverages with lids.

Students are expected to be on time and present for all class meetings. If an emergency results in an absence, the student should contact the instructor as soon as possible informing the instructor of the emergency and inquiring about ways to make up the missed class. The instructor will make judgment on how to handle the situation. Possible reasons for excused absence are listed in the "Student's Guidebook" under class attendance policy. Attendance and tardy records will be maintained and both may result in deductions from your overall grade. Five unexcused absences will automatically result in a failing grade.

Homework: Each student must work on the assigned homework problems on his/her own time. Collaboration is encouraged, but students must understand what they did on the work and be able to explain it to the instructor. If only answers are shown, no credits may be given.

Penalties of Late Work: 20 % deduction within 48 hours, 30% deduction within 96 hours, and no credits after then.

Exams: There will be three midterm exams and a comprehensive final exam. Make-up exams will only be allowed for excused absences such as sickness with a doctor's note and jury duty. Only one make-up exam is allowed. The final exam must be taken.

In-class Quiz: A quiz will be given once or twice a week. Quiz contents will be announced during the lecture.

Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

University Specific Procedures

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the [Student Guidebook](#).

<http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx>

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum: <https://www.britannica.com/topic/netiquette>

TAMUC Attendance

For more information about the attendance policy please visit the [Attendance](#) webpage and [Procedure 13.99.99.R0.01](#).

<http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx>

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf>

Academic Integrity

Students at Texas A&M University-Commerce are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

[Undergraduate Academic Dishonesty 13.99.99.R0.03](#)

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf>

[Graduate Student Academic Dishonesty 13.99.99.R0.10](#)

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/graduate/13.99.99.R0.10GraduateStudentAcademicDishonesty.pdf>

Students with Disabilities-- ADA Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services

Texas A&M University-Commerce

Gee Library- Room 162

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

Email: studentdisabilityservices@tamuc.edu

Website: [Office of Student Disability Resources and Services](#)

<http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/>

Nondiscrimination Notice

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

Campus Concealed Carry Statement

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&M-Commerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the [Carrying Concealed Handguns On Campus](#)

document and/or consult your event organizer.

Web url:

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf>

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M-Commerce campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

A&M-Commerce Supports Students' Mental Health

The Counseling Center at A&M-Commerce, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit www.tamuc.edu/counsel

Artificial Intelligence Software Usage Policy

Texas A&M University-Commerce acknowledges that there are legitimate uses of Artificial Intelligence, ChatBots, or other software that has the capacity to generate text, or suggest replacements for text beyond individual words, as determined by the instructor of the course.

Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

Individual instructors may disallow entirely the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors' guidelines. If no instructions are provided the student should assume that the use of such software is disallowed.

In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI, in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources.

13.99.99.R0.03 Undergraduate Academic Dishonesty
13.99.99.R0.10 Graduate Student Academic Dishonesty

COURSE OUTLINE / CALENDAR

				Lecture Schedule
Week 1	1/10/2024	-	1/12/2024	Basic Python programing 1
Week 2	1/15/2024	-	1/19/2024	Basic Python programing 2
Week 3	1/22/2024	-	1/26/2024	Basic Python programing 3
Week 4	1/29/2024	-	2/2/2024	Basic Python programing 4

Week 5	2/5/2024	-	2/9/2024	Basic Python programming 5
Week 6	2/12/2024	-	2/16/2024	Making plots with Matplotlib
Week 7	2/19/2024	-	2/23/2024	3D vector plots with VPython
Week 8	2/26/2024	-	3/1/2024	Accuracy and speed
Week 9	3/4/2024	-	3/8/2024	Integrals and derivatives 1
Week 10	3/11/2024	-	3/15/2024	<< Spring Break >>
Week 11	3/18/2024	-	3/22/2024	Integrals and derivatives 2
Week 12	3/25/2024	-	3/29/2024	Solution of linear and nonlinear equations 1
Week 13	4/1/2024	-	4/5/2024	Solution of linear and nonlinear equations 2
Week 14	4/8/2024	-	4/12/2024	Fourier transforms
Week 15	4/15/2024	-	4/19/2024	Random processes and Monte Carlo Methods
Week 16	4/22/2024	-	4/26/2024	Selected topics 1
Week 17	4/29/2024	-	5/3/2024	Selected topics 2
Week 18	5/6/2024	-	5/10/2024	Final exam