SEC598/EGR598: Operations and Maintenance of Photovoltaic Systems

Spring 2017 Syllabus

1. Course Schedule

Start Date: 01/09/2017
End Date: 04/28/2017
Times: Tuesdays and Thursdays, 07:30 am to 08:45 am
Location: ECG G218 (Tempe Campus)
Spring Break: March 05, 2016 to March 12, 2017
Final Exam: Tuesday, May 02, 2017, at 07:30 am

2. Catalog Description

Identification of typical operations and maintenance (O&M) issues of utility-scale photovoltaic (PV) systems. Approaches to mitigate and address the O&M issues. Role of O&M in asset management. National and international standards related to O&M. Prior applied knowledge on the PV modules is expected.

3. Textbooks and Class Materials

There is no textbook for the class. Class materials will be covered using PowerPoint® slides, review articles, and national and international standards.

4. Course Objectives

The goal in this course is to study the requirement, application, and basic principles of system-level operations and maintenance of utility-scale photovoltaic power plants.

4.1 Course Approach

Utility-scale PV systems are considered. O&M principles studied in this course can be applied to commercial and residential systems with requisite modifications. The PSM-SEEC and EGR programs are a multi-disciplinary, inclusive program for students with a variety of engineering and physical science backgrounds. As a result, a qualitative, system-level approach is taken, instead of detailed quantitative analysis typical of engineering courses.

A brief review of utility-scale PV systems is introduced to understand the components involved and the need for a robust system-level O&M plan. O&M activities are classified into reactive, preventive, and predictive. National and international standards related to O&M of PV systems will be reviewed. An overview of asset-management is incorporated, which ties the O&M activities to the goals of the PV power plant. Special topics and invited guest lectures are included to allow the student an appreciation of the breadth and depth of O&M of utility-scale power plants.

4.2 Pre-Requisites

No specific courses serve as pre-requisites. Students are expected to be familiar with fundamental operating principles of PV modules and systems.
4.3 Learning Objectives

Upon successful completion of this course, students will be able to:

CO-1. Identify components of a utility-scale, PV system and different stages of a PV plant life-cycle. (Technical Competence, a; Critical Thinking)

CO-2. Determine and describe the role of system-level O&M for successful operation of a PV plant. (Technical Competence, a; Critical Thinking; Communication g)

CO-3. Qualify, quantify, and summarize various activities involved in PV O&M. (Technical Competence, a; Problem Solving e; Critical Thinking; Communication g)

CO-4. Explain the role of national and international standards in PV O&M. (Technical Competence, a; Critical Thinking; Problem Solving e;)

CO-5. Determine and describe the role of O&M in PV plant asset management. (Technical Competence, a; Communication g; Critical Thinking)

CO-6. Special topics in PV O&M. (Communication g; Critical Thinking)

5. Instructors

Dr. Devarajan Srinivasan (Srini)
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Office Hours: By appointment only.

Dr. Govindasamy Tamizhmani (Dr. Mani)
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Office Hours: By appointment only.

6. Course Topics and Schedule

The following topic and schedule outline is tentative, and actual topics covered depends on progress to date. In addition, spring break, review classes, and mid-term exams are not shown.

Week 1 Introduction, course objectives, course procedures, and syllabus. Utility scale PV systems.

Week 2 Operations and maintenance of PV plants

Week 3 Operations and maintenance of PV plants

Week 4 Operations and maintenance of PV plants

Week 5 PV O&M standards

Week 6 PV O&M standards

Week 7 PV O&M standards

Week 8 Labs/Field trips

Week 9 Labs/Field trips

Week 10 Asset management
Week 11 Invited lectures, special topics
Week 12 Invited lectures, special topics
Week 13 Invited lectures, special topics
Week 14 Project presentations

7. Course Procedures
SEC598/EGR598 will consist of lectures using slides and review articles posted on blackboard. Attendance for the classroom sessions is required. Laboratory will be required in the field (Poly campus)

7.1 Laboratory work
Arrangements are being made to set up a lab on the Poly campus to demonstrate some of the O&M activities covered in class. A lab report has to be submitted.

7.2 Mid Term
A mid-term examination will be held around mid-semester and will include topics covered to date. The mid-term exam will include multiple choice and short paragraph type questions. The exam is closed book and closed notes.

7.3 Final Exam
The final exam will be held on Tuesday, May 02, 2017 at 07:30 am. The final exam will include multiple choice and short paragraph type questions. The exam is closed book and closed notes.

8. Grading Guidelines
1. The mid-term, final exam, lab report, and project report will be assigned point scores and scaled to 100%.
2. A composite score will be calculated using the following formula:
   \[ \text{Composite Grade} = 30\% \text{ Final} + 30\% \text{ Mid-Term} + 15\% \text{ Lab} + 10\% \text{ Project} \\
   + 12\% \text{ Homework/Assignment} + 3\% \text{ Attendance} \]
3. The letter grades are typically not curved. Everyone can get an A+ or E. Any grade curves will be to the benefit of the students.
4. The student Letter Grade scale from A+ to E will be based on the composite grade as follows:
   - 97% - 100% A+
   - 94% - 97% A
   - 90% - 94% A-
   - 87% - 90% B+
   - 84% - 87% B
   - 80% - 84% B-
   - 76% - 80% C+
   - 70% - 76% C
   - 60% - 70% D
   - 00% - 60% E