

PHYSICS 401 - Computational Physics

MWF, 9:10-10:00 am, MPHY 213

- Course description:** Learn numerical simulation methods for solving physical problems.
- Prerequisites:** Basic courses in mechanics, quantum mechanics and calculus.
- Learning Outcomes:** Able to use Java to solve physics problems in mechanics and quantum mechanics.
- Instructor:** Prof. Siu A. Chin
- Office:* MPHY 407; best contact by email: chin@physics.tamu.edu
- Website:* <http://faculty.physics.tamu.edu/chin/>
- Hours:* M 2-4 pm, T 3-4 pm and by appointments.
- Telephone:* *Dept. phone only:* 845-7717
- Textbook:** *Computer Simulation Methods*, Third Edition, Pearson-AW, 2007.
by H. Gould, J. Tobochnik and W. Christian. **Can be downloaded from the Web.**
Additional reading materials will be assigned in class
- Grades:** Weekly project assignments: 75%; one final individual project: 25%.
All lectures and weekly assignments will be posted in the above website.
Letter scale: A=90-100; B=80-89; C=70-79; D=60-69; F below 60. (Can be lower by 5.)

Weekly course schedule:

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| Week 1: | Tinkering with Java. | Chapter 2 |
| 2: | More tinkering and the Kepler problem. | Chapter 2, 3, 5 |
| 3: | More tinkering and symplectic integrators. | Chapter 3, 5 |
| 4: | More tinkering and the 3-body problem. | Chapter 5 |
| 5: | Chaotic motion and iterative maps. | Chapter 6 |
| 6: | ” ” | Chapter 6 |
| 7: | Fractals. | Chapter 13 |
| 8: | Molecular dynamic simulations. | Chapter 8 |
| 9: | ” ” | Chapter 8 |
| 10: | Random Process and MC Integration. | Chapter 11 |
| 11: | Phase transition, the 2-D Ising Model. | Chapter 15 |
| 12: | Variational Quantum Simulations. | Chapter 16 |
| 13: | Exact Quantum Algorithms. | Chapter 16 |
| 14: | Time-dependent problems. | Chapter 16 |
| 15: | Quantum Monte Carlo methods. | Chapter 16 |

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Academic Integrity Statement:

The Aggie Honor Code is “*An Aggie does not lie, cheat, or steal or tolerate those who do.*” For more information, refer to the Honor Council Rules and Procedures on the web at <http://www.tamu.edu/aggiehonor>.