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current, high voltage engineering. It is evident that although there are many common teaching topics in the basic course of circuit analysis, there are also certain differences. Unfortunately most

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Science at the University of Illinois at Chicago. He has extensive experience in education and industry and is very active professionally in the fields of circuits and systems. He was Editor-in-Chief of the IEEE

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characteristics of the electric devices used in the transformation to and from electric energy. This text is designed to be used in a one-semester course in electric energy conversion at the second-year level of the Bachelor of Engineering

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course. It is assumed that the student is familiar with the laws of thermodynamics and has taken a course in basic circuit analysis, including the application of phasors. We begin with a discussion of how humankind has successfully

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harnessed the energy of wind, water, the sun, biomass, animals, geothermal sources, fossils, and nuclear fission to make its life comfortable. Some of the consequences of this activity on the environment are examined. In

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Chapter 2, we review the basic physics of energy and its conversion. This may be, to some extent, a repetition of knowledge gained in high-school and first year university courses. However, we believe that such review is necessary to establish

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knowledge on the respective subjects.

Traditionally, power engineering has been a subfield of energy engineering and electrical engineering which deals with

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the generation, transmission, distribution and utilization of electric power and the electrical devices connected to such systems including generators, motors and transformers. Implicitly this

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perception is associated with the generation of power in large hydraulic, thermal and nuclear plants and distributed consumption. Faced with the climate change phenomena,

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humanity has had to now contend with changes in attitudes in respect of environment protection and depletion of classical energy resources. These have had consequences in the power



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production sector, already faced with negative public opinions on nuclear energy and favorable perception of renewable energy resources and about distributed power generation. The objective of

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this edited book is to review all these changes and to present solutions for future power generation. Future energy systems must factor in the changes and developments in technology

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like improvements of natural gas combined cycles and clean coal technologies, carbon dioxide capture and storage, advancements in nuclear reactors and hydropower, renewable

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compatibility, HVDC  
transmission with FACTS,  
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and smart grids, power system resilience, power quality and cost of supply, plug-in electric vehicles, smart metering, control and communication technologies, new key actors as

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