Syllabus

SEC 502: Solar Engineering and Commercialization - II

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Course Intent
The Professional Science Masters program in Solar Energy Engineering and Commercialization (PSM-SEEC) is a program that has been developed to help meet the "Energy Engineering" mandate in the National Academy of Engineering Grand Challenges. This course, Solar Engineering and Commercialization – II, is a companion course to SEC501, and designed to be a finishing building block in the PSM-SEEC program.

Course Participants and Prerequisites:
The course is designed for graduate students in STEM, business, architecture, and public policy with a strong interest in solar energy systems and their role in the technological society. The companion course SEC 501 (Solar Engineering and Commercialization, I) is a pre-requisite for this course for students in the PSM-SEEC program.

Course Description:
This course examines the fundamentals of the solar energy enterprise at the utility scale - the components, the design process, the economic issues, and the policy matters in large scale photovoltaic systems – in both the design of these systems (both central plant and aggregated forms) and their interface with the existing (and future) electrical grid. The course educational objectives for the participants include:

- Learning the principles in utility-scale photovoltaic system design
- Thinking critically and seriously about the interaction of photovoltaic systems with the national grid
- Formulating views and insights regarding energy resources, conservation, economics, government incentives, and so on, at the utility scale
- Expressing and defending these views orally and in writing

The course includes lectures, case studies, interactive classroom projects and guest speakers.

Enrollment requirements:
Prerequisites: Graduate Engineering Students; SEC501 for PSM-SEEC students
Antirequisite: SEC 598 Solar Engineering and Commercialization II

Course Learning Outcomes
- Students will review the operation of the current electricity business
- Students will be able to apply the engineering design process to the development of photovoltaic systems at utility scales
- Students will examine the design and development of large-scale Community Choice Aggregation systems
• Students will understand how to characterize the solar market for utility scale systems and its methods of finance and applicable permitting and regulations.
• Students will understand role of policy (local, state, and federal) in utility scale solar development and commercialization
• Students will learn about the impact of their designs in a global and societal context
• Students will demonstrate their knowledge of design and effective communication by carrying out and presenting two class projects related to contemporary utility scale solar energy issues
Required Course Texts:

Recommended Course Texts and Resources:
- Various web resources (NREL, EIA, First Solar, BLM, etc.)
- Various online trade journals (Solar Industry, Solar Pro, etc.)
- Various online daily news resources (Utility Dive, Greentech Media, etc.)

Course Deliverables:
A normal array of brief quizzes (most every class), homework sets (biweekly), two class projects that include written reports, oral presentations, and poster sessions. All of the work (apart from the quizzes) will be carried out in team format, as cooperative learning is expected and encouraged

Grading Components:
- Quizzes (Daily) – 15%
- Assignments (Biweekly) – 25%
- Midterm Project (Week 09) – 25%
- Final Project (Final Exam Period) – 35%

Grading Scale
- A+ = 97.0-100
- A  =  93.0-96.9
- A- = 90.0-92.9
- B+ = 87.0-89.9
- B  =  83.0-86.9
- B- = 80.0-82.9
- C = 70.0-79.9

Course Format:
The class schedule, assignments, solutions, class presentations, etc., will be posted only on a class webpage.

Weekly Course Schedule

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<th>Week</th>
<th>Topic</th>
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Review of Residential and Commercial PV Engineering and Commercialization

Review of the Business of Electricity
- Generation, Transmission, and Distribution
- Operations and Markets
- Regulation

Utility Scale PV systems – Overview
- Overview
- Engineering and Design
- Land Issues and Permitting
- Energy Off-take, Power Purchase Agreements
- Regulations, PURPA
- Storage
- Financing Models and Issues

Microgrids

Community Choice Aggregation (CCAs)

Interactions among Utilities, Power Producers, and Public Utility Commissions
- Integrated Resource Planning
- Operations
- Current and Future Market Structures
- The “Grid of the Future”

Classroom behavior policies:
- Cell phones must be silenced during class and students should refrain from answering or making phone calls and sending text messages during lectures. If they must do so, they will need to leave the classroom without disrupting the lecture and come back after they are done.
- Laptops should not be open during lectures.
- No recording devices of any kind can be used.
- Behavior that disrupts the lectures is not acceptable and students who engage in such behavior will be asked to leave.

Absence policies:
- Attendance to the lectures is required. If you miss any class, it will be your responsibility to obtain notes for the missed lecture.
- Make up exams will be given for absences that are due to religious observances/practices that are approved by university policy or due to other events or activities sanctioned by the university. In those cases, the student must notify the
instructor in advance (preferably 1 week ahead for the midterm) so that arrangements can be made.

- If an absence is not due to a university sanctioned reason, missed exams will not be made up unless it is due to health issues (a doctor note will be required), or a personal emergency that is appropriately justified. Arrangements need to be made within 1 week following the absence, including a meeting with the instructor to provide justification for it. If there is no attempt on the part of the student to make these arrangements in this time frame, the missed exam will receive zero points.

**Academic integrity and plagiarism policies:**

- Academic integrity will be expected and enforced to the full extent of the current university policy.
- When clear indications of academic integrity violations are found, a warning will be issued for the first offense and will incur a penalty of ZERO points on that assignment. The second offense will be reported to the Dean's office for university level disciplinary action and will result in an automatic failing grade for the course.
- This policy includes homework, exams and project reports.

**Policy against threatening behavior:**
All incidents and allegations of violent or threatening conduct by an ASU student will be reported to the ASU Police Department and the Office of the Dean of Students.

**Disability resources:**

- Students who require accommodation for a disability must be registered with the Disability Resource Center (DRC) and submit appropriate documentation from the DRC and appropriate arrangement will be made.
- Students who plan to make these arrangements should inform the instructor at the first convenient opportunity at the beginning of the semester to facilitate the process.