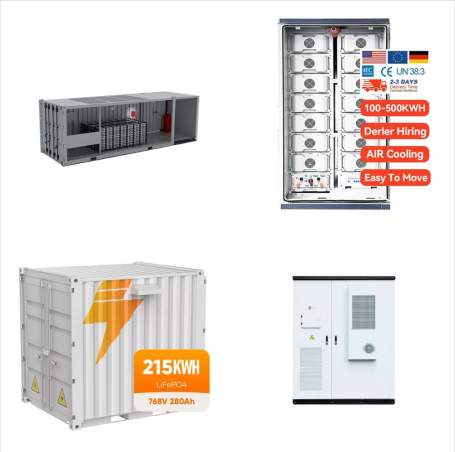
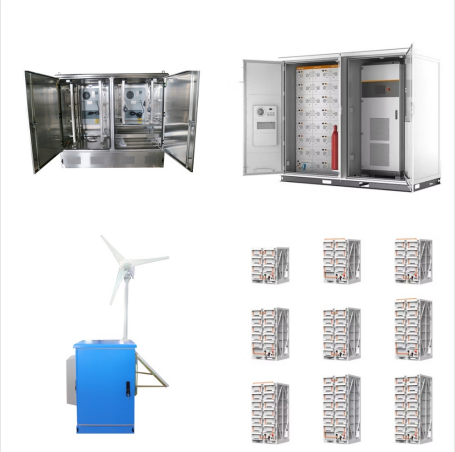
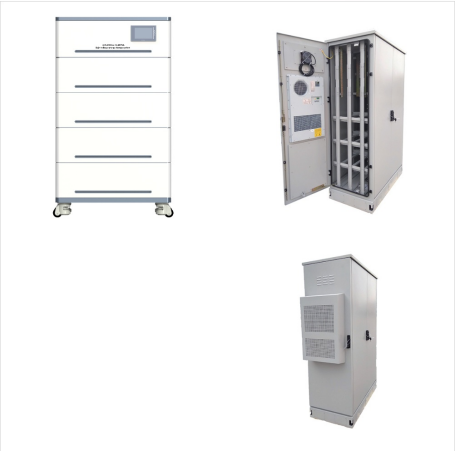


Introduction to Power Systems Class Notes Chapter 9 Synchronous Machine and Winding Models ??? J.L. Kirtley Jr. 1 Introduction The objective here is to develop a simple but physically meaningful model of the synchronous machine, one of the major classes of electric machine. We can look at this model from several di???erent directions.



Introduction to Power Systems Class Notes Chapter 1: Review of Network Theory??? J.L. Kirtley Jr. 1 Introduction This note is a review of some of the most salient points of electric network theory. In it we do not prove any of the assertions that are made. We deal only with passive, linear network elements. 2 Network Primitives



/6.979 Introduction to Power Systems Problem Set 8 Solutions April 10, 2003 The ???rst few parts of this problem set are concerned with the same synchronous machine which is characterized by the following parameters: Number of Poles p 4 Field to Armature Mutual Inductance (Peak) M 37.5 mHy Armature Phase Self Inductance La 1.9 mHy

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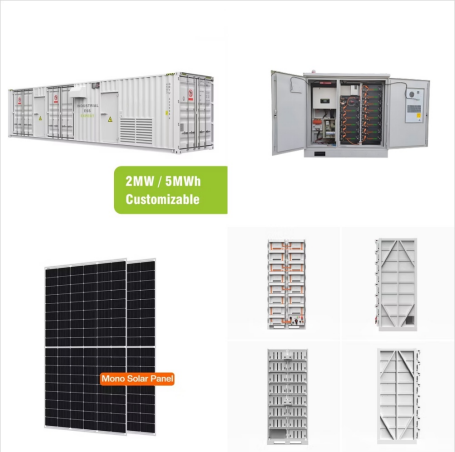
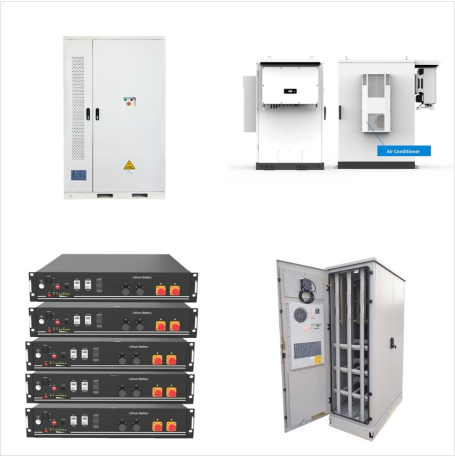
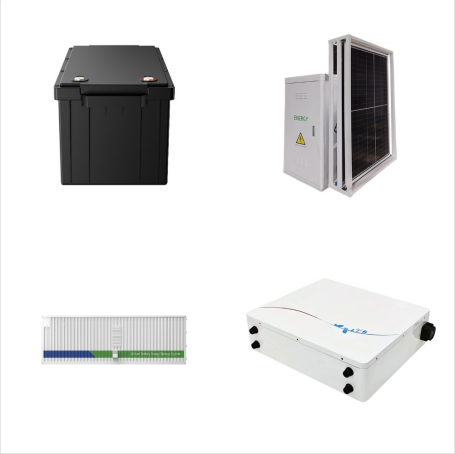


Reactive Power, Vars 1.5 1 0.5 0 ???0.5 ???1 ???1.5 x 105 ???1.5 ???1 ???0.5 0 0.5 1 1.5 Real Power, Watts Figure 1: Sending and Receiving End Circles Vectors from the centers of the power circle to the sending and receiving complex power points are plotted in Figure 1. Note that both real and reactive power are conserved.



/6.690 Introduction to Power Systems Solution To Problem Set 1 February 20, 2007 Problem 1: Domestic circuits in the United States have a nominal voltage of 120V, RMS and come in two current ratings: 15A and 20A. It will have taken you a little bit of lookup



the system is carrying current (in fact it is carrying real power), and then that voltage, ap- plied to the admittance matrix for the system results in current in both positive and negative sequences. The transmission line has phase admittance: .014 .008 .004 Z ph = ???

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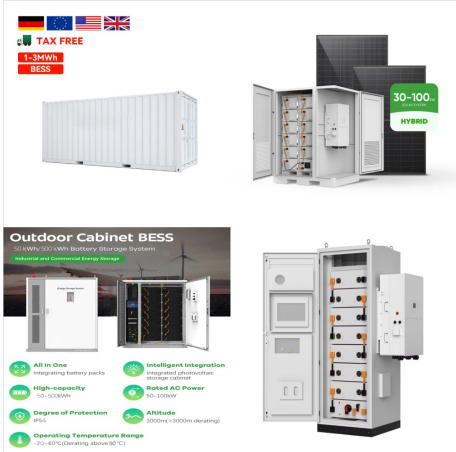
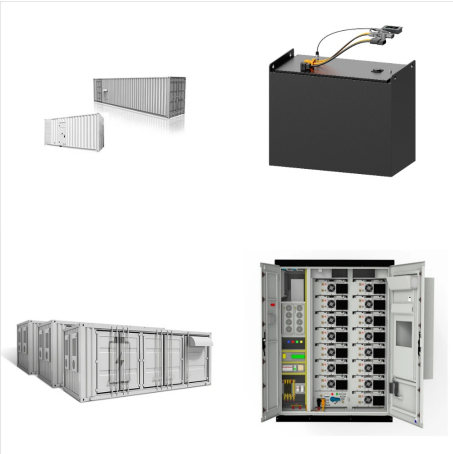
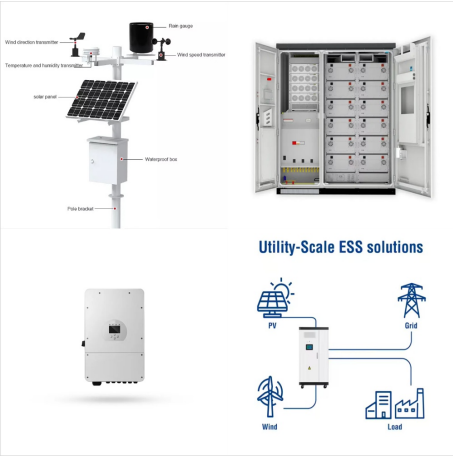


This course is an introductory subject in the field of electric power systems and electrical to mechanical energy conversion. Electric power has become increasingly important as a way of transmitting and transforming energy in industrial, military and transportation uses. 6.061 / 6.690 Introduction to Electric Power Systems

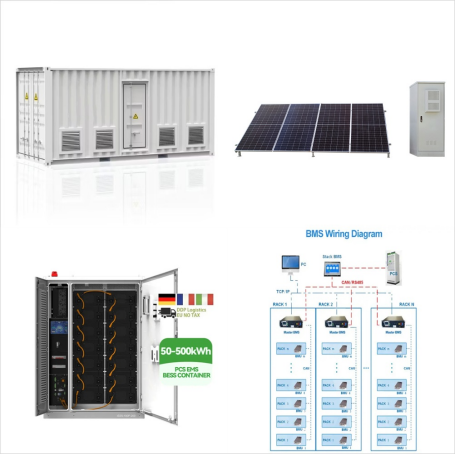


B and C is 8 mHy. Mutual inductance between phases A and C is 4 mHy. The system is operated at 60 Hz. Now: if there is real power transfer between G1 to G2 of 200 MW, at unity power factor at the terminals of G2, with per-unit voltage magnitude of unity, can you estimate the value of negative sequence current ???owing in the leads of the

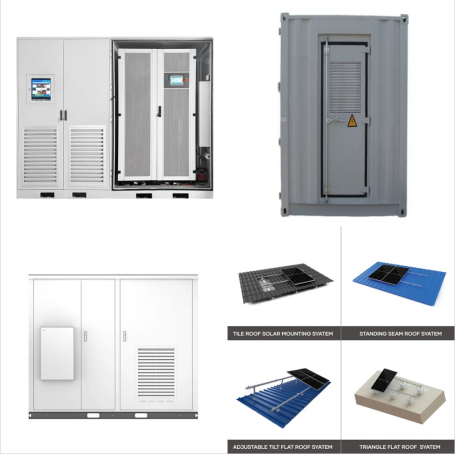


Introduction to Power Systems Class Notes Chapter 4 Introduction To Symmetrical Components ??? J.L. Kirtley Jr. 1 Introduction Installment 3 of these notes dealt primarily with networks that are balanced, in which the three voltages (and three currents) are identical but for exact 120 phase shifts. Unbalanced conditions

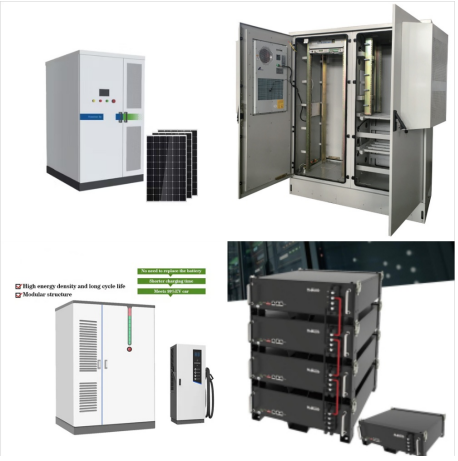
6 061 6 690 INTRODUCTION TO ELECTRIC POWER SYSTEMS



This course is offered both to undergraduates (6.061) and graduates (6.979), where the graduate version has different problem sets and an additional term project. 6.061 / 6.979 is an introductory course in the field of electric power systems and electrical to mechanical energy conversion.



This document summarizes the solutions to problems from the MIT OpenCourseWare course 6.061 / 6.690 Introduction to Electric Power Systems. The first problem involves calculating the torque-speed characteristic of a series motor and applying it to model the acceleration of an electric vehicle. The second problem compares the performance of two different motors for the ???



/6.690 Introduction to Power Systems Problem Set 7 Issued: Ses #13 Due: Ses #16 Problem 1: Figure 1 shows an end view of a special purpose reluctance torquer. This is pictured with the rotor in the maximally aligned position. Assume the following dimensions: Radius

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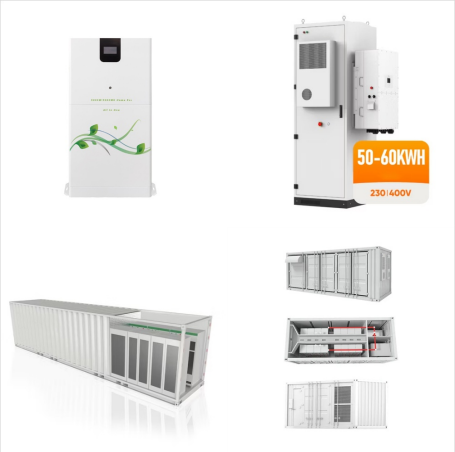
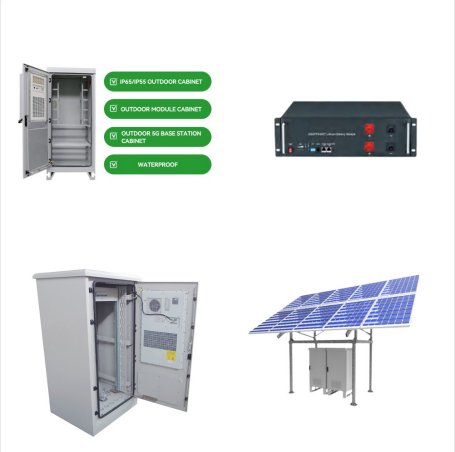
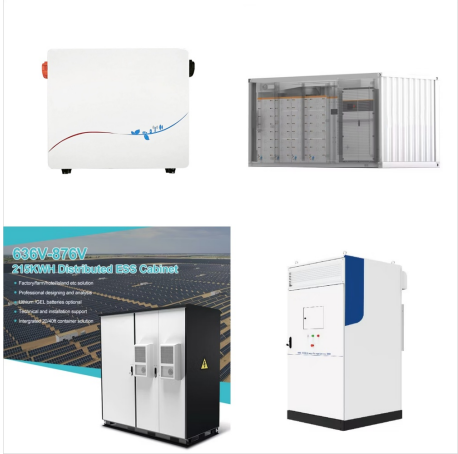


80 % SIL Real Power 100 % SIL Real Power 120 % SIL Real Power Figure 3: Voltage vs. reactive injection So that power is P = 100 x 480 = 48kW. The phase voltage on the secondary (wye) side is 4???80 ??? 277V, so that the turns ratio of the 3 transformer is N = frac4200277 ??? 15.16. Voltage across the load resistor is (see Figure 4) V = 480e

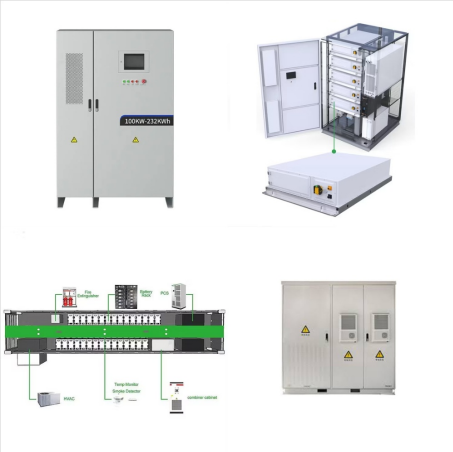


/6.690 Introduction to Power Systems Problem Set 2 Issued: Ses #3 Due: Ses #5 Problem 1: With reference to the simple R-L circuit shown in Figure 1: R = 100?(C) and L = 100mH. The switch has been open for a long time before the action begins at time t = 0. 1.

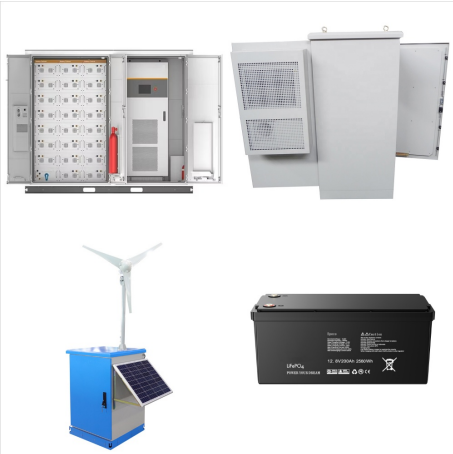


1 Introduction. Electric power systems usually involve sinusoidally varying (or nearly so) voltages and currents. That is, voltage and current are functions of time that are nearly pure sine waves ???

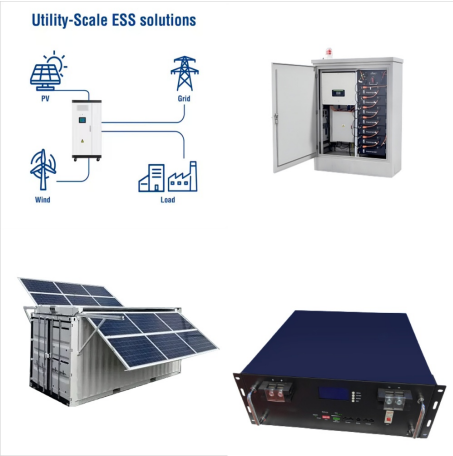
6 061 6 690 INTRODUCTION TO ELECTRIC POWER SYSTEMS



This document provides information about the MIT OpenCourseWare course 6.061/6.690 Introduction to Electric Power Systems including solutions to the first quiz. The quiz solutions include calculating phase currents in a balanced three-phase system, determining the capacitive reactance required for voltage regulation in an L-R-C circuit, and illustrating the behavior of ???

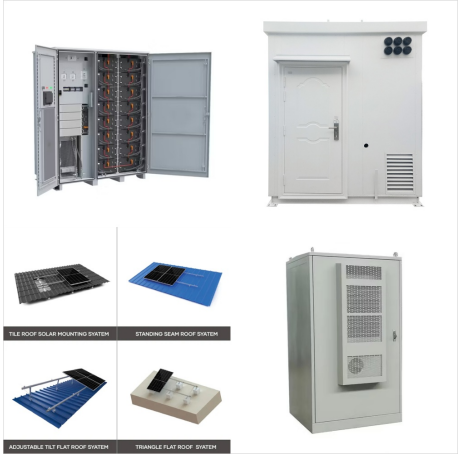


/6.690 Introduction to Power Systems Problem Set 1 Issued: Ses #1 Due: Ses #3 Reading Assignment: Class Notes, Chapter 1 Problem 1: Your ordinary household electrical system is single phase and employs a voltage of 120 V, RMS. What can a circuit with a 20 A breaker handle? ??? In Watts? ??? A motor, rated in horsepower?

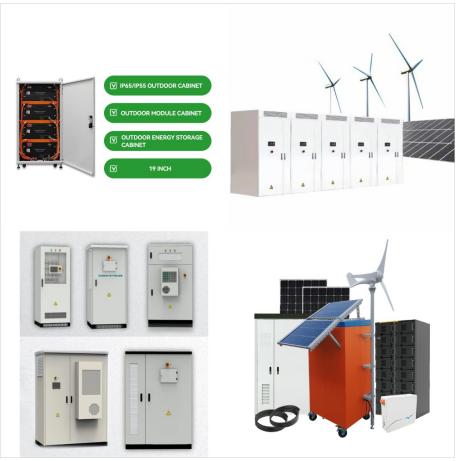


Massachusetts Institute of Technology Department of Electrical Engineering and Computer Science 6.061 Introduction to Power Systems Class Notes Chapter 3 Polyphase Networks ??? J.L. Kirtley Jr. 1 Introduction Most electric power applications employ three phases.

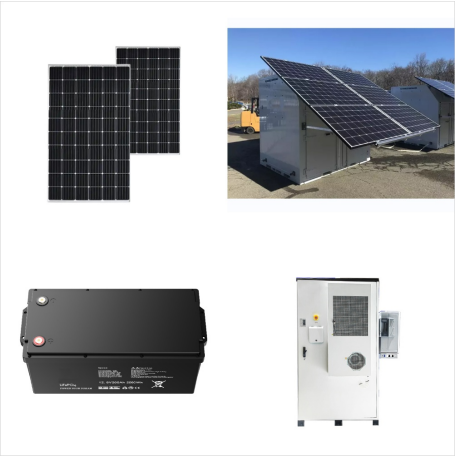
6 061 6 690 INTRODUCTION TO ELECTRIC POWER SYSTEMS



Introduction to Electric Power Systems. Menu. More Info Syllabus Calendar Readings Assignments Quizzes Pages. Course Info Instructor Prof. James L. Kirtley Jr. Departments Electrical Engineering and Computer Science; As Taught In Spring 2011

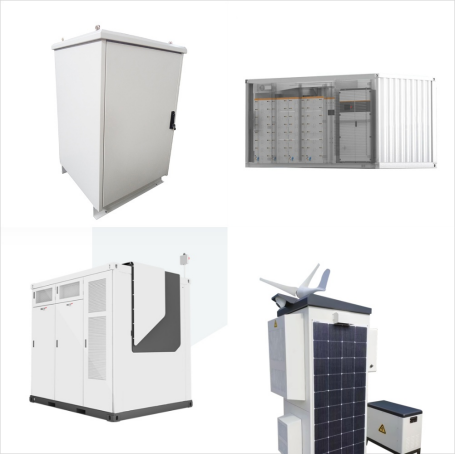


This course is an introductory subject in the field of electric power systems and electrical to mechanical energy conversion. Electric power has become increasingly important as a way of ???

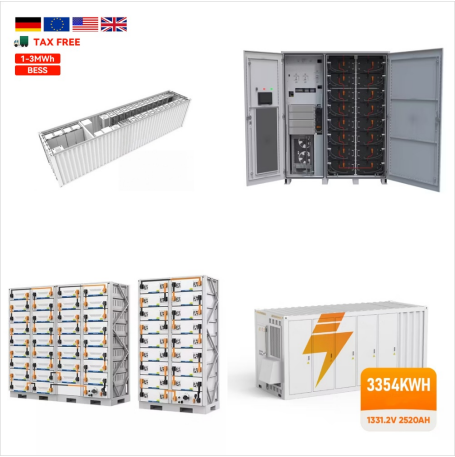


Massachusetts Institute of Technology Department of Electrical Engineering and Computer Science 6.061 Introduction to Power Systems Class Notes Chapter 6 Magnetic Circuit Analog to Electric Circuits ??? J.L. Kirtley Jr. 1 Introduction In this chapter we describe an equivalence between electric and magnetic circuits and in turn a method of

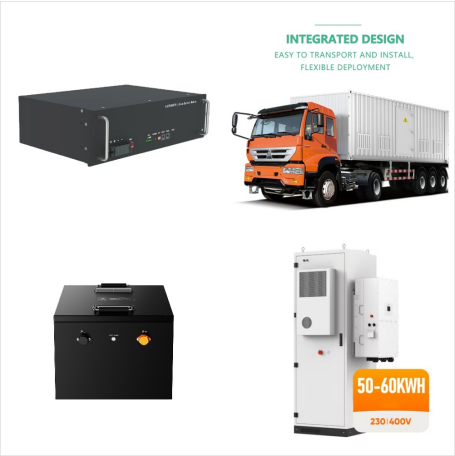
6 061 6 690 INTRODUCTION TO ELECTRIC POWER SYSTEMS



1. Construct and sketch the sending end and receiving end power circle (P vs. Q with 0 < ?? < ??/2). Use the convention that complex power ???ow is from the source to the line at the sending end and from the line to the source at the receiving end. 2. (for 6.960) What is the phase shift ?? across the line when 50 kW is the real power ???ow



This course is an introductory subject in the field of electric power systems and electrical to mechanical energy conversion. Electric power has become increasingly important as a way of transmitting and transforming energy in ???



The material in this subject will be useful to students who pursue careers or research in electric power systems, power electronic systems, vehicle electrical systems (e.g. electric or hybrid vehicles), development or use of electric motors and generators, robots and ???