

SCIENTIFIC THINKING IN ECOLOGY

FAS 5901, FALL TERM 2025

2 CREDIT HOURS

Wednesday, 3:00-4:55, Newins-Ziegler 219

INSTRUCTOR: Patrick Baker

Program in Fisheries

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OFFICE HOURS: Wednesday, 1:45-2:45, McCarty B, Room G118

or contact the instructor for additional times

REQUIRED TEXT: none. Readings will be assigned during the course.

COURSE DESCRIPTION

A key intent of the Fisheries and Aquatic Sciences degree programs is to teach you how to understand and perform science. The objectives of this course are to examine what science is, why we do it, and some of the practical and ethical considerations of science.

The course will be divided into three sequential modules. In the first module, we will examine the history of science as a way to understand what it is that we call science, and how we got here. Science, as a term and a concept, is relatively recent, yet knowledge advanced before “science” existed. What is it about science that makes it a useful way of thinking? Advances in assumptions, logic, the scientific method, and probability will all be examined.

In the second module, we will survey different approaches to conducting science. Fisheries and ecology share methods with many other disciplines, but there are other models. Medical science, for example, focuses on ethics and liability in ways that

can alter the approach to experiments. Manipulative experiments are often impossible in astronomy and geology, yet few would argue that they are not sciences. Statistics are often regarded as simply a way to process data, but there is a reason for statistical analysis that is fundamental to scientific thinking.

In the final module, some of the challenges facing science will be discussed. What are bad science, pseudoscience, and scientific fraud? When is skepticism useful for science, and when is counter to our quest for knowledge? What sorts of biases can creep into science, and how can we avoid them?

PURPOSE OF COURSE AND COURSE OBJECTIVES

The course is intended to strengthen the student's understanding of scientific thought, and how to apply it in their studies and career. The course objectives are as follow.

1. To understand how scientific thinking developed as an intellectual tool.
2. To learn different ways to apply scientific thinking to match different disciplines.
3. To be aware of and be able to counter some of the challenges facing science.

INSTRUCTIONAL METHODS:

The course will be offered in two formats: in-class and online. In-class participation is required for students living in Alachua County and able to attend lectures. Online participation is permitted for students living outside Alachua County and unable to reasonably commute to class. The material will be the same for each format, but in-class participation will be replaced with short essays for online students.

There will be five methods of instruction, but some depend on whether the student is in class or online: lectures and presentations, group discussions, short essays, assignments, and quizzes. Lectures and presentations will be provided both in-class and as on-line resources on the course Canvas website, <https://ufl.instructure.com/courses/534363>. Group discussions will be for in-class participation, while short essays on the same topics will substitute for in-class participation for online students. All students will have similar assignments and quizzes.

Lectures and Presentations will be live unless otherwise noted. Lectures will be provided by the instructor or guest presenters, and there will be time for questions or discussion. Lectures provided by the instructor will be on the course Canvas website in

several file formats but, if there are guest presentations, it will be up to their discretion whether they provide online material. If they do not, the instructor will provide notes from the guest presentation online.

Readings and Discussions by the class will cover previously selected reading materials, on topics related to scientific thinking. Participation will be required and evaluated, based on meaningful and civil contributions to the discussion.

All students, both in-class and online, will also be asked to introduce themselves online, explaining their interest in and plans for science.

Short essays (250-500 words, including citations) based on the reading material will be assigned to online students, and sometimes to all students in addition to in-class discussion. Students taking the in-class format, with excused absences, may substitute an essay for a missing discussion. There will be thirteen short essays (one per week except the final week) for online participation.

Written Assignments will be practical projects, such as practicing different citation formats, designing experiments, or evaluating questionable science. There will be four assignments.

Quizzes will be designed to test the student's understanding of key concepts in presentations or discussions. There will be seven quizzes, all conducted online, outside of class hours. Quizzes will be available from Monday to Sunday every other week starting the third week of the course, and the students will be allowed 60 minutes from the start of the quiz to the end. Honorlock™ will not be used, and students may use any resource for online quizzes except each other. Once students have taken the quiz, they must not speak about it to other students until the quiz period has ended.

GRADING:

The grade will be broken down as follows:

- Course Introduction, due Week 2, one-time 1% of the course grade
- Participation in readings & discussions (in-class) 13 in total, each worth 3% of the grade 39% of course grade
- Assignments - 4 in total, each worth 8% of the grade 32% of course grade
- Quizzes - 7 in total, each worth 4% of the grade: 28% of course grade

In the event of campus being closed for weather, everyone will use the online essay option.

Grades are based on the cumulative of the percentages above; there is no curve. The grade cut-off values are as follow:

93% and above = A

90% = A-

88% = B+

83% = B

80% = B-

78% = C+

73% = C

70% = C-

68% = D+

63% = D

60% = D-

COURSE POLICY ON ACADEMIC INTEGRITY

Science is a collaborative process, but some skills must be acquired by students for themselves. Accordingly, all essays and assignments must be each student's own work. Artificial intelligence programs (e.g. ChatGTP, Grammarly GO) may not be used to assist students, although grammatical assistant functions within word processors are acceptable.

Quizzes will be open-note, but students may not assist each other. Do not discuss the quiz with anyone other than the instructor until the quiz period has ended.

University of Florida Policies:

University Policy on Accommodating Students with Disabilities: Students requesting accommodation for disabilities must first register with the Dean of Students Office ([https://disability.ufl.edu/get-started/Links to an external site.](https://disability.ufl.edu/get-started/Links-to-an-external-site.)). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this

documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

University Policy on Academic Misconduct: Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at [https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/Links to an external site..](https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/Links%20to%20an%20external%20site..)

Proposed course schedule for Fall 2024

August 27 – Introduction to Scientific Thinking: What is Science?

Essay 1* (essays for students, topics TBA)

September 3 – Ancient Thinking: Origins of Logic

Essay 2

September 10 – Medieval Advances: Empiricism and Experimentation

Essay 3, Quiz 1

September 17 – Scientific Thinking in the Renaissance: Science Becomes a Method

Essay 4, Assignment 1 (assignment topics TBA)

September 24 – Early-Modern Scientific Thinking:

Essay 5, Quiz 2

October 1 – Scientific Thinking in the 20th Century: Quantifying Probability

Essay 6

October 8 – Practical Issues in Science: Manipulative vs Mensurative Hypothesis Testing†

Essay 7, Quiz 3

October 15 – Practical Issues in Science: Ethics in Science†

Essay 8, Assignment 2

October 22 – Practical Issues in Science: Confidence, Power, and Probability†

Essay 9, Quiz 4

October 29 – Practical Issues in Science: Authorship and Peer Review†

Essay 10

November 5 – Challenges to Science: Bias in Science

Essay 11, Quiz 5

November 12 – Challenges to Science: Skepticism and Pseudoscience

Essay 12, Assignment 3

November 19 – Challenges to Science: Bad Science and Fraud

Essay 13, Quiz 6

November 26 - Thanksgiving holiday, no classes

December 3 – Challenges to Science: Intelligence in Science

Quiz 7, Assignment 4

*Essays are for students taking the online section; students attending live lectures will instead participate in readings and discussion for the same credit, except on days when classes are cancelled for weather.

†Schedule of topics subject to change, based on schedule of guest speakers.