



SYLLABUS

EE 5383 (CRN: 15048) Smart Grid Fundamentals

Fall 2022

Instructor:

Paras Mandal, Ph.D.
Associate Professor
Department of Electrical and Computer Engineering
Office A-339
Ph: (915) 747-8653; E-mail: pmandal@utep.edu

Class Hours: Tuesday and Thursday 12 PM – 1:20 PM at Undergraduate Learning Center 208

Online Office Hours: Monday 12:30 PM – 1:30 PM via MS Teams
(For other times, by email appointment only; also, see Section III)

RAPSim Software coordinator: Travis Newbolt tmnewbolt@miners.utep.edu

RAPSim Online office hours: Tuesday and Thursday 2:30 pm to 3:30 pm at MS Teams (for in-person meeting and RAPSim related queries, please send email appointment to Travis Newbolt)

I. COURSE GOAL AND DESCRIPTION

This course serves as a graduate entry-level introduction to Smart Power Grid. The aim of this course is to provide basic concepts and principles of Smart Grid. This course will provide the working definition, the functions, the design criteria and techniques and technology needed for building Smart Grid. The focus will be on the motivation for the Smart Grid development, and analytical tools for Smart Grid design and development strategies based on various community constraints and energy needs. This course will incorporate various aspects associated with computational intelligence; distributed energy resources (DERs) such as solar, wind, energy storage, electric vehicles; demand response, prosumers, and consumers; distribution network and microgrids; energy management system (EMS); communication technology and decision support system; and modeling and simulation of smart grid incorporating DERs using RAPSim software; and smart grids in the context of cyber physical systems.

Prerequisites: Engineering mathematics, calculus, electric circuits, energy conversion and power, and MATLAB or other programming skill. Other: Instructor's approval.

II. COURSE LEARNING OUTCOMES

- Students will learn the basic concepts and principles of Smart Grid.
- Students will have sound knowledge about the design criteria and technology needed for building Smart Grid.

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- At the completion of the course, students would be able to learn various aspects of smart grid, such as importance and adoption of smart grid technologies, practices, and service options; technology to improve reliability, security, and efficiency of microgrid and electric grid; demand side management (DSM), demand response and energy efficiency; optimization of grid operations and resource including cyber security; deployment and integrations of distributed energy resources including energy storage systems.
- Students would also be able to apply fundamental concepts to solve application problems.
- Students would be able to independently study advanced materials and present the findings to others.
- Presentations, homework, and project will prepare the students to have sound understanding of smart grid and associated technologies.

III. COURSE COMMUNICATION: HOW WE WILL STAY IN CONTACT WITH EACH OTHER?

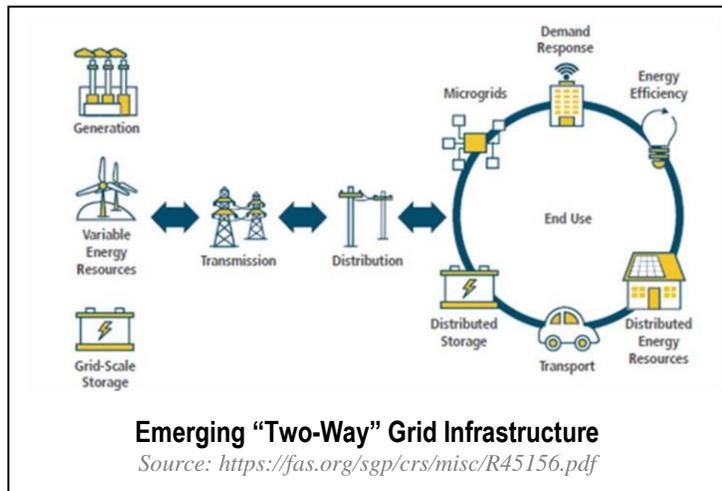
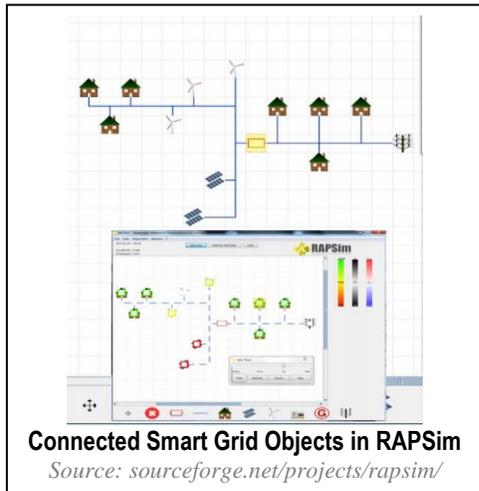
- Student can visit me during the online office hours via MS Teams.
- In-person meeting will be conducted upon request.
- If you are unable to visit during office hours, you need to send an appointment email and we will set up a meeting schedule, e.g., via MS Team.
- While sending email, always write in the subject line **“EE5383 Smart Grid – your query”**.
- **Note:** you must use your UTEP email ID while communicating with me to receive my response.

IV. COURSE RESOURCE AND REFERENCE

Lecture Notes provided by the instructor.

References/Resource Material

- Smart Grid: Fundamentals of Design and Analysis, *IEEE Press Series on Power Engineering*, by James Momoh
- Research articles assigned by the instructor: Students will need to read several research articles available in the field of smart grid, e.g., papers published in IEEE Transactions on Smart Grid, other IEEE Transactions journals, IEEE conference papers, and others.
 - **Software:** **RAPSim** (Renewable Alternative Powersystems Simulation) and **OpenDSS** (distribution system simulator)



V. COURSE FORMAT

The class is scheduled to meet twice a week from 12 PM to 1:20 PM every Tuesday & Thursday during the term. The course format includes lectures, project work, class discussions, presentations, exercises, problem formulation, simulation software, video clip, etc.

VI. GRADING POLICY

Grades will be given based on following distribution:

Assignments and Presentations	40%
Research Project, Presentation, and Report	60%
Total	100%

As a general case, grades will be given as follows:

- 90-100 → A
- 80-89 → B
- 70-79 → C
- 60-69 → D
- 59 or below → F

VII. COURSE TOPICS

<ul style="list-style-type: none"> • Overview and Introduction to Smart Grid • Smart Grid Architectural Designs • Smart Grid Communications and Measurement Technology • Pathway for Designing Smart Grid • Demand Response: A Key Characteristic of Smart Grid • Distributed Energy Resources and Integration to Grid • Distribution Systems and Microgrid Energy Management • Smart Grids and Cyber Physical Systems • Performance Analysis Tool for Smart Grid Design Using RAPSim and OpenDSS Software 	<p><i>Presentations: There will be several presentations on related topics</i></p>
<p>Disclaimer: Syllabus may subject to change within reasonable limits according to instructor’s discretion. Any changes will be announced in the class.</p>	
<p>Please check the Blackboard frequently.</p>	

The instructor may be on business related travel (e.g., conference, meeting), which might fall on the dates for which classes are scheduled. Such dates are expected to occur minimally during the semester period. In such cases, the scheduled class may either be rescheduled or make up with special assignment or a guest speaker will be available to substitute.

VIII. CLASS PARTICIPATION

This is largely a skill course. So, it is important to attend class, participate in class activities, read all assignments, answer other students' questions, and ability to lead discussion in class. I will distribute a sign-in sheet to keep track of attendance and keep a diary to make note of your significant class participation. Student will be responsible for the material covered in the class in case of an absence.

IX. ASSIGNMENTS/HOMEWORK

Assignments will be posted online (e.g., in blackboard) and/or informed via email. Assignments could be theoretical, or simulation based, or numerical problems, or research paper (or related topic) presentation, etc. Students are expected to complete the assigned work in a timely manner demonstrating a professionally high standard. Late homework submission is not encouraged. *If you submit an assignment late (after the due date and time), it will be graded out of 60% (i.e., you will instantly lose 40% points) or there will be specific notes available on the assignment regarding reduction in points.* If you fail to submit an assignment, you will receive zero.

X. MAKE-UP POLICY

There will be **NO MAKE-UP** for course activities, presentation, assignments, or any assigned tasks, etc., **However, in case of pressing circumstances**, e.g., student having medical reason (evidence required from doctor) or military duties (with advanced notification) or compassionate reasons should inform the Instructor by sending email in advance **or** in emergency (i.e., in case a student is unable to inform the instructor in advance due to medical reason about his/her absence), the student must inform the instructor on the same week by Friday 5 PM via email with evidence (from doctor) as attachment. Compassionate reasons do not include student's business/personal travel, car failure, traffic jam, etc.

XI. RESEARCH PROJECT

This part of the course is very important as it demonstrates the student's ability of performing research based on the theoretical knowledge delivered in the class. This will be an individual work. Student should be able to demonstrate a good understanding of Smart Grid through the project using software, which includes detail analysis of the case studies and writing report.

More information on the *Research Project* will be distributed later in the semester. The final report of the project (only the best chosen) might take the form of an IEEE conference paper or symposium.

XII. EFFORT, ETIQUETTE, AND CLASSROOM ENVIRONMENT AND POLICIES

- Arrive in class before the lecture starts. Make class environment smooth, easy, interactive, and share your knowledge and experience.
- Part of being a professional is being on time and being prepared to do your job.
- Have an active participation in class activities → asking questions, answering other students' questions, and ability to lead discussion in class.
- Read the course materials before coming to the next class.
- **All the rooms in the UGLC has NO FOOD and NO DRINK (excluding water) policy.**

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- **NO CELL PHONE POLICY:** Cell phone should be completely switched off during the lecture hours. Student will be asked to leave the classroom immediately (or will be given one-time warning) if the student is found using the cell phone in the classroom during lecture hours. *In such case, the student will also receive 10 points reduction in the final grade. Furthermore, if the same student is found using the cell phone for the second time, the instructor can drop out the student from the course.* In case of an urgency (during lecture hours), student can leave the classroom to make a phone call and can rejoin the class. If a student is found leaving and entering the class several times during the lecture, it will also not be acceptable. It is highly recommended to do your personal things before or after the lecture.
- **LAPTOP and E-Tablet Policy:** In the classroom, you can use your laptop or IPAD or e-tablet for course related activities, e.g., browsing lecture materials, simulation studies, research paper/project presentation/power point slides, writing notes and anything purely related to the course only. *However, any student caught facebooking, texting, chatting, browsing irrelevant material, etc., will be asked to leave the class immediately, and the student will also receive 10 points reduction in the final grade.*
- **Student disturbing the class,** e.g., talking, gossiping, misbehaving while the instructor is lecturing/busy in the class activities, etc., will be highly unacceptable.

NOTE: Student who is not following the aforementioned policies will be asked to leave the class immediately and can also be dropped from the course.

XIII. INSTITUTIONAL POLICIES

Academic Honesty:

Cheating is unethical and not acceptable. Plagiarism is using information or original wording in a paper without giving credit to the source of that information or wording: it is also not acceptable. Do not submit work under your name that you did not do yourself. You may not submit work for this class that you did for another class. *If you are found to be cheating or plagiarizing, e.g., in anything related to course, you will be subject to disciplinary action, per UTEP catalog policy.*

- Plagiarism, Cheating, and Academic Dishonesty are unacceptable and will NOT be tolerated.
- Student who is caught cheating/plagiarizing will receive a **failing grade** as well as additional disciplinary measures by the University.
- Any case involving academic dishonesty will be referred to the Engineering Dean's Office and the Office of the Dean of Students. See the Office of the Dean of Students' home page at www.utep.edu/dos/acadintg.htm for more information.
- Please review the statements below and UTEP's Web page on Policy on Academic Integrity at <http://sa.utep.edu/osccr/academic-integrity/>

Center for Accommodations and Support Services (CASS):

If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.

XIV. COVID-19 PRECAUTIONS

Please stay home if you (1) have been diagnosed with COVID-19, or (2) are experiencing COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, and alternative instruction will be provided. The Student Health Center is equipped to provide COVID 19 testing.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area, and will be available at no charge on campus during the first week of classes. For more information about the current rates, testing, and vaccinations, please visit epstrong.org

XV. SOME OTHER IMPORTANT NOTES

- **Disclaimer:** Syllabus (that includes any content) may subject to change within reasonable limits according to instructor's discretion. Any changes will be announced in blackboard or in the class.
- **Students are expected to check the blackboard frequently** (*at least three times daily*) for course materials (e.g., Syllabus, Lecture Notes, announcements, etc.) and related information to see if any updates.
- **Students should also be checking emails frequently** (*at least three times daily*) as instructor can communicate via email.
- Usually the instructor sends email to all students keeping them in Bcc if it will be a group email.
- **Email Communication with a particular student:** (1) Instructor may send an email to a particular student to set up an online meeting or for any course related matter, and that student is supposed to answer the instructor's email as soon as possible (*which is Email-1*). (2) If the student does not reply to Email-1 within 24-hour period (*as students are expected to check email thrice a day*), the instructor will send a reminder email (*which is Email-2*). (3) If that student still does not reply to Email-2 within 2-business-day, there may be an impact on that student's grade.
- **Important note about Grade:** Grades are earned by students.
- Students are supposed to contact instructor in advance for any query.

Prepared by: Paras Mandal, Ph.D.
Associate Professor
Department of Electrical and Computer Engineering, UTEP
Ph: (915) 747-8653
E-mail: pmandal@utep.edu

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