



**Department of Electrical Engineering**

**College of Engineering**

**Salahaddin University – Erbil**

**Subject: Smart Grids**

**Course Book: Third Academic Year / Power Engineering**

**Lecturer : Assist Prof. Dr. Fadhil Toufick Aula**

**Academic Year: 2020 -2021 Spring Semester**

**Course Book**

<b>1. Course name</b>	<b>Smart Grids</b>
<b>2. Lecturer</b>	<b>Assist Prof. Dr. Fadhil Toufick Aula</b>
<b>3. Department/ College</b>	<b>Electrical / Engineering</b>
<b>4. Contact</b>	<b>e-mail: fadhil.aula@su.edu.krd</b>
<b>5. Time ( hr. / week )</b>	<b>2 hrs/week</b>
<b>6. Office hours</b>	<b>4</b>
<p><b>7. Course overview:</b> The use of information technologies, advanced digital devices and communications is likely to cause major shifts in the way energy transferred to consumers.</p> <p>The smart grid will use these modern tools to deliver electricity reliably and efficiency. This course will examine not just the smart grid technologies, but also the transformational impacts of the smart grid on the industry.</p> <p>Students in this course will learn the fundamental of the smart grid: its purpose and objectives, its technologies, its architectures, and its management.</p> <p>Students will also learn many if the challenges facing the smart grid as part of its evolution.</p>	
<p><b>8. Course Objective:</b></p> <p>After successfully completing this course, a student will have gained an understanding of:</p> <ol style="list-style-type: none"> <li>1. The various aspects of the smart grid, including <ul style="list-style-type: none"> <li>• Technologies</li> <li>• Components</li> <li>• Architectures</li> <li>• Applications</li> </ul> </li> <li>2. How smart grid can be designed to meet the needs of a utility, including <ul style="list-style-type: none"> <li>• Meeting a utility's objectives</li> <li>• Helping to adopt new technologies into grid</li> <li>• Creating a framework for knowledgeable power engineers to operate the grid more effectively</li> </ul> </li> <li>3. The major issues and challenges that remain to be solved.</li> </ol>	
<p><b>9. Student's Obligation</b></p> <ul style="list-style-type: none"> <li>➤ Regular attendance is required according to the university rules.</li> <li>➤ The use of mobile phone during the class is prohibited.</li> </ul>	

- Only the students who are officially enrolled can attend the class, guests and children are not admitted.
- Daily participation and conducting assignments are required.

### 10. Forms of Teaching

Teaching methods include overhead project presentation, online materials, classroom website, in class whiteboard usage.

### 11. Assessment Scheme

Midterm Exam	20 %
Daily + assignments + Quizzes, etc.	20 %
Annual	40 %
Final Exam	60%
Total	100%

### 12. Course Reading List:

1. S. Borlase, Smart Grids: Infrastructure, Technology, and Solutions, CRC Press, 2013
2. J. Momoh, Smart Grid Fundamentals of Design and Analysis, Wiley, 2012
3. International Renewable Energy Agency, Smart Grid and Renewables: A Guide for Effective Deployment, IRENA 2013
4. N. Hadjsaid and JC. Sabonnadiere, Smart Grids, Wiley, 2012

### Spring Semester: 15 Weeks

Week	Subject
1 <sup>st</sup>	Introduction to Smart Grid:
2 <sup>nd</sup>	General consideration for a smart grid, characteristics of smart grid, difference between conventional and smart grid, Present development and international policies in smart grid.
3 <sup>rd</sup>	Smart Energy Resources: renewable generation. energy storages.
4 <sup>th</sup>	Smart Energy Resources: electric vehicles, energy consumptions.
5 <sup>th</sup>	Smart Power Grid: power grid operation and systems, load demand, LFC, reactive power control, AGC, load factor, microgrids.
6 <sup>th</sup>	SCADA: Part One
7 <sup>th</sup>	SCADA: Part Two

8 <sup>th</sup>	Midterm Exam
9 <sup>th</sup>	Synchronized Phasor Measurements: Part One
10 <sup>th</sup>	Synchronized Phasor Measurements: Part Two
11 <sup>th</sup>	Smart Meters
14 <sup>th</sup>	Dead week
15 <sup>th</sup>	Final Exam