

Memorial University of Newfoundland  
**CMSC6950 Computer Based Research Tools and Applications**  
Intersession 2017

**Instructors:**

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**Office Hours:** Please schedule appointment over email.

**Lectures:** Wednesdays and Fridays 9am-12pm in room C2039 (First Lecture May 10, 2017)

**Course website:** <https://ostueker.github.io/CMSC6950-2017> and also D2L

**Course Description:**

Using computers in research computing requires a diverse set of skills and tools for the research to be effective and efficient. The goal of this practical six-week intersession course is to increase your level of proficiency with using computers to do research in science.

Computing in research often gets applied with one of two approaches. Some researchers develop new code and have to consider the technical details of numerical analysis and software engineering. Other researchers use proven applications that provide a predefined user interface and have established work flows. This course sits at the interface between those approaches and will cover how to build new programs from other software and libraries. It will also develop automation of research work flows for passing data between different software applications.

Textbook: Anthony Scopatz, Kathryn D. Huff. *Effective Computation in Physics: Field Guide to Research with Python*. O'Reilly Media, 2015.

Available on-campus through the MUN library at

<http://proquestcombo.safaribooksonline.com/book/physics/9781491901564>

**Course Evaluation:**

- Quizzes (6, every Friday): 36%
- Assignments (4): 40%
- Group project: 24%

## Course Outline:

### 1: Command line and scripting

- The Bourne Shell (bash)
- Bash scripting
- Regular expressions
- Editors

### 2: Python scripting

- Basic Python
- Jupyter notebooks
- numpy, scipy, matplotlib

### 3: Software development

- Revision control (git)
- Building software (make)
- Unit testing
- Test-driven development
- Debugging, profiling and code optimization
- Code documentation

### 4: Working with data and visualization

- Data structures
- Files and formats
- Databases

### 5: Other topics

- Other 2D and 3D visualization tools
- Animations and movies
- Introduction to Compute Canada and ACENET facilities
- Parallel programming
- GPGPU programming (time permitting)

## Memorial University Policies:

Accommodations for Students with Disabilities <http://www.mun.ca/blundon/accommodations/>

Student Code of Conduct <http://www.mun.ca/student/conduct/>

Exemptions From Parts of the Evaluation

<http://www.mun.ca/regoff/calendar/sectionNo=REGS-0601#REGS-1949>

Academic Misconduct <http://www.mun.ca/regoff/calendar/sectionNo=REGS-0748>