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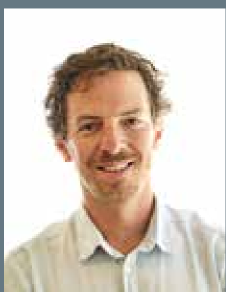
Power electronics HIL teaching laboratory

Courseware

OP1130



"All power electronics models used in the teaching courseware run on FPGA for very high-definition accuracy. Students can discover and learn power electronics with very high definition tools that are fast enough to visualize all phenomena that can be seen on more expensive and time-consuming analog setups."

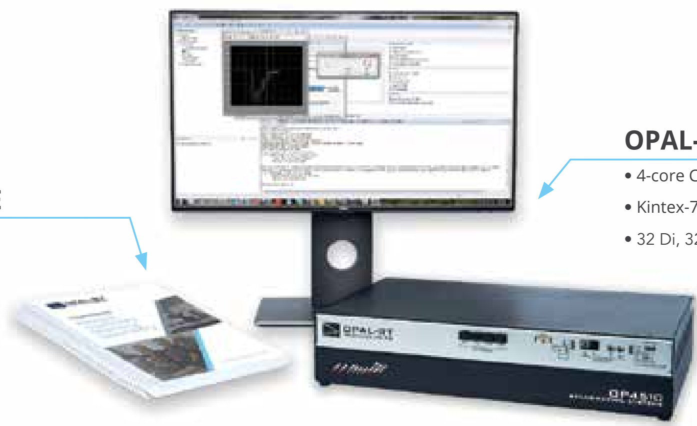
Pierre-Yves Robert, M.Sc.A
FPGA Specialist

Power electronics HIL teaching laboratory by OPAL-RT TECHNOLOGIES is an educational courseware intended to teach power electronics to university undergraduate 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

- Less analog lab equipment is needed, with subsequent lower maintenance time and cost.
- Editable and upgradable courseware to fit with specific courses or activities.
- Provides a good platform to pursue graduate research on the same setup.

COURSEWARE KIT



COURSEWARE

Power electronics HIL teaching laboratory Modules 1 to 4

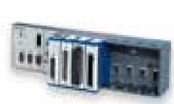
OPAL-RT OP4510

- 4-core CPU, Xeon E3 3.5 GHz
- Kintex-7 XILINX FPGA, 325T
- 32 Di, 32Do, 16 Ai, 16Ao

Also available on these platforms:

OPAL-RT OP4200

- ARM® Cortex® A9 CPU - 2 cores - 1 GHz
- Xilinx Zynq® FPGA Kintex™7 125K LUT
- 32 Di, 32Do, 16 Ai, 16Ao



NI cRIO-9068

- 667 MHz dual-core ARM Cortex-A9 processor
- Zynq-7020 FPGA
- 8-slot chassis.

OUR POWER ELECTRONICS HIL TEACHING LABORATORY COMES WITH FOUR MODULES

Power electronics software provides real-time simulation of DC-DC, AC-DC and DC-AC converters for educational purposes in power electronics laboratories. The teaching laboratory is divided into four modules. All power electronics modules include laboratory exercises.

MODULE 1 :

DC-DC Choppers

OBJECTIVES

- Learn the principles of operation of choppers: boost, buck, buck-boost.
- Understand the impact of duty cycle value on the converter in continuous conduction mode

Laboratory Exercises include:

- Impact of varying parameters of converter
- Effect of varying the duty cycle
- Calculation of PI controller parameters using MyRio E

MODULE 2 :

AC-DC Rectifiers

OBJECTIVES

- Learn the principles of operation of passive rectifiers
- Understand single-phase and three-phase diode bridges.

Laboratory Exercises include:

- Impact of varying rectifier parameters
- Calculation of the form factor and the ripple factor
- Impact of activation of smoothing capacitor

MODULE 3 :

DC-AC Inverters

OBJECTIVES

- Learn the principles of operation of three-phase two-level inverter and PWM modulation technique
- Study the effect of the neutral connection on waveforms of the phase voltages and line currents
- Study the effect of filtering at the inverter output

Laboratory Exercises include:

- Impact of neutral connection and filtering
- Impact of varying PWM frequency and dead time
- Introduction to the hysteresis controller using MyRio external controller

MODULE 4 :

Three-Phase Three-Level NPC Inverter/ Rectifier

OBJECTIVES

- Learn the principles of operation of three-phase three-level NPC topology
- Operate in inverter and rectifier modes
- Study the effect of filtering at the converter output

Laboratory Exercises include:

- Design aspects: component sizing /switch control
- Variable-configuration load: AC-motor/capacitive/ inductive
- Power flow/waveforms