

## EST535: Electric power systems

### DESCRIPTION<sup>1</sup>:

This course deals with the physics, design and operation of power systems, essentially the grid. We will first discuss the engineering principles, including the fundamental concepts and mathematical frameworks required to understand electric circuits, alternating current and electricity generation. We will cover the basic constituents of electric power systems, including generation technologies (such as coal, natural gas, nuclear, wind, solar and hydropower), transmission and distribution, electricity loads, transformers and safety equipment. We will then discuss the design and operation of the power systems. We will cover power system planning (including integrated resource planning and reliability); power system operation and control (including generator dispatch and ancillary services), and emerging technical issues in the electricity industry (including grid integration of renewables, electric vehicles and the “smart grid”).

**CLASS SCHEDULE:** Tuesdays **5:30pm- 8pm**, with a 10-minute break; please read the materials beforehand.

**LOCATION:** 1310 Old Computer Science

**OFFICE HOUR:** Wednesdays 2-4PM, appointment link: <https://goo.gl/oMjKuj>

**CONTACT:** Office in 1420 Computer Science Building; Email: [Gang.He@stonybrook.edu](mailto:Gang.He@stonybrook.edu) (please include EST535 in the title for class related communication)

**READINGS:** Required readings will be available through Blackboard.

### TEXTBOOK (Optional):

Meier, Alexandra von. 2006. Electric Power Systems: A Conceptual Introduction. John Wiley & Sons.

Masters, Gilbert M. 2013. Renewable and Efficient Electric Power Systems. 2 edition. Hoboken, New Jersey: Wiley.

### GRADING:

|                                    |     |
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| Class Participation and discussion | 10% |
| Homework assignments               | 40% |
| Final paper proposal               | 10% |
| Final presentation                 | 20% |
| Final Paper                        | 20% |

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<sup>1</sup> The syllabus is up to change, please check blackboard for update. Material for this course benefits from course material prepared by Alexandra von Meier, Duncan Callaway and many others. All errors are my own.

**Class participation and discussion:** Discussion evaluation based on both quantity and quality of *responses and discussions in class*.

**Homework:** Four homework assignments are designed to enhance students' preparation and master of the course material.

**Mid-term (paper proposal):** A one page proposal to show your final paper topic.

**Final paper:** Students write a paper on a topic covered by the class, submit your proposal before mid-term and I will be available for discussion, start earlier.

**MISC POLICY:**

Late submission: One point is subtracted for each 24-hour submitted late (rounded up to the nearest integer). One free late day is allowed of your choice. Request an approval for sick leave and a doctor's note might be needed by University policy. If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services at (631) 632-6748. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. If you have a religious observance that conflicts with your participation in the course, please meet with me before the end of the second week of the term to discuss appropriate accommodations. Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

**ACADEMIC INTEGRITY:**

"Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at <http://www.stonybrook.edu/academicintegrity>."

# **COURSE SCHEDULE**

- 1. (Jan 23) Introduction**
- 2. (Jan 30) Fundamentals**
- 3. (Feb 6) AC Power**
- 4. (Feb 13) Grid Components**
- 5. (Feb 20) Generation: coal/gas)**
- 6. (Feb 27) Power Flow**
- 7. (Mar 6) Load**
- 8. (Mar 13) Spring recess**
- 9. (Mar 20) System Control and Operation**
- 10. (Mar 27) Frequency Response and ancillary service**
- 11. (Apr 3) Putting it all together: Sequence**
- 12. (Apr 10) Electricity Market**
- 13. (Apr 17) Reliability**
- 14. (Apr 24) Recap and Review**
- 15. (May 1) Presentations and final paper due (May 11)**