CSRN 152: IDEASS Laboratory Practicum
(Impact Designs: Engineering and Sustainability through Student Service)
2-units, FWS
Class #1s and Class #2s 3:20- 4:55pm
Engineering - 2 Room 599/506

Instructor Tamara Ball 545-B Engineering-2, tball@ucsc.edu 459-2138
Office Hrs: Wednesday 9:00am-11am, or by appt.

Supervising Instructor: Ronnie Lipschutz, rlipsch@ucsc.edu

IDEASS-LP is a 2-unit lab course designed to advance sustainability education with real-world impact while enabling students to develop as change agents and to make valued contribute to sustainable-design projects that advance new technologies or strategies and bring about societal and environmental change on campus and in the Monterey Bay region. The program relies on an apprenticeship model that pairs interdisciplinary teams of students with professionals including non-profit, municipal, industry and other regional / community partners dedicated to designing sustainable systems and technologies for the built environment. This course may be taken up to three consecutive quarters for credit. The class is open to all students, with preference given to those minoring in Sustainability Studies, working in the Sustainability Lab, enrolled in an Environmental Studies Department internship program and the Baskin School of Engineering CE/EE Senior Design Capstone Course.

Students in IDEASS-LP participate in S-Lab and Engineering projects in collaboration with more experienced students pursuing capstone credits in affiliation with one or more of the UCSC programs mentioned above. They support project teams working to design, implement and evaluate innovations using green technologies and developing green products and services. Each project has an external mentor/sponsor, an IDEASS project advisor, access to "content experts" and, if possible, a faculty supervisor. Participants learn to work with professionals in an interdisciplinary context to address technological, environmental, humanistic and societal aspects of sustainability challenges in integrated ways. STEM is integral to this interdisciplinary approach but the ultimate goal is to foster cross-disciplinary communication and comprehension.

ENVS Students may be eligible to participate in projects through ENVS 183A/B internship capstone option. Students in other majors must make arrangements with faculty if they wish to receive exit credit.

There are two primary tracks in CRSN 151

Project Feasibility and Impacts Assessment: Some of the greatest challenges to the overall success of solution-driven sustainable design projects occur before the projects are launched. The overarching goal of any feasibility study is to describe what the most appropriate solution for a particular site/facility in its socio-cultural context will be.

Feasibility studies are needed to help project teams determine whether a proposed project is economically, technically, and practically viable, requiring background research and other preparatory activities, including site assessments, prototype testing, gathering user feedback. Feasibility studies help to identify key technical, environmental, and planning issues and risks associated with a project, estimate a return on investment, and provide information on project costs, funding and potential revenue streams. Identification of market/user needs, priorities and behaviors, and anticipated impacts relative to system design, are critical to determining project feasibility.

Digital Storytelling: An important aspect of sustainable development is increasing awareness, interest and investment in sustainable technologies and systems and seeing that sustainable designs are embraced by the audience they are meant to serve. Audiovisual "stories" (digital documentaries) describing the motivation for a design, and narrating challenges and successes that sustainable design teams encounter as they work to develop and implement sustainable solutions, can be a powerful way to raise awareness and increase transparency as well as to catalyze community debate, dialogue and investment needed to mobilize action and change. Production of digital stories about sustainable design projects offers students opportunities to witness and learn first hand about advanced technologies and processes to which they might not otherwise have access. Digital storytelling legitimates the role of these "peripheral partcipants" in professional spaces and makes them privy to professional discussion and decision-making from which they might otherwise be excluded.

Course learning objectives: Students will
1. implement quantitative and technical approaches to "wicked problem" solving;
2. develop targeted writing and communication skills, including audiovisual experience;
3. become knowledgeable about key concepts, principles and practices of solution-driven Sustainable Design as a formal process;
4. learn how to develop, plan and implement feasibility studies or assess performance and impacts, track and show evidence of project outcomes; and fund a project and administer those funds; and
5. acquire professional and applied skills, create professional networks, acquire experience in project planning, time management and project management

Required Text:
Striebig, B., Ogundipe, A. A., & Papadakis, M. (2015). ***Engineering applications in sustainable design and development.*** Nelson Education. Online text can be purchased for $37.50 through Cengage Learning: http://www.cengage.com/us/

Other Resources:

- Agile-SCRUM sprint planning software is free from https://trello.com/
- Cradle-to-Cradle online training and certification @ http://www.c2ccertified.org/education/design-for-the-circular-economy "A free web-based course on practical concepts and strategies for regenerative and circular design"

- A variety of resources for understanding the role of materials in eco design and sustainability are available through GrantaDesign https://teachingresources.grantadesign.com/
- Dropbox and Google Drive

Grading distribution:
15%: Assignments from weeks 1-4.
20%: Sprint 1
20%: Sprint 2
20%: Attendance and participation in weekly class meetings, participation in at least one additional team meeting each week and attendance at least one extra enrichment activity (field trip, guest speaker etc.)
25%: Course and Project-Specific Deliverables

Course logistics & schedule

Throughout the quarter, students groups engage in two 2-3 week *sprints*, based on the Agile-SCRUM framework for project planning and management, and devoted to completing a specified set of tasks. In Agile, work is confined to a regular, repeatable work cycle ("sprint"). Sprint #1 is dedicated to developing the initial work plan, defining individual roles, understanding the scope and needs of the project and determining initial tasks. Sprint #2 involves identifying project needs (special resources, equipment &/or funding) and securing them, making plans to secure access to resources or get funding and begin carrying out project-specific tasks that you will define during the sprint planning process. Students are required to deliver a short poster or other public presentation describing their project. Students will summarize and report on time spent on work related to IDEASS in a **weekly log**. More instructions about requirements for the weekly log will be presented in class. In addition to the 2 hours of class time, and project work and homework (3 hrs.), all teams are required to hold at least one additional team meeting per week (1 hour), to meet at least four times with an outside project mentor or partner during the quarter.

Week 1: Introduction to IDEASS-LP and Cradle-to-Cradle Design: Understanding what to expect in IDEASS -LP and what will be expected of you.
Class #1: Introduction to CRSN 151.
Assignment: Review Examples of Prior IDEASS Project Portfolios on eCommons; Review Final Project Reports included in Portfolios.

Class #2: Q&A with IDEASS alumni Panel
Assignment: Read "How Green is a Tesla Really?" (link: http://grist.org/business-technology/how-green-is-a-tesla-really/#.Ui9pjh0YTFs.email); "Prius vs. Hummer controversy" http://www.pacinst.org/wp-content/uploads/sites/21/2013/02/hummer_vs_prius3.pdf ; view William McDonough on Cradle to Cradle Design:

http://www.ted.com/talks/william_mcdonough_on_cradle_to_cradle_design?language=en

Week 2: What is Sustainable? Who says so? How do we know?
Defining the problem is the first step in any problem solving or engineering design activity. However the way that problems are defined very much depends on the values and parameters (implicit and explicit) that we also use to establish criteria for acceptable or "sustainable" solutions. The *Sustainable Packaging Activity* is intended to help reveal your own prior knowledge including your explicit beliefs and implicit assumptions about what is or isn't, should or shouldn't be considered sustainable.
Class #1. Begin Sustainable Packaging Activity
Assignment: Complete Packaging Activity Part I Handout. Take baseline course survey (available online).

Class #2: Complete Sustainable Packaging Activity Part I
Assignment: Answer discussion questions on sustainable packaging criteria worksheet; See handout or review assignment on eCommons for specifics.

Week 3: Sustainability Criteria for the Built Environment and Project Topics.
Part II of the Sustainable Packaging Activity challenges students application of sustainability criteria to a specific agenda *and* consideration of their relative importance in comparison to others. Why is it so difficult to create standard sustainability reporting parameters and protocols for business and industry?
Class #1 "Speed Dating" with invested stakeholders including students, mentor or project sponsors.
Assignment: Review Project Topic Descriptions (on eCommons). Draft Needs Statement for a potential project topic of interest to you (1 page total, submit through eCommons, bring 2 printed copies to review in class Week 4). See handout for specifics or review assignment on eCommons

Class #2: Teams finalized. Sustainable Packaging Activity Phase II. Complete Sustainable Packaging Pugh Chart with scores and multipliers
Assignment: Ch. 1 in Streiberg, et al.

Week 4: Models for Sustainable Engineering and Introduction to Agile-SCRUM Method. Introduction to concepts for analysis of how design choices can enhance environmental, social and economic sustainability.
Class #1: Introduction to sustainable design and understanding issues in sustainability as "wicked problems." Begin Cradle-to-Cradle online training and certification
Assignment: Ch. 7 in Streiberg, et al.

Class #2: Introduction to Agile-SCRUM project management practices and rituals.
Assignment: Begin collecting user-stories. Draft Problem Statements (upload to eCommons, bring two copies to review Week 5) Review SCRUM readings and videos in resource folder on eCommons.

Week 5: Problem Statements and Project Planning with User Stories. Once students are familiar with the project topic on which they will be working, they define a distinct problem statement and distinguish this from the larger problem context they will be working within.
Class #1: Writing Workshop I - Jigsaw share, review and revise problem statements. Teams define roles for new members, develop/revise major project objectives, milestones, deliverables.
Assignment: Revise individual problem statements, (upload final draft to eCommons). Identify major project players/stakeholders.

Class #2: Review sprint plan, practice 3 rounds of planning poker, begin working on sprint tasks.
Assignment: Submit 1st Sprint plan for approval; Ch. 8 in Streiberg, et al.

Week 6: Energy Conservation and Development. Almost everything we do in the built environment requires some form of energy. Understanding the impacts of energy use on the environment is essential to developing strategies for sustainable energy use including efficiency, conservation, recovery, renewable energy, fuel switching, alternative fuels and distributed energy.
Class #1: Global energy production and emissions.
Assignment: Work on 1st Sprint tasks; schedule mentor and client meetings and have mentor agreement forms signed.

Class #2. Teams perform Daily Stand-Up and other SCRUM rituals
Assignment: Continue using Agile-SCRUM method to define specific project objectives and timeline; *w*ork on 1st sprint tasks; upload sprint 1 report to eCommons

Week 7: Risk Assessment for Wicked Problems & Understanding Tradeoffs. A sustainable approach to development seeks a balance between the risks industrialized changes pose to the economy, environment and social systems. Methods and measures of risk related to critical resources such as air, water and food are important for managing both the anticipated impacts and unintended outcomes of mitigation proposals.
Class #1: Multiple attributes and priorities of project objectives/impacts and tradeoffs among them to guide project planning and establish priorities.
Assignment: Complete mock evaluation exercise of payback period for residential greywater systems; Read Ch. 10 in Streiberg, et al.

Class #2: Review results of mock evaluation of residential greywater system & Sprint 2 planning,
Assignment: Complete 2nd sprint plan.

Week 8: Life Cycle Analysis and Expanding our vision. Each quarter, students visit professionals working in the field at different industry, non-profit or municipal sites. Guest speakers will also visit to talk about their own professional journey in the world of sustainability development or policy work in the built environment.
*Class #1***:** Guest speaker.

Assignment: Work on 2nd sprint tasks
Class #2: Site visit.
Assignment: Work on 2nd sprint tasks.

Week 9: Public speaking and communications. Raising public awareness and investment in sustainable strategies for the built environment can be as critical to the success of a project as any of the other outcomes. IDEASS-LP students will each be expected to appear in at least one public forum to give a short presentation on their work.
*Class #1***:** Design & develop draft posters
*Assignment***:** Finalize project abstracts, problem statements and Posters or Slides for public speaking presentations.

*Class #2***:** Review/revise sprint 2 tasks.
Assignment: complete Sprint 2; upload sprint report.

Week 10: Finalizing Deliverables and Next Steps
Class #1: Meet with mentors and project advisors to review and finalize specifications for final project deliverables.
Assignment: Finalize deliverables.

Class #2: Consider next steps for the project and identify sprint tasks that should be moved into the project backlog for the following quarter.
Assignment: Finalize deliverables.

Deliverables are due finals week.