

**Name:** Advanced Circuit Theory and Applications

**Prerequisites:** Basic Circuit Theory

**Course contents:**

Static energy conversion: transformer and switching converters.

Transformer: transformer equivalent circuit model, circuit parameters values identification, short circuit and open circuit tests, transformers in parallel, three phases transformers.

Switching converters: transients in linear time invariant circuits, ideal switches, diodes and transistors, dc/dc converters, voltage conversion ratio, diode rectifier, controlled rectifier, inverter, three phases topologies, PWM control.

AC motors: operating principle, windings, slip, mechanical and electro-mechanical characteristics, start-up, speed regulation, stator currents frequency control, rotor resistance control, other methods for speed regulation, braking, power electronics and control, single phase AC motor.

DC motors: operating principle, collector and brushes, mechanical and electro-mechanical characteristics, start-up, speed regulation, braking, power electronics and control, brushless and step motors, permanent magnet motors.

Renewable energy systems: photovoltaic principle, dc/dc converters for photovoltaic applications, photovoltaic systems control, wind energy systems, motors used in wind energy conversion apparatuses.

Simulation: computer simulations of circuits, motors and complex electrical systems are conducted by Matlab and PSIM softwares.

**Recommended reading:** G.Fabricatore, Elettrotecnica e Applicazioni, Liguori  
Notes to be downloaded at [www.elettrotecnica.unisa.it](http://www.elettrotecnica.unisa.it)

**Teaching methods:** lectures

**Assessment methods:** oral examination