

URBAN INFRASTRUCTURE LAB STUDIO
Urban Design and Planning 508, Winter Quarter 2016
With optional follow up studio in Spring Quarter 2016

Class: Tuesday and Thursday, 4:00 PM to 8:00 PM
Gould Hall, Room 12C

Instructor: Prof Jan Whittington
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Office hours: By Appointment, 448D Gould Hall

Course Webpage: TBD

The purpose of this course is to offer an educational opportunity to experience solar infrastructure project development, from planning through construction, for solar installations on three UW buildings. This course is open to UW students at all levels (freshman-PhD candidate) and all disciplines/majors with an interest or aptitude for solar/renewable policy, outreach, planning, finance, design, procurement, delivery, information management, security, and operation. There are many areas of expertise needed to develop any infrastructure project, and the success of this studio will be attributable to the diversity of the students that participate.

This course is made possible by coordination between the Urban Infrastructure Lab (Prof Jan Whittington, Urban Design and Planning) and UW-Solar group and the Clean Energy Institute (Prof Daniel Kirschen and Prof Miguel Ortega-Vazquez, Electrical Engineering) to develop solar infrastructure on the UW Campus. Solar infrastructure development aligns with the UW missions of research, teaching and service, providing a testbed for energy infrastructure research, multiple and ongoing activities conducive to interdisciplinary education, and renewable energy facilities for the campus.

This studio is focusing on the planning, design, and construction of three solar installations on the following buildings: East Campus Utility Plant; Kane Hall; and Paul G. Allen Center. The installations are part of a joint research project with the University of Washington (UW), Pacific Northwest National Laboratory (PNNL), and Washington State University (WSU) with the main mission of creating a “Transactive campus energy systems: an R&D testbed for renewables integration, efficiency, and grid services.” Funding for the project and studio course is provided by the U.S. Department of Energy, the Washington Clean Energy Fund (WA CEF) administered by the Washington Department of Commerce.

When completed, the three solar installations and supporting equipment (i.e., battery system, metering system, and laboratory equipment for system control and data acquisition) that comprise the UW test bed will support the integration of renewables and other regional needs, using the flexibility provided by loads, energy storage, and smart inverters for batteries and photovoltaic (PV) solar systems, at four physical scales: multi-campus (UW, WSU and PNNL), campus, microgrid, and building. The UW test bed will form an R&D platform for how:

- 1) Campus resources can be aggregated and operated to balance fluctuations in the region’s renewable generation, both up and down.
- 2) Self-aware buildings, smart enough to transact with the grid to provide services, result in reduced energy consumption and increased energy efficiency opportunities.
- 3) Campuses can support the grid by reducing their impact on local and regional peak loads and wholesale power costs.

The technical aim of this joint activity is to streamline the interactions between clean energy supply, efficient buildings and the smart grid to enhance the impact of renewable generation, energy storage, and advanced energy efficiency —while simultaneously improving the reliability and resilience of the electric grid.

Instructional Objectives

Throughout the Winter quarter course students will be developing, in concert with applicable parties in the UW administration, the required materials to go out to bid for the procurement and installation of the three solar systems. The instructional objectives during Winter quarter include:

- How to conduct informational interviews with industry and related market research regarding prices, quantities, common contractual terms, and the policy environment for the development of solar infrastructure systems on and off the UW campus;
- How to provide coordinated delivery of educational and policy outreach in and beyond the UW Campus, with regard to the projects as they progress and their relation to the ongoing development of the UW Campus Master Plan;
- Studying the feasibility of a solar infrastructure development project, in the comparatively complex environment of public agency contracting;
- The process of site evaluation, schematic design, detailed design, construction specification (spec) development, and permitting for a solar infrastructure project on the UW campus;
- The basic mechanics of competitive market contracting, such as the drafting and publication of a Request for Proposals, conducting a meeting with prospective bidders, and the evaluation and selecting of a winning bid, and the negotiation of the contract with the winning bidder;
- In infrastructure project development, the comparative roles, responsibilities, and incentives of the stakeholders in the projects, which include researchers (UW faculty), financial sponsors (WA Department of Commerce), facility owners (UW administration), facility managers (UW facilities), information technology and security managers (UW IT and CISO), campus planners (UW administration), the local utility (Seattle City Light and UW grid managers), industry vendors and experts (private firms), and the consumers of the energy provided by the system (the UW student body, along with faculty, staff, and administration).

The Spring term studio will continue and expand these goals through the procurement, installation, and early operational phases of the three solar systems. Construction of the solar arrays is scheduled to be complete in April, 2016, while laboratory system integration and data management from the system is expected to take place after the completion of construction.

Course Requirements (perfect grade = 400 points):

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| • <i>Feasibility Study</i> | <i>100</i> |
| • <i>Construction Documents and Site Requirements</i> | <i>100</i> |
| • <i>Winter Studio Report</i> | <i>100</i> |
| • <i>Participation</i> | <i>100</i> |

Participation acts as a check-in to know the progress of work each member is doing and to have accountability with each other, and to receive guidance and critiques equivalent to a graduate level studio course from Prof. Whittington and other faculty engaged in the effort.

Course Schedule

This schedule contains hard dates, with no room for adjustment. All tasks are to be completed on time, to be able to have construction to begin in March of 2016.

Date	Topic	Deliverables
Jan 5 th & Jan 7 th	Introductions Feasibility Study	Project Introductions Group formations Introduction to Feasibility Studies Development of Feasibility Study Outline Assignments of Sections to group
Jan 12 th & Jan 14 th	Feasibility Study RFP Development	<u>Research/In-Class work:</u> Development of stakeholder permissions required Contact and schedule stakeholder meetings Structural Engineer & Surveying RFP Development
Jan 19 th & Jan 21 st	Stakeholder Analysis RFP Development	Stakeholder meetings <u>Research/In-Class work:</u> Structural Engineer & Surveying RFP Development
Jan 26 th & Jan 28 th	Structural and Survey RFP Feasibility Study Specification Development	Structural Engineer & Surveying RFP Out to Bid <u>Research In-Class work:</u> Research on solar panels and ballasts for each building
Feb 2 nd & Feb 4 th	Bid Questions/Tours Feasibility Study Specification Development	Structural Engineer & Surveying Bid questions and tours <u>Research In-Class work:</u> Research on solar panels and ballasts for each building Solar Panel and Ballast spec development
Feb 8 th & Feb 11 th	Project Check-In	50% of Feasibility Study to be completed. Group check-ins on Feasibility Study progress.
Feb 16 th & Feb 18 th	Structural and Survey Contract Feasibility Study	Selection of bidders for Structural Engineer and Surveyor <u>Research In-Class work:</u> Development of Construction Schedule/Timeline
Feb 23 rd & Feb 25 th	Feasibility Study RFP Development	<u>Research In-Class Work:</u> Analysis of Structural and Surveyor work RFP development of construction contract
March 1 st & March 3 rd	Project Check-In	95% of Feasibility Study to be completed. Group check-ins on Feasibility Study progress.
March 8 th and 10 th	Feasibility Study RFP Final Approvals RFP Out To Bid	Feasibility Study turned in. Final approvals of the RFP will be completed. The three projects will go out to bid. Questions and site tour will be hosted.

Academic Standards for Written Products of the Studio

Turn assignments in printed, in person; with an electronic version as an e-mail attachment to your professor. Grading will be based on content, organization, and measures of style appropriate to writing at the level of the student (undergraduate and graduate). Style refers to your method of citing sources, grammar, punctuation, and related issues. I (strongly!) urge you all to refer to the Chicago Manual of Style (16th Edition, University of Chicago Press) as you compose and edit your work. Papers that do not conform to Chicago Style will be marked down, and any paper using a hot link as a replacement for a full citation will lose credit. See this site: <http://guides.lib.uw.edu/research/citations/citation-basics>. Please make use of the resources available. Odegaard Library has one of numerous writing centers, available to you free of charge: <http://guides.lib.uw.edu/c.php?g=342041&p=2300216>.

Plagiarism is defined as the use of creations, ideas or words of publicly available work without formally acknowledging the author or source through appropriate use of quotation marks, references, and the like. Plagiarizing is presenting someone else's work as one's own original work or thought. This constitutes plagiarism whether it is intentional or unintentional. Any student who is uncertain whether his or her use of the work of others constitutes plagiarism should consult the course instructor before formally submitting the course work. Visit the following site, which articulates University policy: <http://depts.washington.edu/pswrite/plag.html>. State regulations governing student conduct can be found here: <http://apps.leg.wa.gov/WAC/default.aspx?cite=478-120-020>. Plagiarism is not acceptable, so I advise each of you to read a style manual in order to learn how to avoid it. You, as the author of your work, are ultimately responsible for this. Anyone found to plagiarize will be given a failing grade for the work and their case reported to the Associate Dean for Academics for formal review.