

Phys 300: Interdisciplinary STEM Seminar
(Cross listed as PHYS300/CHEM300/ MATH300/CS346)

College of Arts & Sciences Syllabus

COURSE INFORMATION

Credit Hours: 1

Course Description: : Interdisciplinary STEM Seminar is a 300-level elective to be taken by Chemistry, Computer Science, Earth Science, Mathematics and Physics majors or minors who are interested in acquiring introductory training in research methodologies in the physical and mathematical sciences and are intending to serve as peer leaders for the lower level classes in their program.

This course provides a stimulating introduction to a set of topics that are at the forefront of research in the sciences. The course is structured around a series of modules introducing select research techniques that are widely used and have broad applications across different scientific, mathematical and computational fields. The modules will draw connections between scientific disciplines, and explore how advances and methodologies used in one discipline are modified and applied in another. Students will develop research proficiency and build the skills of scientific inquiry, and gain an appreciation for the interconnectedness among different scientific fields.

This course will involve a set of multi-disciplinary exercises, spanning the disciplines of Chemistry, Computer Science, Earth Science, Mathematics and Physics. The course is intended to be a focused exploration of the common scientific methodologies, analytic and computational techniques used in the participating disciplines. Each hands-on, open-ended exercise will be carried out over a period of 3 weeks, and will incorporate tools from different scientific fields so that students make connections between disciplines. Computation will be a significant component of many of these modules. Active learning exercises in scientific inquiry, in-class discussions, and select readings from scientific literature will be used.

Course Prerequisites: None.

FACULTY INFORMATION

Instructor: Scott Mayle

Office Location: BBH 221D

Office Hours: Tuesday/Thursday 6 pm – 7 pm and Fridays 9:30 am – 10 am

Phone Extension: (773) 442-6050

E-mail: s-mayle@neiu.edu

COURSE MATERIALS

List of Required Texts / Materials:

There is no text for this course. Instead, the instructor will make available, through the course web-page and/or D2L, the reading materials or in other cases, provide references to the reading materials for each topic. A non-complete list of readings follows from web sites posted on D2L:

Getting Involved with Science:

<https://www.mathsisfun.com/activity/buffons-needle.html>

<http://digipac.ca/chemical/molemass/moles3.htm>

<http://practicalphysics.org/estimating-size-molecule-using-oil-film.html>

http://undsci.berkeley.edu/lessons/mystery_tubes.html

Evaluating good and bad science in the real world:

https://www.ted.com/talks/jonathan_drori_on_what_we_think_we_know

https://www.ted.com/talks/ben_goldacre_battling_bad_science?language=en

https://www.ted.com/talks/how_simple_ideas_lead_to_scientific_discoveries

Science Ethics

<http://www.cpet.ufl.edu/wp-content/uploads/2013/03/Ethics-in-Science-Classroom-Debate-Scenarios.pdf>

COURSE OBJECTIVES / STUDENT LEARNING OUTCOMES

List of what students are expected to know and be able to do after taking the course.

- Knowledge of the basic operating principles of the scientific method.
- Knowledge of general experimental design and the ability to evaluate experiments based on its merit.
- Ability to evaluate scientific analysis (both data analysis and conclusions) based on its merit.
- Knowledge of how basic research is done in a variety of STEM related fields
- Knowledge of how cross discipline research can promote progress and understanding across fields.
- Ability to communicate scientific information effectively.

STUDENT TASKS / ASSIGNMENTS / REQUIREMENTS

Assessment:

Assessment of student learning will be primarily through in-class assignments, homework assignments, class participation and oral and written presentations. Assignments will assess research skills and scientific thinking, i.e. assimilation of scientific concepts and the application of these concepts to scientific phenomena – through problem solving exercises. Oral and written assignments will assess scientific literacy and research proficiency as well as reading and writing skills.

Assignments:

Weekly assignments will involve both individual and team work.

Exams

There will be no exams. Grades will be based on assignments, class participation and presentations. It is essential that students work consistently throughout the semester to be successful in this class.

Grading Policies and Formulae:

- 65 % - 5 modules/exercises/presentations
- 20% - Peer-leading exercises/participation
- 15 % - Reading assignments

A+	97-100	C+	77-79
A	93-96	C	73-76
A-	90-92	C-	70-72
B+	87-89	D+	67-69
B	83-86	D	65-66
B-	80-82	F	Below 65

Classroom Civility

Each student is strongly encouraged to help create an environment during class that promotes learning and preserves mutual respect for everyone.

Course Outline/Schedule

- Week 1-3 Scientific methodology, quantitative analysis, Scientific ethics discussion in PLTL format
- Week 4-5 Pedagogical issues in STEM, reading journal papers, writing

Week 6-7	The Chemistry of Cleaning (Chemical Analysis of non-Chlorine Bleaching Agents), prepare, work, present
Week 8-9	The Physics of Gravity (Mapping gravitational fields of planets and moons), prepare, work, present
Week 10-11	Decision Trees (Training technology to make reasonable decisions), prepare, work, present
Week 12-13	Modeling Geological Hazards (Mapping volcano flows and geologic hazards using GIS tools), prepare, work, present
Week 14	Statistical analysis of research data (Presenting and analyzing data, confidence intervals, regression analysis), prepare, work, present
Weeks 15	Presentations feedback, Wrap up

Note this is a rough outline and subject to change (especially since each module is run by a different professor).

Grading Policies and Formulae:

Class participation: 25% (10 points per class)

Lab notebook: 30% (10 points per class)

Quizzes 15%

Final project/presentation/paper 30%

COURSE POLICIES AND STATEMENTS

Course Work

Regular attendance of lectures is strongly recommended. Students are strongly encouraged to read ahead and reading exercises identifying the material to be covered in the next class will be assigned every class. Active participation in classroom discussions and research exercises is essential for a good grade in this course.

Absence Policy:

There is a grade based on participation in class. If there is an unexcused absence, you will receive no participation points for that class.

Academic Integrity Policy:

By enrolling in this course, you are bound by the NEIU Student Code of Conduct:

<http://www.neiu.edu/university-life/student-rights-and-responsibilities/student-code-conduct>.

You will be informed by your instructor of any additional policy specific to your course regarding plagiarism, class disruptions, etc.

ADA Statement:

Northeastern Illinois University (NEIU) complies with the Americans with Disabilities Act (ADA) in making reasonable accommodations for qualified students with disabilities. To request accommodations, students with special needs should make arrangements with the Student Disability Services (SDS) office, located on the main campus in room D104. Contact SDS via (773) 442-4595 or <http://www.neiu.edu/university-life/student-disability-services>.

Campus Safety:

Web links to Campus Safety: Emergency Procedures and Safety Information can be found on NEIUport on the MyNEIU tab or as follows:

http://homepages.neiu.edu/~neutemp/Emergency_Procedures/MainCampus/.

Center for Academic Writing

Center for Academic Writing (CAW) provides peer tutoring for students enrolled in officially-designated Writing Intensive Program (WIP) courses. WIP peer tutors, who are recommended by faculty and hired and trained by CAW, are affiliated with specific WIP courses and provide discipline-specific writing support. WIP peer tutors help students of all abilities become better writers by helping them focus on every step of the writing process - from brainstorming ideas, prewriting, and outlining, to drafting, revising, and editing. Students do not need to have a completed draft to meet with a WIP peer tutor. WIP peer tutors can provide the most effective help if students come early in the assignment process and return throughout the semester.

Students should speak with their WIP course instructor and/or contact CAW for more information about WIP peer tutoring. Information is available on the web at www.neiu.edu/caw. Students can stop by CAW on the fourth floor of the Ronald Williams Library or call 773-442-4492 to make an appointment.