

FAME	ENSEA	
	Fundamentals of Power Engineering	
US Credits : 4	Lecture : 33h, Laboratory : 12h	Language : English

Summary

The goal of this course is to understand and to apply the basic principles involved in the design and the modelling of Power Engineering systems.

Prerequisites

- Mathematics basis including integrals, differential equations, complex numbers and matrices.
- Physics basis in Electronics (e.g. voltage, current, resistance, inductance and capacitance). Students are also supposed to have basic knowledge about electronic circuit analysis.

Contents

Lecture

- Power definitions: active and reactive power, power factor, linear and non-linear receptors.
- Magnetic circuits and coils: magnetic materials, magneto-motive force, reluctance, magnetic energy, self and mutual inductances, hysteresis and Eddy current losses, equivalent circuits.
- Three-phase systems: definitions, coupling, power measurement.
- Single and three-phase transformers: Kapp assumptions, equivalent circuits, losses and efficiency, parameter identification using no load test and short-circuit test.
- DC motors: Structure and model, operating modes and power (motor, generator), efficiency.
- Three-phase AC motors: Structures, models, equivalent circuits, power losses and efficiency.
- Power electronics: Elementary components (Diode, IGBT, FET) and design rules (association of voltage and current sources), power bridges (rectifier, chopper, inverter) and introduction to variable speed drives,
- Brief introduction to power networks and smart grid.

Labs

- Transformer (hysteresis cycle and magnetic saturation, no load test and short-circuit test, operation under resistive, inductive and capacitive load).
- Variable speed drive based on a DC motor and a controlled power bridge.
- Alternator (synchronous generator) and power generation.

Organization

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Textbook

Electrical Energy an Introduction, Mohamed A. El-Sharkawi, CRC, **3rd Edition**

Similar to the following courses

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| <ul style="list-style-type: none"> • IIT Chicago ECE 319 • University at Buffalo EE 425 • University of Pittsburgh ECE 1771 | <ul style="list-style-type: none"> • University of Illinois at U-C ECE 330 • Mississippi State University ECE 3414/3614 • University of Michigan at AA EECS 419 • Michigan Tech EE 4219 (2 cr) |
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