STATE UNIVERSITY OF NEW YORK
New Paltz, New York.

Computational Physics
Course No. PHY305 (3 credits)
Spring 2026

Instructor:	Dr. T. Biswas
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Text

The following will be the primary text for the course and it will be available to students in electronic form from Brightspace.

Computing for Physics: A Beginner's Workbook (using Java), by T. Biswas.

References

- *Numerical Recipes in C*, by Press, Teukolsky, Vetterling and Flannery (Oxford).
- *Physics*, by Resnick, Halliday and Walker (John Wiley).

Course Description

Numerical techniques using computers are becoming more and more essential for survival in the world of physics. Hence, students find themselves using such techniques very early in a physics program. However, these early introductions are in package forms that hide the actual numerical techniques used. This course is designed to show the detailed workings of some standard numerical techniques used in physics. Knowing these details helps students use such techniques more effectively in terms of flexibility and speed of computation. Here we shall be using the programming language Java to implement the desired numerical techniques. Although it will be useful, a prior knowledge of Java is not required for this course. Necessary parts of Java will be discussed in the course. Numerical techniques commonly used in physics will be introduced in the course and then applied to some physical simulation examples. As a final project, each student will be required to simulate a significant physics problem using the techniques learned.

Grading

70% of grades will be based on regular computer assignments (one assignment every one or two weeks). 30% of grades will be from a computer project. Each student must pick a project topic early on (within first month) in the semester. The instructor will help in the selection of the topic. Final exams are not very practical for a computer based course like this. Hence, the final exam time will be used for student presentations of their computer projects.

Assignments and topics to be covered

Assignment	Topic	% of grade
Chap. 1 (Ex. 3, 5, 6)	Real roots of algebraic equations.	10%
Chap. 3	Numerical differentiation.	0%
Chap. 4 (Ex. 1)	Numerical integration.	10%
Chap. 5 (Ex. 1, 2)	Matrix manipulations and linear algebraic equations.	20%
Chap. 6 (Ex. 1)	Differential equations.	10%
Chap. 7 (Ex. 1)	Large oscillations of a simple pendulum.	20%
Final Project	To be chosen by student with instructor guidance.	30%

Administrative Addenda

Student Learning Outcomes

To acquire basic skills in numerical methods used in physics related computing.

Campus-Wide Policies

https://www.newpaltz.edu/acadaff/academic-policies-including-academic-integrity/

Deadlines

http://www.newpaltz.edu/events/academic.php