Tools and Challenges for the Modern Scientist
Course Number: CRN 18603 / WILD 7970
Fall 2024 (19 August 2024 – 14 December 2024)
Fridays, 1 pm – 2:50 pm

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Course Description: This is a 2-hour discussion-based class focused on the contemporary tools and challenges encountered by modern scientists and how these factors have altered the process of science. Specific topics will be crowdsourced and tailored to students' interests, although we have provided several examples below. Students will be able to add topics to the sections below, based on their interests, and then we will select several topics per section for discussion during the semester.

I) Responsible science

1. Addressing the leaky pipeline that leads to underrepresentation of women and minorities in science
2. The reproducibility crisis and tools for developing responsible, reproducible, and productive research
3. Open science practices (e.g., data repositories, pre-registration, research notebooks, reference managers etc.)
4. Code-audits and version control
5. Online teaching: The value and merit of online coursework and degrees – can we get the same experience online as in the classroom?
6. Artificial intelligence – the good, the bad, and the ugly
7. Is it reasonable to expect scientists / grad students / professors should work more than 40 hours per week?
8. The ethics of volunteer positions and internships in science – What is the role of unpaid labor in advancing knowledge?

II) Data and data analysis

1. Citizen science… is it really science?
2. The role of the hypothesis in the era of big data
3. The usefulness of the p-value for hypothesis testing and decision making
4. Harnessing modern computing power – perks and pitfalls
5. Cloud computing
6. R shiny for web-based code and analyses

III) Scientific publishing in today's world

1. What is the future of the pay-to-publish model in science? What is an "ethical journal" and how does one define it?
2. Can entire journals be black-listed as predatory, and if so, how does one define a predatory journal?
3. Use of pre-print servers to expedite dissemination of results from non-peer-reviewed manuscripts
4. Pre-registration of hypotheses and manuscripts – a benefit to reproducibility or a hindrance to progress?
5. Data repositories and manuscript authorship in the era of publicly available data
6. Should we be required to make our data publicly available? What are the pros and cons?
7. Manuscript reviews: reviewing, responding to reviews, and verifying reviews via databases.
8. Should we move to a double-blind review system?
9. Copyright – who owns the rights to our published articles and who SHOULD own the rights?
10. How should the impact of our science be measured? Journal impact factors, citation indices, altmetrics, h-index, etc.
11. Who should be an author?

IV) You and your science

1. Promoting oneself as a scientist through websites, and social media networking
2. Preparing for the job market, including preparing a CV, and research/teaching/diversity statements
3. Science communication and outreach: In the face of growing science denial, what is our role as advocates for truth?
4. How do we keep up with the high volume of literature being published in our research fields?
5. What makes for a good presentation?
6. The mental health crisis in academia

Credit Hours: This will be a 2-credit hour course.

Course Prerequisites: Available to graduate students only.

Outcomes and Objectives

Student Learning Outcomes:

- Students will demonstrate critical thinking skills by applying knowledge from readings and personal experiences to classroom discussions.
- Students will demonstrate understanding of the tools available to them for science communication through discussion and ultimately using these tools to promote their own research.
- When presented with options for potential publishing outlets, students will be able to assess those options critically, responsibly, and ethically.
- Through discussions, students will demonstrate understanding of the philosophical nuances associated with different types of data and analytical approaches.
- Students will be able to identify tools available to them to improve the reproducibility of their research and will demonstrate knowledge of the advantages and limitations of these tools via in-class discussions and out-of-class applications.

Objectives: The overall goals of this course will be to: (1) help students develop skills for navigating a modern science career; and (2) spark dialogue about how the practice of science is being altered by contemporary forces, for better or worse.

Assignments, Grading, and Class Materials

Assignments:

- Classroom participation – this is a discussion course, and you are expected to:
    - Prepare for each class by reading/viewing the assigned materials before class;
    - Attend class; and
    - Participate in in-class discussions.
- Weekly written assignment – after every class period, you will be given an assignment in which you will provide written feedback on the topic. We will provide a prompt for you (e.g., write a letter to a politician summarizing your position on the topic).
    - Weekly assignments will be due by the start of the following week's class period.
    - These assignments will be maintained in an R notebook that is stored and shared on GitHub.
- Presentation – Once during the semester, each student will be responsible for leading the class discussion.
    - The presenter will identify the primary article on the topic s/he would like the class to read.
        - You MUST have this reading approved by the instructors before assigning it.
        - You MUST have the reading available to students by the time class starts the week before your presentation
        - Therefore, you MUST get your assignment approved more than 1-week ahead of time.
    - The presenter will provide an ~ 20-minute summary presentation on the topic via PowerPoint and facilitate a classroom discussion

- The presenter will generate 5 discussion questions and the class will be separated to discuss these in small groups
- We will then return to a larger group for the final hour of class for a group discussion

Grading and Evaluation Procedures:

- 90-100% is an A, 80-89% is a B, 70-79% is a C, 60-69% is a D, and grades < 60% will earn an F.
- Preparation for and participation in conversation topics led by other students will comprise 34% of the student's grade.
- Performance on weekly written assignments will comprise 33% of the grade.
- The final 33% of the grade will be based on the student's presentation and facilitation of in-class discussion.
- Reminder: students may withdraw without grade penalty until the 15th class day and until mid-semester (although a W will appear on the student's transcript if the student withdraws between the 16th and 36th day of class).
- Reminder: students who withdraw from the course between the 6th day of class and the 15th day of class will pay a course drop fee of $100.

Classroom Policies

- Weekly attendance is critical given that participation in discussions comprise 34% of the student's grade.
  - Students are allowed 1 excuse-free absence from class during the semester
  - Beyond that, students will be granted excused absences from class **with appropriate documentation** for the following reasons: illness of the student or serious illness of a member of the student's immediate family, death of a member of the student's immediate family, trips for student organizations sponsored by an academic unit, trips for University classes, trips for participation in intercollegiate athletic events, subpoena for a court appearance and religious holidays.
  - Students who wish to have an excused absence from this class for any other reason must contact the instructors in advance of the absence to request permission. The instructors will weigh the merits of the request and render a decision. When feasible, the student must notify the instructors prior to the occurrence of any excused absences, but in no case shall such notification occur more than one week after the absence. Appropriate documentation for all excused absences is required.
  - **Because learning via discussion is the crux of this class, any absence (beyond the first) will require preparation of an additional 1,000-word written assignment that summarizes additional literature on the topic.**
- Weekly written assignments are due before the start of the following week's class period
  - No late assignments will be accepted, but students may skip submission of 2 assignments during the semester.
- Weekly assignments and other course notifications will be disseminated via Canvas. Students are responsible for checking Canvas to ensure they are up-to-date on course information. Note that each student has control over her/his notifications via Canvas and

can edit settings to alert them when an announcement is posted, an assignment is due, a grade is released, etc.

- Students who need accommodations are asked to electronically submit their approved accommodations through AU Access and to make an individual appointment with the instructor during the first week of classes – or as soon as possible if accommodations are needed immediately. If you have not established accommodations through the Office of Accessibility, but need accommodations, make an appointment with the Office of Accessibility, 1228 Haley Center, 844-2096 (V/TT).
- All portions of the Auburn University Student Academic Honesty code (Title XII) found in the Student Policy eHandbookLinks to an external site. will apply to this class. All academic honesty violations or alleged violations of the SGA Code of Laws will be reported to the Office of the Provost, which will then refer the case to the Academic Honesty Committee.
- The Auburn University Classroom Behavior Policy is strictly followed in the course; please refer to the Student Policy eHandbookLinks to an external site. for details of this policy. Given that we will be discussing sometimes controversial topics, particular attention will be paid to students' efforts to treat their peers with courtesy and respect.
- If normal class and/or lab activities are disrupted due to illness, emergency, or crisis situation, the syllabus and other course plans and assignments may be modified to allow completion of the course. If this occurs, an addendum to your syllabus and/or course assignments will replace the original materials.

Tentative 15-week schedule

Prior to class – Please review Dr. Belsare's Shiny app and vote for your favorite topics of discussion.

- 23 August 2024 – Introduction to class
    - Introduction to class, faculty, and other students
    - Create a list of potential discussion topics
    - Demonstrate how to submit weekly letters via GitHub

- 30 August 2024 – Week 2 presentation by Ani and Jonathon
- 6 September 2024 – Week 3 topic
- 13 September 2024 – Week 4 topic
- 20 September 2024 – Week 5 topic
- 27 September 2024 – Week 6 topic
- 4 October 2024 – Week 7 topic
- 11 October 2024 – Week 8 topic
- 18 October 2024 – Week 9 topic
- 25 October 2024 – Week 10 topic
- 1 November 2024 – Week 11 topic
- 8 November 2024 – Week 12 topic
- 15 November 2024 – Week 13 topic
- 22 November 2024 – Week 14 topic

- 29 November 2024 – Thanksgiving
- 6 December 2024 – Week 16 topic

Mental Health

If you are experiencing stress that feels unmanageable (personal or academic) during the semester, Auburn University's Student Counseling & Psychological Services (SCPS) offers a variety of services to support you. The mission of SCPS is to provide comprehensive preventative and clinical mental health services to enhance the psychological well-being of individual students, as well as the broader campus culture. As an instructor, I am available to speak with you regarding stresses related to your work in this course, and I can assist in connecting you with the SCPS network of care. You can schedule an appointment yourself with the SCPS by calling (334)844-5123 or by stopping by their offices on the bottom floor of Haley Center or the second floor of the Auburn University Medical Clinic.Links to an external site. If you or someone you know needs to speak with a professional counselor immediately, the SCPS offers counseling during both summer term as well as the traditional academic year. Students may come directly to the SCPS and be seen by the counselor on call, or you may call 334.844.5123 to speak with someone. Additional information can be found at http://wp.auburn.edu/scsLinks to an external site.

Basic Needs

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course or others is urged to contact Auburn's Basic Needs Center for support at https://aub.ie/basicneedsLinks to an external site.. Furthermore, please notify the professor if you are comfortable in doing so as this will allow the faculty member to connect you with any other known resources.

Justification for Graduate Credit

This course is eligible for graduate credit given that we will be discussing topics relevant to practicing scientists that are unlikely to be encountered by even higher-level undergraduate students. Further, students will be responsible for independent learning regarding assigned discussion topics will facilitate classroom wide learning through discussions with their peers.