E11: Written Technical Communication in Engineering and Applied Science

Syllabus Winter 2017

Section 03: Wednesdays 1:00-1:55pm Keck 142
Section 04: Thursdays 1:00-1:55pm Keck 142

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COURSE DESCRIPTION

Science not worth reading is not worth doing. If no one knows about your work, does it matter that you did it? Successful scientists and engineers are able to communicate their research effectively so that their audience understands the motivation, merit, and significance of their work. The writing process and the scientific method work together to produce and disseminate clear, logical, and meaningful knowledge that makes an impact on the field and society at large. These communication skills are critical for proposing research, writing project updates, and publishing results – all required for successful careers in science and engineering.

In this course, students will practice techniques for effective technical writing of science and engineering publications. They will select a research project or a technical review topic and write, review, revise, and rewrite/resubmit a manuscript for a scientific or engineering journal of their choosing. Students will receive guidance and feedback on their writing from the instructor, their peers, and a content expert in their field as they write and revise their manuscripts. *This course fulfills the Institute's scientific writing requirement.*

LEARNING OBJECTIVES

The goal of this course is to help create better *writers* not better *writing.*

By the end of this course, students will:

- Be able to conduct investigatory literature searches, find the best sources for their claims, and efficiently manage these sources during the writing and publication process.
- Identify their audience and tailor their technical writing style to them.
- Understand the anatomy (form and function of the components) of a scientific manuscript.
- Gain experience reviewing scientific articles and providing feedback to their scientific peers.
- Practice professional communication in the form of emails, cover letters, and responses that are commonly used in science and engineering disciplines.
- Gain confidence in their writing and communication abilities.

POLICIES ON PLAGIARISM

To improve as a writer, *you* must write and rewrite and rewrite.

Write your own words; plagiarism will not be tolerated. Ignorance does not absolve guilt. Make sure to read the Hixon Writing Center's guide to Understanding and Avoiding Plagiarism.

Self-plagiarism is also prohibited. If you have written about your research for a SURF paper and plan to write a manuscript on the same topic, you must submit an original copy of your SURF paper to the instructor with the understanding that you will write an original work for this class. Research that has already been published (including in CURJ) is ineligible content for this class.

STUDENT RESPONSIBILITIES AND GRADING

Scientific writing is often a collaborative process; therefore, it is expected that you participate in the collaborative learning environment in class. Your perspective as an engineering writer and reader brings intellectual value and diversity to our discussions. Your attendance and participation is required in the section for which you are registered. During the quarter, students will attend one-to-one meetings with the instructor to receive feedback throughout the writing process.

Individual assignments are brought to class (unless otherwise directed) for credit and submitted online to the course Moodle page for originality checks. **Please upload your writing submissions as Word documents (.doc, .docx).** Late submissions will be penalized 10% each day past the deadline. Late submissions of the final manuscript packet will not be accepted. Known absences can be accommodated but must be discussed with the instructor at least two weeks prior. Extenuating circumstances will be handled on a case-by-case basis.

Component	Points
Class Participation	25
Writer-Instructor Meetings	25
Topic Proposal	10
Outline	20
Introduction Draft	15
Methods and Results / Main Analysis Draft	15
Discussion / Conclusion Draft	10
Abstract	10
Cover Letter to the Editor	10
First Draft (with revisions)	20
Reviewer Comments (x 2 manuscripts)	20
Final Manuscript Packet Submission	20
Total	**200**

Letter Grades:

%: **A** ≥ 89.5 > **B** ≥ 79.5 > **C** ≥ 69.5 > **D** ≥ 59.5 > **F**
Points: **A** ≥ 179 > **B** ≥ 159 > **C** ≥ 139 > **D** ≥ 119 > **F**

You can punt 20 points and still get an A, assuming the rest of your work is stellar. However, because the goal of this course is to produce better *writers* not better *writing*, it is strongly encouraged that you put your best effort into every writing opportunity.

COURSE SCHEDULE AND ASSIGNMENTS

Week 1. Introduction to scientific writing: Preconceptions, purpose, process, product. Anatomy of a manuscript. Fractals in written documents.
Assignment 1: Students will learn how a top science and engineering journal feel about scientific writing practices by reading a one-page *Nature Physics* article on scientific writing.
Assignment 2: Students will select a research or review article topic and write a brief (one-paragraph) proposal on their selection. This proposal will address the Why, How, What, and So What of the topic and identify a target journal for their writing.
Assignment 3: Students will identify a content expert (Caltech faculty, research staff, postdoctoral scholar, or a JPL staff member) to review the validity of their technical writing. Students and Experts will discuss the proposed topic and scope of the paper, sign/e-sign an agreement form, and the student will submit it online. If the student is writing about a SURF project, they must also append their submitted SURF paper to their form and include it in the submission.

Week 2. Planning and investigatory writing: Using outlines and storyboards to prepare to write. *Expert Lecture:* Using databases effectively and managing sources with EndNote.
Assignment 1: Students will read *Made to Stick* Chapter 1 "Simple" and discover their manuscript's "Commander's Intent."
Assignment 2: Students will create a detailed outline or storyboard for their manuscripts, including figures or figure sketches and captions, with their "Commander's Intent" indicated at the top. The outline for a research paper should contain the same or same types of sections as an example article in your target journal, usually an Introduction, Methods, Results, and Discussion (IMRAD). The outline for a review article will not include traditional methods or results section, but will include significantly more background and discussion. Every piece of the outline/storyboard will support the "Commander's Intent" for the manuscript. References should be included where possible.

Week 3. Setting the stage: Identifying and addressing your audience. Providing context and motivation with an Introduction.
Assignment 1: Building off their outlines, students will flesh out the introduction/background section of their manuscript into a first draft. The students will follow other articles from their target journals as models for the scope and depth of their introductions.

Week 4. Communicating data and describing results. The power of effective figures.
Assignment 1: Students will learn to improve the credibility of their manuscripts through concrete examples by reading *Made to Stick* Chapter 3 "Concrete" and applying these concepts to their writing.
Assignment 2: Students will write the text of the Methods and Results sections or the Main Analysis and Major Breakthrough sections of their manuscripts following the figure sequence from their outline/storyboard. *These content sections will be sent to Content Experts for review.*

Week 5. "So what?": Situating research in the field to communicate its significance and impact.
Assignment 1: Students will write about the implications, significance, and future directions of the work

as they write their Discussion/Conclusion sections. Students will use examples from published articles in their target journals for style, scope, and content guidelines.

Week 6. The most important elements of a research paper: Writing effective titles and abstracts.
Assignment 1: Students will craft attention-grabbing technical titles for their manuscript and a standalone abstract that follows the hourglass structure. Abstracts should adhere to target journal submission guidelines.

Week 7. Selling, not just telling, your story: Communicating a good match in a cover letter to the editor.
Assignment 1: Students will write a one-page professional cover letter addressed to the editor of their target journal. In the letter they will explain the match between the manuscript and the journal and identify three potential reviewers in the field.
Assignment 2: Students will incorporate all revisions suggestions from work on previous sections and send their first draft and cover letter to their Content Expert and two predetermined peers for review.

Week 8. The flip side: What it's like to be a reviewer, not a writer. (Class does not meet.)
Assignment 1: Students will receive and review two manuscripts from their peers. They will write reviewer comments for each, judging each manuscript on writing style, scientific content, and flow of logic.

Week 9. Professionalism as strategy: Addressing and responding to reviewer comments in order to get published.
Assignment 1: Students will revise their manuscripts using feedback from writer-instructor meetings, Content Expert feedback, and peer review comments. Students will then write a response to reviewers to accompany their manuscript (second draft) resubmission.

Week 10. Finishing touches: Revision to make a good manuscript great.
Assignment 1: Students will have the opportunity to revise their manuscripts using additional feedback on grammar, style, flow, figure design, scientific content, and more.

Final Submissions Due: March 15 (Sec. 3) and 16 (Sec. 4), 2017.

Grades Due: March 20, 2017.

COURSE TEXTS (REQUIRED AND RECOMMENDED)

1. Elements of Style. *Nature Physics.* Vol. 3 No. 9 pp. 581 (2007). PDF here. **Required**.
2. *Made to Stick* by Chip and Dan Heath – Chapters 1 "Simple" and 3 "Concrete", **required**. Chapters will be made available one at a time on the course **Moodle page**. The book and Kindle copies of the book are also on reserve at the Sherman Fairchild Library. – *This is a quick, refreshing read that communicates skills you will use for life—be it starting a business, giving a lab presentation, or branding social media pages.*
3. *Scientific Writing and Communication* by Angelika Hofmann. – *A great resource for manuscripts, proposals, and other scientific reports. Copy available to browse at Hixon Writing Center.*
4. *How to Write and Publish a Scientific Paper* by Robert Day and Barbara Gastel – *Another great resource on research papers. Copy available to browse at Hixon Writing Center.*