
MSE 590 – Introduction to Research

Fall 2023

Instructor: Prof. Haydn Chen

[Haydn H Chen | The Grainger College of Engineering | UIUC \(illinois.edu\)](#)

Lecture: W 5:30-6:50 PM

(First class meets on September 6, 2023)

Venue: 2051 Sidney Lu Mechanical Engineering Bldg.

Meeting/Contact Hours: Six main lectures delivered by the instructor (each for 80-minute)

With other assignments such as homework and student presentations

(See calendar for lecture schedule)

Email:	haydnc@illinois.edu
Office:	312F MSEB
Office Hours:	by appointment – contact above email to schedule
Course Website:	Canvas

Course Credit

- The course is for 1 credit hour. It is offered to students in MatSE Department pursuing Master's and Doctoral degrees. Students who have taken MSE 396 before may not be enrolled.
- For students who are doing research in a research group, you could sign up for independent study with your research advisor and then also take this course as a "supplement"; for students who are not doing research in a group, you would sign up for just this course.

Recommended Text

- [*Research Methods for Science*](#), Cambridge University Press, M. P. Marder, 2011
- Other texts on reserve at Grainger Library or available in electronic format are listed below. (The titles of texts available in electronic format are hyperlinked to the source.)
- *Scientific Writing and Communication: Papers, Proposals, and Presentations*, Oxford University Press, Angelika H. Hofmann, 2010
 - [Scientific Papers and Presentations](#) [electronic resource], Academic Press, Martha Davis, 2013

- [Style and Ethics of Communication in Science and Engineering](#) [electronic resource], Morgan & Claypool Publishers, J.D. Humphrey and J.W. Holmes, 2009
- *An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements*, University Science Books, J.R. Taylor, 1997
- [Introduction to Probability and Statistics for Engineers and Scientists](#) [electronic resource], Academic, S.M. Ross, 2009
- *Small Message, Big Impact: How to Put the Power of the Elevator Speech Effect to Work for You*, Greenleaf Book Group Press, T.L. Sjodin, 2012
- [Presenting to Win](#) [electronic resource], Prentice Hall, J. Weissman, 2010.

Class Description and Objectives

Students are encouraged, but not necessarily required, to be involved in research during the semester they are enrolled in MSE 590. The student's research activities are not limited to faculty in the Materials Science and Engineering department.

Students who do not have ongoing research activities are most welcome to take the course so to learn how to engage in future research, presentation and writing. For those students, each is to determine a virtual project based upon literature review or other forms of research topics in order to meet the course requirements.

The fundamental tenets of research will be covered, including an introduction to laboratory safety, the ethical conduct of research, constructing a hypothesis and the design of experiments to test the hypothesis. In addition, the students will be exposed to the basics of mathematical modeling and statistical analysis of data, including the analysis of their research data. Exposure to the basic procedures comprising engineering communication and the importance of clear and concise verbal and written communication will be emphasized. Students will be required to give an elevator talk in class and give a research talk at the end of the semester. During the semester students will also have several written assignments in preparation for the final research report.

The safe conduct of research is a requirement in all institutions, industrial, government, and universities. The section on laboratory safety has been developed in conjunction with the Division of Research and Safety on campus at University of Illinois, Urbana-Champaign. The safety section concludes with an online safety exam that the student must complete with a satisfactory grade and hand in the certificate that demonstrates that the online training was completed in a satisfactory manner. **It is not possible to pass this course without completing the laboratory safety training.**

Ethical training is now a requirement by funding agencies, including the National Science Foundation, which has rules governing the Responsible Conduct of Research. The section on the ethical conduct of research requires that the student complete the online ethical training. **It is not possible to pass this course without completing the ethics training.**

Students will be introduced to the process of writing and publishing a research paper. Lectures will summarize the different sections of a research paper and the style of writing each section and the relevant information to be included in each section. Students will also be introduced to technical presentation, design of content, presentation materials and speaking practices.

Finally, an introduction to the concepts of error analysis, statistical analysis and mathematical modeling of data are discussed. The basics of statistical analysis of data are introduced, including the process of determining error bars for data and fitting of data with mathematical functions.

Grading Policies

Student learning and growth will be assessed based on the following:

Grading Breakdown

Class Attendance	40%
Course work (homework and assignments)	15%
Presentations	20%
Final Paper or Report	25%

- **Class Attendance**
 - ***It is not possible to pass this course if you neglect the lecture segment of the course without good reasons.***
- **Course Work**
 - ***All assignments must be typed and submitted on time.***
 - Homework assignments are designed to teach the fundamental tenets of research.
 - Complete the general segment of the online safety training and any additional safety training relevant to your research and turn in the certificates. **(It is not possible to pass this course without completing the safety training.)**
 - Complete the online ethics training and turn in the certificate. **(It is not possible to pass this course without completing the ethics training.)**
 - Write your hypothesis and experimental approach.
 - Write an introduction to your research paper or report.
 - Elevator Talk and Final presentation ([see below for more details](#))
 - Final Paper or Report ([see below for more details](#))

- **Presentations**
 - You will give presentations on your research topic to the class.
 - This talk will be 15 minutes in length.
 - 12 minutes for the presentation.
 - 3 minutes for Q & A.
 - The format for this talk will follow that given in lecture.
 - The date of final presentations will be scheduled toward the later part of the semester. (Please refer to class schedule. The number of days for final presentations will be determined by the size of the class.)

- **Final Paper or Report**
 - The paper/report is to be 5 pages in length, typed; its format shall be in line with all the relevant sections of a research paper submitted for publication.
 - The paper is to follow the standards laid out during the lecture on publishing your research or the final paper write-up that can be found on Compass.

Late Assignments

- **No late homework assignments will be accepted unless prior arrangements are made with the instructor for valid excuses.**
 - Valid excuses include, but are not limited to, deaths in the family, jury duty, and hospitalization for illness, etc.
 - Non-valid excuses include, but are not limited to, oversleeping, “my printer didn’t work,” “I wasn’t here when you assigned it,” etc.
- If you have concerns, I am happy to discuss your specific situation with you and clarify any questions you have.

Academic Code of Conduct

- This course will execute a “zero-tolerance” policy concerning cheating and plagiarism.
- Use of AI GPT tools is not forbidden but must be clearly stated in the paper. Students have the responsibility for copyright, giving clear and accurate statement about the reference including the use of GPT for any part of the work.
- Students are referred to the University of Illinois, Urbana-Champaign Student Code for completed details on the Student Code. Special attention should be given to Part 4 of Article 1 (<http://admin.illinois.edu/policy/code/>).
- Cheating and plagiarism will be dealt with according to established campus policy. Students caught cheating will receive a failing grade.

Proposed Calendar – Subject to adjustment and change as the class develops

Class Date		Class Topic	Assignments	Assignments Due
Wed.	Aug 23	No class		
Wed.	Aug 30	No class		
Wed.	Sep 06	Introduction, Safety	HW 1: Safety	
Wed.	Sep 13	Scientific Presentations	HW 2: Elevator talk	HW 1
Wed.	Sep 20	Elevator Talks		HW 2 (in class)
Wed.	Sep 27	No Class		
Wed.	Oct 04	The Scientific Method	HW 3: Describe your Hypothesis	
Wed.	Oct 11	No Class		HW 3
Wed.	Oct 18	No Class		
Wed.	Oct 25	Elements of the Research Paper	HW 4: Write the Introduction to your paper	
Wed.	Nov 01	No Class		
Wed.	Nov 08	Ethics	HW 5: Ethics	HW 4
Wed.	Nov 15	Presentations		HW 5
Wed.	Nov 22	Presentations		
Wed.	Nov 29	No Class		
Wed	Dec. 6	Final Paper Due		Final Paper Due: 5 PM