

THE UNIVERSITY OF TEXAS AT EL PASO
COLLEGE OF SCIENCE

Physics

Course & CRN #: PHYS 3360 16052

Course Title/Topic: Introduction to Computational Methods for Physics Problems

Credit Hrs: 3

Term: FALL 2022

Course Meetings & Location: PSCI 218

Prerequisite Courses: PHYS 3351, MATH 2326, PHYS 3325 or consent of instructor.

Instructor: Rajendra Zope

Office Location: PSCI Rm 116

Contact Info: E-mail: rzope@utep.edu

Phone: 915-747-8742

Website:

Office Hours: send email or ask in class (open door policy)

Textbook(s): **Class notes**, Recommended: Computational Physics: Tao Pang;

Suggested: A First Course in Computational Physics by Paul L. DeVries, John Wiley and Sons, IC, Numerical Methods for Physics, 2nd Edition: Alejandro L. Garcia; Computational Physics: N. J. Giordano and H. Nakanishi.

Course Objectives : The objective of this course is to introduce undergraduate students in physics to numerical solutions of physical problems which are too intractable using the traditional analytical methods. Computer simulations begin with the development of a model that can be represented by an algorithm. In the simulations many numerical methods can be used. The purpose of the course is to teach how to effectively use various existing numerical methods to solve particular problems in physics. Familiarity with a higher-level programming language is desirable but not required. A programming language will be introduced and used to solve physical problems. The students will learn numerical methods mostly related to solving physics problems. The students will be encouraged to write simple codes in the class which will enhance their understanding about methods as well as scientific programming. Several physics topics will be covered. Some of these are: numerical methods for simulating single particle motion, trajectories in 2D and 3D, oscillatory motion, two- and three-dimensional motion of a charged particle in an electro-magnetic field, dynamics of a driven pendulum, damped driven pendulum, classical scattering cross-sections for Yukawa potential, planetary motion, solution of one dimensional Schrodinger equation, moment of inertia and principal axes, random numbers, introduction to classical Monte Carlo method, determining the geometry of a small cluster with classical potential, least square fit to the data, standard and generalized eigenvalue problem for obtaining eigenvalues of Schrodinger like equations.

Course Assignments: There will be materials related to the numerical methods which the students will have to apply to solve physics problems. The lab work is an integral part of the course.

Assessment of course objectives: The assessment will be on the course-cum-lab work assigned and through a final test.

Course Schedule: Meet for 3 hours every week

Attendance Policy: None.

Grading Policy: Grading based on lab work, results and independent analysis.

Academic Integrity Policy: The University policy is that all suspected cases or acts of alleged scholastic dishonesty must be referred to the Dean of Students for investigation and appropriate disposition. Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to cheating, plagiarism, collusion, submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. For further information, please refer to: <http://academics.utep.edu/Default.aspx?tabid=23785> or http://www.lib.iastate.edu/commons/resources/facultyguides/plagiarism/dis_honest.html.

Civility Statement: Please do not use cell phones, pagers, iPods, MP3 players, blue tooth devices, etc. during class. Cell phones and pagers should be set to silent or vibrate, and any calls should be taken outside of class. Please do not wear headsets or blue tooth devices during class. **Disability Statement:** If a student has or suspects she/he has a disability and needs an accommodation, he/she should contact the Disabled Student Services Office (DSSO) at 747-5148 or at <dss@utep.edu> or go to Room 106 Union East Building. The student is responsible for presenting to the instructor any DSS accommodation letters and instructions.

Military Statement: If you are a military student with the potential of being called to military service and/or training during the semester, please contact me by the end of the first week of class.

ACCOMMODATIONS POLICY

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS). Contact the Center for Accommodations and Support Services at 915-747-5148, or email them at cass@utep.edu, or apply for accommodations online via the CASS portal.

SCHOLASTIC INTEGRITY

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is

unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. To learn more, please visit HOOP: Student Conduct and Discipline.

Grading: (tentative)

Classwork and HW [30%]

Two midterm exams [30%]

Final exam 40%