

EE303 — Energy Systems and Power Electronics

Lecture 9. Mutual inductance and transformers

Prof. Dionysios Aliprantis

Electrical & Computer Engineering

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Today's objectives

- **IDENTIFY** fundamental magnetic quantities and their units:
 - magnetic flux & flux density
 - magnetic field
 - permeability
 - flux linkage and inductance
- **RECALL** basic principles of electromagnetism:
 - Ampère's law
 - Faraday's law
 - Gauss' law
- **EXPLAIN** structure of transformers using physical reasoning
- **ANALYZE** the “ideal” transformer
- **SHOW** how a secondary-winding impedance is reflected (or “referred”) to the primary (and vice versa)

Examples 11.1 & 11.3

Problem

A transformer has 5000 turns in the primary winding and 100 turns in the secondary winding.

- 1 If 200 V are applied to the primary, compute the voltage across the secondary.*
- 2 If the power drawn by the load is $S = 4\angle 30^\circ$ VA, compute the reflected impedance of the load as seen from the primary.*

Reading material

The material we covered today corresponds to:

- Chapter 11, pp. 277–307 of textbook