

**THE UNIVERSITY OF TEXAS AT EL PASO**  
**COLLEGE OF SCIENCE**  
**Physics**

Course & CRN #: PHYS 3360 12730

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

Credit Hrs: 3

Term: FALL 2024

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 an email or ask in class.

**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, 2<sup>nd</sup> 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 that can be intractable using 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 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 of 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, damp driven pendulum, classical scattering cross-sections for Yukawa potential, planetary motion, solution of one dimensional Schrodinger equation, the moment of inertia and principle 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 that 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 10.30 am-11.50 am. If the course becomes independent study, then the meeting time/format will be discussed in the classroom in the first week.

**Attendance Policy:** Attendance is highly desirable for your success in the course.

**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 an 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](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 the military service and/or training during the semester, please contact me by the end of the first week of class.

Course Communication: How we will stay in contact with each other

- Office Hours: • Email: UTEP e-mail is the best way to contact me. I will make every attempt to respond to your e-mail within 24-48 hours of receipt. When emailing me, be sure to email from your UTEP student account and please put the course number in the subject line. In the body of your e-mail, clearly state your question. At the end of your e-mail, be sure to put your first and last name, and your university identification number.
- Announcements: Check the Blackboard announcements frequently for any updates, deadlines, or other important messages.

## NETIQUETTE

As we know, sometimes communication online can be challenging. It's possible to miscommunicate what we mean or to misunderstand what our classmates mean given the lack of body language and immediate feedback. Therefore, please keep these netiquette (network etiquette) guidelines in mind. Failure to observe them may result in disciplinary action.

- o Always consider the audience. This is a college-level course; therefore, all communication should reflect polite consideration of other's ideas.
- o Respect and courtesy must be provided to classmates and to the instructor at all times. No harassment or inappropriate postings will be tolerated.

- o When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.

- o Blackboard is not a public Internet venue; all postings to it should be considered private and confidential. Whatever is posted in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space.

Course Policies: What do you need to do to be successful in the course

#### ATTENDANCE AND PARTICIPATION

Attendance in the course is determined by participation in the learning activities of the course. Your participation in the course is important not only for your learning and success but also to create a community of learners. Participation is determined by the completion of the following activities:

- o Reading/Viewing all course materials to ensure understanding of assignment requirements
- o Participating in engaging in discussion with your peers on the discussion boards (grading rubric provided in the "grading information" area of each forum)
- o Participating in scheduled Blackboard Collaborate sessions
- o Other activities as indicated in the weekly modules

Because these activities are designed to contribute to your learning each week, they cannot be made up after their due date has passed.

#### EXCUSED ABSENCES AND/OR COURSE DROP POLICY

According to UTEP Curriculum and Classroom Policies, "When, in the judgment of the instructor, a student has been absent to such a degree as to impair his or her status relative to credit for the course, the instructor may drop the student from the class with a grade of "W" before the course drop deadline and with a grade of "F" after the course drop deadline." See academic regulations in the UTEP Undergraduate Catalog for a list of excused absences. Therefore, if I find that, due to non-performance in the course, you are at risk of failing, I will drop you from the course. I will provide 24-hour advance notice via email.

OR

I will not drop you from the course. However, if you feel that you are unable to complete the course successfully, please let me know and then contact the Registrar's Office to initiate the drop process. If you do not, you are at risk of receiving an "F" for the course.

#### BLACKBOARD COLLABORATE SESSIONS

#### MAKE-UP WORK

Make-up work will be given only in the case of a documented emergency. Note that make-up work may be in a different format than the original work, may require more intensive preparation, and may be graded with penalty points. If you miss an assignment and the reason is not considered excusable, you will receive a zero. It is therefore important to reach out to me—in advance if at all possible—and explain with proper documentation why you missed a given course requirement. Once a deadline has been established for make-up work, no further extensions or exceptions will be granted.

#### ALTERNATIVE MEANS OF SUBMITTING WORK IN CASE OF TECHNICAL ISSUES

I strongly suggest that you submit your work with plenty of time to spare in the event that you have a technical issue with the course website, network, and/or your computer. I also suggest you save all your work (answers to discussion points, quizzes, exams, and essays) in a separate Word document as a

back-up. This way, you will have evidence that you completed the work and will not lose credit. If you are experiencing difficulties submitting your work through the course website, please contact the UTEP Help Desk. You can email me your back-up document as a last resort.

#### INCOMPLETE GRADE POLICY

Incomplete grades may be requested only in exceptional circumstances after you have completed at least half of the course requirements. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines.

#### 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](mailto: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.

#### TEST PROCTORING SOFTWARE

#### PLAGIARISM DETECTING SOFTWARE

Some of your coursework and assessments may submitted to SafeAssign, a plagiarism detecting software. SafeAssign is used to review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase.

## COPYRIGHT STATEMENT FOR COURSE MATERIALS

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.

UTEP provides a variety of student services and support:

### Technology Resources

- Help Desk: Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.

### Academic Resources

- UTEP Library: Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- University Writing Center (UWC): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- Math Tutoring Center (MaRCS): Ask a tutor for help and explore other available math resources.
- History Tutoring Center (HTC): Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- RefWorks: A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

### Individual Resources

- Military Student Success Center: Assists personnel in any branch of service to reach their educational goals.
- Center for Accommodations and Support Services: Assists students with ADA-related accommodations for coursework, housing, and internships.
- Counseling and Psychological Services: Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.