Power Electronics Courseware

OP1130

"This courseware helps students to deeply learn the main topologies used in power electronics converters, namely, choppers, rectifiers, and inverters. Notions of PWM frequency, duty cycle, harmonic analysis, power flow computation, and filtering are thoroughly addressed."

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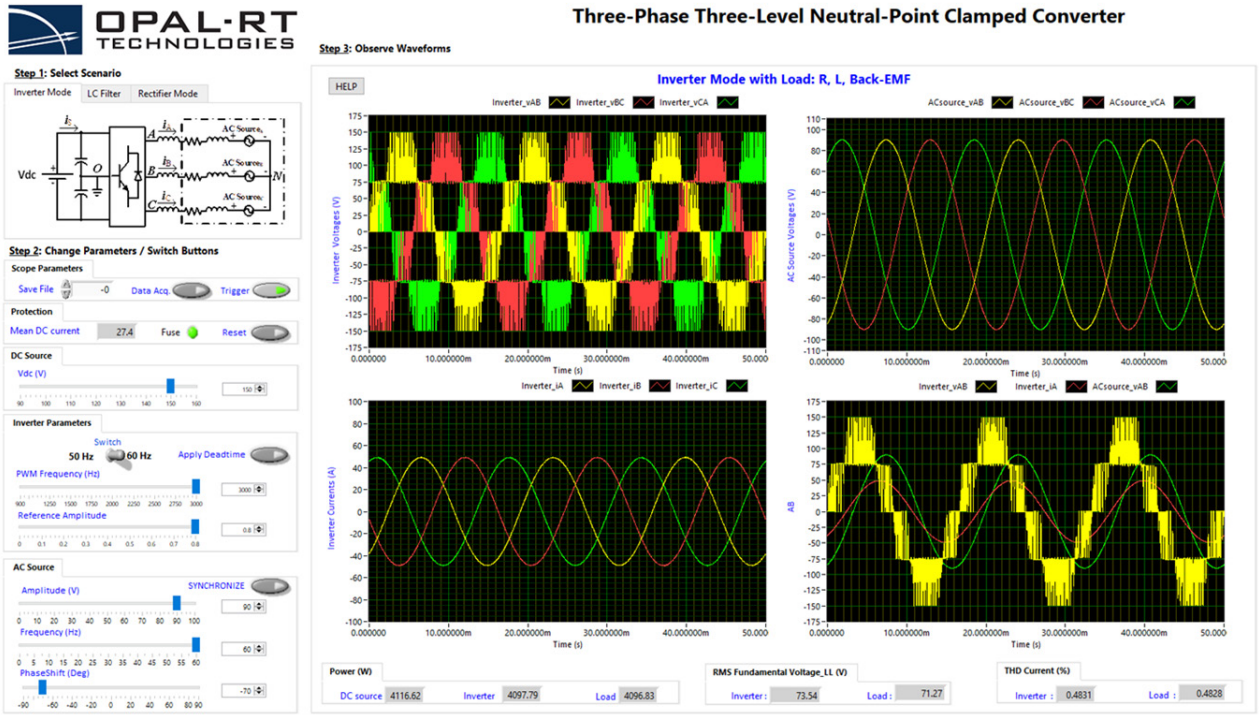
The power electronics courseware is intended to teach power electronics converters to universities' undergraduates and colleges' students. Students can experiment and learn power electronics, such as converters, rectifiers, and inverters, including the control logic with HIL and RCP Tools commonly used in innovative power electronics industry research and development.

MAIN BENEFITS

- An interactive user interface with real scope features, allowing students to visualize all phenomena that can be seen on more expensive and time-consuming analog setups.
- Provides the flexibility to perform experiments that might damage the real test bench, thus allowing the observation and study of the systems' limitations.
- Provides a good platform to pursue graduate research on the same setup.

INTERACTIVE PANEL



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POWER ELECTRONICS COURSEWARE LEARNING OUTCOMES

Choppers - Boost, Buck, and Buck-Boost: Observe and measure the impact of varying duty cycle, PWM frequency, input voltage, and choppers' parameters, namely inductance and capacitor. Vary the load from a pure resistance (R), with multiple values, to a combination of resistance and inductance (RL). Observe and measure the impact on the waveforms of the output voltage (Vout) and current (Iout).

Diode-based Rectifier: Observe and measure the impact of varying the sinusoidal input voltage. Vary the load (R or RL). Observe and measure the impact on Vout and Iout, as well as the input current THD.

Thyristor-based Rectifier: Repeat the same exercises as for the diode-based rectifiers. Additionally, vary the firing angles to analyze the operation limits of the model for varying loads (R and RL).

Single-phase two-level inverter: Vary input DC source voltage. Vary the inverter parameters, namely, PWM frequency, reference amplitude (modulation), and switching dead-time. Vary the AC load that is composed of fixed resistance and inductance in series with an AC source with variable amplitude, frequency, and phase-shift. Connect or disconnect a LC filter. Observe impacts on inputs and outputs waveforms, THD, power computation, fundamental and RMS voltages and currents.

Three-phase two-level inverter: Repeat the same exercises as for the single-phase inverter. Additionally, study the effects of neutral connection.

Three-level three-phase NPC converter: Repeat the same exercises as for the three-phase inverter. Additionally, understand the concept of three-level voltages and the switching control strategies for the NPC topology. Reverse the power flow by using the NPC converter in rectifier mode.