

CTL312/E312: Science and Engineering Course Design
Winter 2015
Wednesday 3:15-5:05
Location: Building 160, Room 120

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Welcome to Science and Engineering Course Design. This class provides an opportunity for graduate students interested in an academic career to begin the process of designing science or engineering courses at the undergraduate and/or graduate level. The overarching goal is to apply research on science and engineering learning to the design of a syllabus and effective course materials for a course of your own choosing. General topics include: understanding your students, rhythms of the term, content and class format decisions, creating assignments that solidify learning, assessment planning and grading, and leveraging resources to support your teaching.

Course Learning Objectives. Some of the benefits you will derive from active engagement and completion of the course assignments are that:

- 1) You will become familiar with current research in science and engineering learning and will translate this knowledge as appropriate into your own teaching and course design products.
- 2) You will experience and analyze a broad range of teaching styles, applying that experience to choices you make in your own course format decisions.
- 3) You will create a course syllabus that is based in sound practices of course design, focuses on student learning, and helps you meet your course goals.
- 4) You will create selected teaching materials (e.g., lab, lecture, field trip, design project) for your course that strongly reflect your desired learning outcomes.

There is no gene for good teaching. Neither does it follow that content expertise bestows pedagogical expertise. To teach effectively is a learned skill that benefits from practice and self-reflection. To reach this goal, an instructor applies relevant learning research, obtains regular feedback, and develops habits of reflection and growth.

Course Design. This course is project-based and follows two main threads. The *process thread* involves you in course design as you iteratively map out major aspects of your course. The *content thread* weaves major understandings from science/engineering education research into this process, and class topics are sequenced to build upon one another as you simultaneously develop course materials. Early emphasis is on creating a learning-centered classroom climate and on understanding how research in science and engineering learning can impact informed course design. From these ideas, you will establish learning objectives for your course and will develop priorities for course format, content, assignments, and assessments. As you begin to create materials for your lectures, assignments, etc., our readings and discussions will focus on ways that students process technical information, barriers to learning, and strategies for engaging students actively in inquiry and design processes. The quarter concludes with strategies for giving students feedback on their learning and for getting feedback on your own teaching.

Credit and Deliverables: CTL312/E312 can be taken for two or three credit units and grading is Satisfactory/NC. Weekly assignments and in-class activities contribute directly to the final products you will turn in at the end of the term.

To achieve Satisfactory for two credits you will:

- draft a course plan and produce a syllabus for a course of your choice,
- create and/or adapt for your course one active learning lab or in-class exercise,
- write a scholarly reflection about teaching (~3-6 pages), and
- complete brief weekly assignments in preparation for active participation in class, missing no more than one weekly session/assignment..

To achieve Satisfactory for three credits, *in addition to the above*, you will:

- create a full set of “ready-to-go” materials for one week of your course.
So that you may develop materials most relevant to your course goals, there is a lot of flexibility in this assignment. The week you select might include several 50-minute lectures, laboratory sessions, a field trip, or an exam. (We will talk about the details before you advance far into the preparation.) We strongly encourage you to find an additional faculty mentor to work with you as you develop these materials. Ideally this would be someone who has teaching experience closely aligned with your course content area and who will make time available to give you feedback on your developing work.

Readings:

(Required) Ambrose, S.A., et al, 2010, *How Learning Works: Seven Research-Based Principles for Smart Teaching*, Jossey-Bass Publ. San Francisco, 301pp. ISBN: 978-0-470-48410-4

Additional weekly readings, some optional, will be posted to the Coursework website each week.

Weekly Topic Summary:

Jan. 7: Learning-Centered Course Design
Jan. 14: Knowing Your Students and Pitching Your Course
Jan. 21: Rhythms of the Term
Jan. 28: Broad Content Decisions
Feb. 4: Course Plan: Merging Goals and Content
Feb. 11 Course Plan: Assignments to Solidify Learning
Feb. 18: Course Plan: Format and Teaching Strategies
Feb. 25 Course Plan: Feedback and Grading Decisions
Mar. 4: Leveraging Resources to Support Teaching
Mar. 11: Teaching is about Community
Mar. 16: Final materials due by noon.

Students with Documented Disabilities

Students who may need an academic accommodation based on the impact of a disability must initiate the request with the Office of Accessible Education (OAE). Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is being made. Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk; phone: 723-1066; web site <http://studentaffairs.stanford.edu/oae>.