

<b>Date:</b>	Examination No.:	Academic Year:2023-2024	Start:16/1/2024
<b>Module Name - Code</b>	Smart Grids 21305		
<b>Module Language:</b>	English		
<b>Responsible:</b>	Asst. Prof. Dr. Fadhil T. Aula		
<b>Lecture (s):</b>	None		
<b>College:</b>	College of Engineering – Salahaddin University-Erbil		
<b>Duration:</b>	15 weeks – 6 <sup>th</sup> semester		
<b>Course Outcomes:</b>	<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>		
<b>Course Contents:</b>	<ol style="list-style-type: none"> <li>1. Introduction to Smart Grid:</li> <li>2. General consideration for a smart grid, characteristics of smart grid, difference between conventional and smart grid, Present development and international policies in smart grid.</li> <li>3. Smart Energy Resources: renewable generation. energy storages.</li> <li>4. Smart Energy Resources: electric vehicles, energy consumptions.</li> <li>5. Smart Power Grid: power grid operation and systems, load demand, LFC, reactive power control, AGC, load factor, microgrids.</li> <li>6. SCADA:</li> <li>7. Synchronized Phasor Measurements</li> <li>8. Smart Meters</li> </ol>		
<b>Literature:</b>	<ol style="list-style-type: none"> <li>1. S. Borlase, Smart Grids: Infrastructure, Technology, and Solutions, CRC Press, 2013</li> <li>2. J. Momoh, Smart Grid Fundamentals of Design and Analysis, Wiley, 2012</li> <li>3. International Renewable Energy Agency, Smart Grid and Renewables: A Guide for Effective Deployment, IRENA 2013</li> <li>4.N. Hadjsaid and JC. Sabonnadiere, Smart Grids, Wiley, 2012</li> </ol>		
<b>Type of Teaching:</b>	3 hrs. in lectures		
<b>Pre-requisites:</b>	None		
<b>Preparation Modules:</b>			
<b>Frequency:</b>	Spring Semester		
<b>Requirements for credit points:</b>	For the award of credit points, it is necessary to pass the module exam. It contains: An examination during the academic semester, Quizzes, Assignments, and Final examination. <b>Student's attendance is required in all classes.</b>		
<b>Credit point:</b>	4		

<p><b>Grade Distribution:</b></p>	<p>The following grade system is used for the evaluation of the module exam:  The module exam is based on the summation of two categories of evaluations:  <b>First: (40%)</b> of the mark is based on the academic semester effort which includes</p> <ul style="list-style-type: none"> <li>- An examination during the academic semester = 30%.</li> <li>- Assignments = 5%</li> <li>- Quizzes = 5%</li> </ul> <p><b>Second: (60%)</b> of the mark is based on final examination that is comprehensive for the whole of the study materials reviewed during the academic semester.</p>
<p><b>Work load:</b></p>	<p>The workload is 135 hrs. It is the result of 45 hrs. attendances and 90 hrs. self-studies (Assignments, quizzes. and preparation for the exam).</p>