

EE303 — Energy Systems and Power Electronics

Lecture 11. Mutual inductance and transformers

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Today's objectives

- **DERIVE** the equivalent circuit of the single-phase transformer
- **IDENTIFY** all circuit elements of the equivalent circuit, and **UNDERSTAND** what they refer to
- **APPLY** the equivalent circuit for voltage drop and efficiency calculations

Examples 11.12 & 11.13, pp. 302 & 304

Problem

A single-phase transformer has the following parameters:

$N_1/N_2 = 10$, $R_1 = R'_2 = 0.5 \Omega$, $X_1 = X'_2 = 5 \Omega$, $R_0 = 1000 \Omega$, $X_0 = 5000 \Omega$. The rated voltage of the primary winding is 1000 V. A $0.5\angle 30^\circ \Omega$ load is connected across the secondary terminals.

- 1 *Compute the load voltage.*
- 2 *Compute the transformer's efficiency.*