ECE 823: POWER SYSTEM STABILITY AND CONTROL  
FALL 2022

Time, Place: 4:10 p.m. to 5:30 p.m., MW; ERC C-103

Instructor: J. Mitra
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Web: http://www.egr.msu.edu/~mitraj
Office hours: Tu: 2:00–3:00 p.m., W: 3:00–4:00 p.m., ERC C-105 and Zoom, or by appointment.


Supplementary material will be provided in class.

Course Outline: Catalog description: Analysis and simulation of small and large disturbance stability of power systems. Generator, exciter, voltage regulator models. Design of excitation systems and power system stabilizers.

Topics covered:
- Overview of power system stability issues; transient and steady state stability
- Angle stability:
  - The single-machine-infinite-bus (SMIB) system and the equal area criterion
  - Power flow formulation, methods and algorithms
  - Numerical solution of systems of differential equations
  - Multi-machine systems; numerical simulation of multimachine systems
  - Synchronous machine models: voltage and flux relationships, Park’s transformation, effect of saliency, dynamic model
  - Control of synchronous generators: governor control, voltage regulation, power system stabilizer, SMIB model
  - Concept of virtual inertia for small and non-rotating generators
  - Lyapunov (energy function) method of stability analysis
- Voltage stability:
  - Load models and their effect on voltage stability
  - Effects of FACTS devices
  - Bifurcation analysis
  - Controls and countermeasures against voltage stability issues

Evaluation Criteria: The course grade will be determined as follows:
2 tests, 20% each: 40%
2 projects, 30% each: 60%
Grading scale: 4.0: 93–100%; 3.5: 85–92%; 3.0: 77–84%; 2.5: 69–76%; 2.0: 61–68% 1.5: 53–60%; 1.0: 45–52%; 0: below 45%.
Other Information

1. **Academic Honesty**: In Article 2 of the Student Rights and Responsibilities it is stated that “The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards.” In addition, the Department of Electrical & Computer Engineering adheres to the policies on academic honesty as specified in General Student Regulations 1.0, *Protection of Scholarship and Grades*; the all-University Policy on *Integrity of Scholarship and Grades*; and Ordinance 17.00, Examinations. (See *Spartan Life: Student Handbook and Resource Guide* and/or the MSU Web site: www.msu.edu.)

   Therefore, unless authorized by your instructor, you are expected to complete all course assignments, including homework, lab work, quizzes, tests and exams, without assistance from any source. You are expected to develop original work for this course; therefore, you may not submit course work you completed for another course to satisfy the requirements for this course. Also, you are not authorized to use the www.allmsu.com Web site to complete any course work in ECE 320. Students who violate MSU academic integrity rules may receive a penalty grade, including a failing grade on the assignment or in the course. Contact your instructor if you are unsure about the appropriateness of your course work.

2. **Accommodations for Students with Disabilities**: From the Resource Center for Persons with Disabilities (RCPD): Michigan State University is committed to providing equal opportunity for participation in all programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities at 517-884-RCPD or on the web at rcpd.msu.edu. Once your eligibility for an accommodation has been determined, you will be issued a verified individual services accommodation (“RISA”) form. Please present this form to me at the start of the term and/or two weeks prior to the accommodation date (test, project, etc.). Requests received after this date will be honored whenever possible.

3. **Drops and Adds**: The last day to add this course is September 7. The last day to drop this course with a 100 percent refund and no grade reported is September 23. The last day to drop this course with no refund and no grade reported is October 18. You should immediately make a copy of your amended schedule to verify you have added or dropped this course.

4. **Commercialized Lecture Notes**: Commercialization of lecture notes and university-provided course materials is not permitted in this course.

5. **Attendance**: Students whose names do not appear on the official class list for this course may not attend this class. Students who fail to attend the first four class sessions or class by the fifth day of the semester, whichever occurs first, may be dropped from the course.

6. **Disruptive Behavior**: In Article 2 of the Student Rights and Responsibilities it is stated that “The student’s behavior in the classroom shall be conducive to the teaching and learning process for all concerned.” In the same article it is also stated that “The student has a right to scholarly relationships with faculty based on mutual trust and civility.” *General Student Regulation 5.02* states: “No student shall . . . interfere with the functions and services of the University (for example, but not limited to, classes . . .) such that the function or service is obstructed or disrupted.” Students whose conduct adversely affects the learning environment in this classroom may be subject to disciplinary action through the Student Faculty Judiciary process.

7. **COVID-19 Vaccine and Mask Mandate**: Students are required to comply with MSU’s *COVID-19 vaccine mandate*. Per the mandate, face masks are no longer required in classrooms. Please watch the site frequently as the mandate may change.