

***Interdisciplinary Experiences:  
Intro to Scientific Programming with MATLAB and Github***

**Winter 2019**

**INSTRUCTOR:** Jay Brodeur, [brodeujj@mcmaster.ca](mailto:brodeujj@mcmaster.ca), Mills Library, Rm L104B

**Course Description:**

Scientific computing—using computer algorithms to solve scientific problems—plays an important role in research for many modern scientific disciplines. By developing computer programs that collect, refine, analyze, and visualize experimental data, scientists are able to explore new scientific hypotheses, and broaden their understanding of physical phenomena and relationships. Even in cases where datasets are small and relatively straightforward, using scripted, programming approaches can greatly improve the efficiency and the reproducibility of scientific analysis.

Further to this point, it is very likely that as your scientific career progresses, you will find yourself in a situation where using a programmatic approach is required to complete your research work, and/or immensely beneficial and timesaving in comparison to other approaches. Though you may not have expertise with a specific programming application, having knowledge of the basics of programming and scientific computing, and the confidence to experiment and continue to learn will be invaluable assets. To this end, the goal of this course is to develop both of these aspects, while also introducing you to best practices in creating and maintaining scientific code.

In this course, students will use [MATLAB](#) to learn and apply the basics of scientific computing and programming. Through the in-class guidance of the instructor and a take-home task, students will apply programmatic approaches to analyze and visualize real observational scientific datasets, in order to evaluate scientific hypotheses. In addition, students will gain experience with best practices in developing, updating, and sharing scientific code, through an introduction to commenting, documentation, and git and github for version control and code publishing.

**Learning Objectives:**

Through participation in the course, students will develop a number of knowledge- and skill-based competencies. By the end of this course, students will be able to:

- Navigate and operate the MATLAB computing environment;
- Use git and github for version control, code publishing, and sharing;
- Apply basic elements of commenting and markdown to create documentation;
- Describe the various variable types and control structures available in MATLAB (and generally in any programming language), and discuss why, when, and how they might be used in a scientific computing approach;
- Apply principles of scientific computing to perform future data analyses and visualization

**Course Schedule: / Class Activities:**

Date	Time	Location
Saturday, 02-Feb, 2019	0930 - 1600	BSB 241 (or Mills Library Wong Classroom)
Wednesday, 27-Feb, 2019	1900 - 2200	BSB 241 (or Mills Library Wong Classroom)

**Office Hours:**

By appointment, as needed.

**Required Texts & Materials:**

**Students are asked to bring a personal laptop computer to the session to facilitate some work that may not be possible with the computer lab workstation software.**

**Deliverables:**

The class will be graded on a pass/fail basis. There will be a total of three evaluation components; all components must be passed in order to pass the course.

- Under instructor guidance, students will participate in a hands-on introduction to scientific computing and the MATLAB environment.
- Students will select a project from a small selection of choices that will be provided by the instructor. Students will be assigned a number of requirements, and will work independently (with assistance from the instructor or peers, as necessary) to develop programmatic approaches to meet the requirements. All datasets and background information required to complete the tasks will be required.
- Students will be required to comment their code appropriately, use git to track versions, and will archive their products (code and data) using [Github](#). As a final passing requirement, the contents of the Github repository must be understandable and executable by the instructor or another student.

**GENERAL INFORMATION**

**A reminder that this course is PASS or FAIL. You are responsible for participating in all aspects of the module and absences or missed work could result in grade penalties.**

**Absences & Missed Work:**

If you are absent from the university for a minor medical reason, lasting up to 3 calendar days, you may report your absence, once per term, without documentation, using the McMaster Student Absence Form (MSAF). Absences for a longer duration or for other reasons must be reported to your Faculty office, with documentation, and relief from term work may not necessarily be granted. When using the MSAF, report your absence to course instructor or designate. You must then contact the instructor/instructional assistant/other immediately (normally within 2 working days) by email. Please refer to the contact list on the first page of this outline for appropriate email addresses. The instructor/instructional assistant will indicate what relief may be granted for the work you have missed, and relevant details such as revised deadlines, or time and location of a make-up exam/quiz/test. Please note that the MSAF may not be used for final deliverables, nor can it be used for a final examination or its equivalent.

**Checking Your Grades:**

All grade concerns and discrepancies must be reported to the Instructor within a week of receiving the grade.

### **Communication between Students and the Instructional Team:**

Any e-mails addressed to faculty must have a brief, relevant subject line, must come from a mcmaster.ca e-mail account and must copy in all relevant parties (e.g. other markers, other group members). All e-mail communication addressed to students will be sent to their mcmaster.ca e-mail account.

Work that is late, handed in to the wrong person, inadequately identified, or in the wrong format, risks losing marks.

Instructors will endeavor to return marked materials within two weeks of hand-in.

### **Student Responsibilities:**

To get the most out of the course, you must be prepared to:

- attend all sessions, make up all missed work, and provide documentation for authorized absences;
- interact frequently with faculty, students, TAs, and other support staff;
- plan and manage your own time;
- complete preparatory tasks (such as reading, writing assignments, and initial research) in advance of sessions;
- develop and use reflective learning skills (for example identifying learning objectives, planning and carrying out research tasks, acting on academic feedback);
- work as an effective, efficient, and responsive team member on group assignments;
- follow all the guidelines as outlined in the Introduction section of the Laboratory Manual;
- check the course Avenue site, and your McMaster and Avenue e-mail daily for updates; and,
- follow all university policies and guidelines, and in all ways be a responsible university member.

### **Senate Student Policies**

Students can view full policies here (<http://www.mcmaster.ca/policy/Students-AcademicStudies/>).

Senate Policy Statements are also available from the Senate Secretariat Office, Room 104, and Gilmour Hall.

### **Academic Integrity - <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>**

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty.

The following illustrate only four of many forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained;
- copying or using unauthorized aids in laboratory exercises
- improper collaboration in group work; and
- copying or using unauthorized aids in quizzes, tests and examinations

**All students are reminded of the importance of academic integrity, and the serious consequences of academic dishonesty.**

**Student Code of Conduct - [https://www.mcmaster.ca/policy/Students-AcademicStudies/Code\\_of\\_Student\\_Rights\\_and\\_Responsibilities.pdf](https://www.mcmaster.ca/policy/Students-AcademicStudies/Code_of_Student_Rights_and_Responsibilities.pdf)**

You acknowledge that your behavior in all aspects of this course should meet the standards of the McMaster University Student Code of Conduct. You understand that any inappropriate behavior directed against any of your colleagues, teaching assistants, or the instructional team will not be tolerated. Disruptive behavior during any session (e.g. lecture, seminar, lab, tutorial) such as talking, sleeping or non-class computing while an individual presents information, or constantly being late, will also not be tolerated. Abuse, ridicule, slander, inappropriate language, and discrimination towards instructors teaching staff, teaching assistants and other students will not be tolerated in any capacity. Shared spaces including e-spaces such as the Avenue to Learn course discussion board are to be considered inclusive and safe.

**Plagiarism Detection**

In this course, we will be using a web-based service (Turnitin.com) to reveal plagiarism. Students will be expected to submit their work electronically to Turnitin.com and in hard copy so that it can be checked for academic dishonesty. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to

<https://www.mcmaster.ca/academicintegrity/>

<https://www.mcmaster.ca/academicintegrity/turnitin/students/index.html>

**Copyright Policy**

In this course you will have access to material that is subject to copyright laws. This includes (but is not limited to) textbooks and all resources developed by the instructors such as lab manuals, demonstration videos, quizzes, assignments, tests, class notes and class slides. Under no circumstance are you allowed to share or redistribute this material in any printed or electronic form without the explicit written consent of the copyright holder. This includes posting any course material on Internet bulletin boards, course repositories, social networks, etc.

**McMaster Accommodation for Religious, Indigenous and Spiritual Observances Form (RISO):**

At the beginning of EACH term, visit the website of the Office of the Associate Dean (Academic) <https://www.science.mcmaster.ca/associatedean/current-students/procedures-forms.html> if you need accommodations for religious, Indigenous and/or spiritual observances. Follow the procedure explained there under “Accommodation for Religious, Indigenous and Spiritual Observances Form (RISO)”.

**Inclusivity and Accommodations:**

McMaster University aims to foster a supportive, inclusive learning environment that will encourage both individual and collective growth. Students are required to register with Student Accessibility Services (SAS) first (<https://sas.mcmaster.ca/>). Any student who then wishes to invoke an accommodation for any aspect(s) of this course must contact the instructor at the beginning of the semester to discuss how the accommodations detailed in their SAS letter will be fulfilled in this course.

**Policy about Online Access or Online Course Work Requirements: If your course has an online element:**

In this course we will be using email and Avenue. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

**The instructors and the university reserve the right to alter this outline if necessary.**

The instructors and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.