

**Course Name:** Tools & Techniques in Genomics Research for the Applied Biologist

**Course Number:** ENTM699M, 1 credit

**Instructor:** Megan Fritz, Ph.D., Entomology

**Course Summary:** “Tools & Techniques in Genomics Research for the Applied Biologist” introduces basic programming principles to biologists/entomologists with no previous programming experience. The primary aim of this course is to give students the basic tools to work with large scientific data sets, as well as instill best practices to enhance repeatability, reproducibility, and efficiency for “big” scientific data analyses. Students will participate in 7 highly interactive sessions, where they follow along with instructor live-coding to learn basic commands in the Unix shell and best practices for script development. *This is a pre-requisite for ENTM699N*, a special topics seminar covering genomic data analyses.

**Course Outcomes:** Upon completion of this course students will be able to:

1. Write scripts for the Unix command shell that improve efficiency of scientific data analysis.
2. Identify at least 3 additional resources that will enable them to continue learning scripting skills that will improve efficiency in their own data analyses.
3. Access a remote computing cluster and prepare their workspace for data analysis.

**Course Schedule:** Wednesdays from 11am-12:50pm for the first 7 weeks of Spring 2022. Please arrive 10 min early to set up your computer for class.

**Meeting Location:** Gahan Conference Room, Plant Sciences Building

**Course Requirements:** Students *must bring a laptop* with a Mac, Linux, or Windows operating system (not a tablet, Chromebook, etc.) that they have *administrative privileges* on.

- Specific software packages required for class:
  - The Bash Shell - a commonly-used shell that gives you the power to do tasks more quickly.
  - Git - a version control system that lets you track who made changes to what & when and has options for easily updating a shared or public version of your code on [github.com](https://github.com). You will need a [supported web browser](#).
  - Text Editor - When you're writing code, it's nice to have a text editor that is optimized for writing code, with features like automatic color-coding of key words. We will use nano for this course.

**\*\*Software Installation Instructions are available through the course ELMS page.**

**Optional Textbooks:**

Practical Computing for Biologists, Haddock & Dunn. Estimated cost is \$90.00 for new paperback.

Learn GIT in a Month of Lunches, Rick Umali. Estimated cost is \$30.00 for new paperback.

\*Both texts are available at Amazon.com and are good resources for further reading.

**Course-relevant websites:** Some course material is adapted from the Software Carpentry curriculum found [here](#).

**Readings:** All required readings provided on the course ELMS site.

**Assessments and Grading:**

*Homework:* There will be 2 homework assignments (10 pts. each) in Weeks 4 & 6 made available through the ELMS course page. Assignments will be available immediately following class and will be due by upload to ELMS before class the following week. Homework assignments will be worth 20% of the final grade.

*Quizzes:* There will be 3 timed online quizzes (8 pts. each) offered through the ELMS course page. Follow the quiz link on the left side of your screen to find the quizzes and their due dates. All quizzes will be open from Wednesdays at 1:00pm through Fridays at 1:00pm and will be accessible for 10 min. Students with accommodations should contact Dr. Fritz directly about their needs in the first week of class. Quizzes will cover material discussed since the previous quiz or exam. Online quizzes will be worth ~25% of the final grade.

*Participation:* Students should attend and participate in all course meetings during the semester (8 pts. per period). Participation is worth ~55% of the final course grade. Student participation grades will be determined based upon the quantity, dependability, and quality of participation. Appropriate forms of engagement include: 1) respectful and positive verbal discourse with the instructor or peers, or 2) insightful questions related to course materials. For more information on what constitutes acceptable in-class participation, see [Petress 2006](#).

**COVID-19 Missed Class Policy:** If you are ill or have been exposed to COVID-19, *PLEASE* do not attend class. While I expect in-class participation each week for healthy students, an online substitute for some course materials can be made available to earn participation points for students who are unwell (see Attendance Policy).

**Grading Scale:**

93–100: A	77–79.9: C+
90–92.9: A-	73–76.9: C
87–89.9: B+	70 –72.9: C-
83–86.9: B	67 –69.9: D+
80–82.9: B-	60 –66.9: D
	Below 60: F

**Attendance:** Attendance is not required but incentivized with a participation grade. Students must be present to receive a participation grade, unless otherwise arranged with Dr. Fritz. Students must follow the [university policy](https://www.ugst.umd.edu/courserelatedpolicies.html) when requesting excused or pre-arranged absences. See the policy here: <https://www.ugst.umd.edu/courserelatedpolicies.html>

\*\*Pre-arrangements for religious observances and planned, excusable absences must be made by email during the schedule adjustment period at the beginning of the semester. If an illness prevents participation in class, a note from a physician or evidence of a COVID-19 test must be provided within 72 hours of the missed class period.

**Make-Up Policy:** Make-up quizzes or assignments (homework or participation) will be given only to students who have university-excused absences with appropriate documentation.

**Course Schedule:**

Week	Topic	Assigned Reading
1	Introduction to Practical Computing & the Command Shell <b>In-class hands-on with pseudo-code</b>	<a href="#">Wilson et al. 2017</a>
2	Working with Files and Directories in the Command Shell	H&D Chapter 4
3	Regular Expressions, Pipes & Filters <b>ELMS Quiz 1 (covering weeks 1 &amp; 2)</b>	H&D Chapter 2
4	Loops and Command Shell Scripting <b>HW 1 assigned (due before class in Wk 5)</b>	H&D Chapter 6
5	Version Control with Git <b>ELMS Quiz 2 (covering weeks 3 &amp; 4)</b>	Umali Chapters 4 & 6
6	Collaborative Scripting with GitHub <b>HW 2 assigned (due before class in Wk 7)</b>	SWC Version Control with <a href="#">Git Episodes 7-11</a>
7	Remote Connections and Preparing your Workspace for Data Analysis <b>ELMS Quiz 3 (covering all weeks)</b>	H&D Chapter 20