Physics 3800: Computational Physics –Winter 2020

3800 Computational Physics is a project-based course that trains students to become functional in computational methods by writing and compiling computer code (C/Fortran) in a Unix environment to solve problems from different areas of physics. Students complete one or more projects that introduce students to a particular class of numerical methods. Lectures and tutorials cover the theory that underlies the computational methods and background for code development and the application of the required numerical methods.

Prerequisites CS1510 or CS1001 or Engineering 1020 or other programming course; P2820, M2260 (ODE's I) and M3202 (vector calculus)

Schedule
Lectures: Slot 17, Tuesdays and Thursdays, 9:00 –10:15 am, Room C3020

Phys 3800 will be taught in a hybrid format for Winter 2020. We will be using C3020, which has video conferencing facilities, as our class meeting room. Approximately 75% of the class meetings will occur using Zoom video conferencing. You are welcome to attend this class either in person in room C-3020 or remotely via Zoom. A TA will be available in room C3020 to provide additional support.

Additional tutorial times will be organized after the course has started.

Instructor
Dr. James Munroe, Ph. 709-771-0450, jmunroe@mun.ca

- Please contact me to set up appointments through Zoom (or any equivalent web-based video conferencing service).
- I will be on the St. John's campus approximately one-week per month. I am happy to meet individually over video conference at a time that works better for you (including evenings and weekends.)

Course web page: See D2L and https://www.physics.mun.ca/courses/p3800/

Evaluation

Assignments (4)	20% (5% each)
Computer Projects (4)	75% (first 10%, second 20%, third 20%, fourth 25%)
Presentation on Project #4	5%

Note on Computer Projects.
These will involve solving a given physics problem using a particular numerical technique. A written report in Latex or as a Jupyter Notebook with graphs, analysis, discussion of results AND your original computer code will be submitted in both hard copy and soft copy format. The computer code must be self-contained, with input files, make files and scripts to generate output, and your generated output files so that the instructor can run the code himself and reproduce your results.

Course texts:

- An Introduction to Computer Simulation Methods 3rd Ed. Gould, Tobochnik, and Christian.
    - This is will be our primary course text.
    - This text is available online under a '*Free Access*' Access Rights: https://www.compadre.org/osp/document/ServeFile.cfm?ID=7375&DocID=527
    - A hardcopy is available on reserve at the QEII Library.

- Computational Physics, Second Edition, by Nicholas J. Giordano and Hisao Nakanishi (Pearson, 2006)
    - Previous course text.
    - A hardcopy is available on reserve at the QEII Library.

Other useful texts:

- *Introductory Computational Physics*, by A. Klein and A. Godunov. (Cambridge University Press, 2006)
- *Computational Physics: An Introduction.* (F. Vesely, Kluwer 2001)
- *Numerical Recipes–various editions*, by Press, Flannery, Teukolsky, and Vetterling.
- *An Introduction to Computational Physics*, T. Pang.
- *Computational Physics*, Landau, Paez and Bordeianu.

Outline

Approximately 2 weeks / chapter
Chapter 7: Random Processes
Chapter 9: Normal Modes and Waves
Chapter 10: Electrodynamics
Chapter 11: Numerical and Monte Carlo Methods
Chapter 14: Complex Systems
Chapter 15: Monte Carlo Simulations of Thermal Systems

General information from the University

Accommodations for Students with Disabilities
http://www.mun.ca/blundon/accommodations/
Student Code of Conduct
http://www.mun.ca/student/conduct/
6.7.5 Exemptions From Parts of the Evaluation
http://www.mun.ca/regoff/calendar/sectionNo=REGS-0601#REGS-1949
6.8.2 Exemptions From Final Examinations
http://www.mun.ca/regoff/calendar/sectionNo=REGS-0628
6.12 Academic Misconduct
http://www.mun.ca/regoff/calendar/sectionNo=REGS-0748
NOTE: Last day to drop a course without academic prejudice is Monday, Mar. 2, 2020. See University Diary (http://www.mun.ca/regoff/calendar/sectionNo=GENINFO-0086).