Physics 3800: Computational Physics  
Winter 2016.

Slot 6: Monday, Tuesday and Thursday. 1:00 – 1:50. Room C3067.  
Lab slots in C3057 (tutorials and help with projects) will be scheduled later.

Prerequisites  
CS1510, P2820, M3202 (vector calculus), M3260 (ODE’s I).

Instructor.  
Prof. Ivan Saika-Voivod  Rm C3026.  Ph. 864-8886.  saika@mun.ca.

Course web page: See D2L

No official text: Notes are based on a number of sources.  
Recommended texts:  
Computational Physics by Philipp O.J. Scherer, 2nd Ed (Springer, 2013)  
Basic Concepts in Computational Physics by Stickler & Schachinger, 2nd Ed (Springer, 2016)  
[Both available in electronic format from MUN’s library.]

Introductory Computational Physics, by A. Klein and A. Godunov.  (Cambridge University Press, 2006).  [Previous text for this course.]

An Introduction to Computational Physics, T. Pang.  
Computational Physics, Landau, Paez and Bordeianu.  
Introduction to Fortran 90, Nyhoff and Leestma.  
An Introduction to Fortran 90 for Scientific Computing, Ortega.  
The C Programming Language, Kernighan and Ritchie.

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 mostly involve solving a given physics problem using a particular numerical technique.  Fortran, C or C++ can be used. A written report in Latex 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, and generated output files so that the instructor can run the code himself and reproduce your results.
Outline

I. Review of Unix and Numerical Calculus.
   - Basic Unix commands.
   - Basic Latex.
   - Using batch and Make files.
   - Editing and plotting routines.
   - Review of numerical differentiation and integration

II. Ordinary Differential Equations (ODEs).
   - Euler, Leap Frog.
   - Runge-Kutta.
   - Adaptive time steps.
   - Order and Accuracy.

III. Matrices and Eigenvalues.
   - Gaussian elimination.
   - Poisson’s equation.
   - Eigenvalue problems.
   - Library Subroutines.

IV. Monte Carlo Simulations.
   - Random number generators.
   - Random walk.
   - MC integration.
   - Metropolis method.
   - Molecular dynamics.

V. Partial Differential Equations (PDEs).
   - Laplace, Wave and Diffusion equations.
   - Euler and Lagrangian methods.
   - Matrix forms.

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 Thursday, March 2, 2016.
See University Diary (http://www.mun.ca/regoff/calendar/sectionNo=GENINFO-0086).