www.opal-rt.com/academy

“An investment in knowledge pays the best interest.”

Benjamin Franklin
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OPAL-RT Academy

Your keys to success in the challenging field of real-time simulation are education and experience.

OPAL-RT Academy delivers highly focused, practical and theoretical training on the crucial tools and methodologies used in real-time simulation and Hardware-in-the-Loop (HIL) testing of critical systems.

Since 1997, the OPAL-RT Academy has taught hundreds of engineering students and professionals how to quickly and efficiently set up real-time simulators and to properly select and use mathematical solvers for specific simulation applications. They learn about the processes behind simulating complex systems, and reinforce their studies with extensive hands-on workshops.

OPAL-RT Academy’s instructors are selected amongst experienced professionals to deliver valuable content and motivate you to surpass your maximum potential.
It is with great pleasure that I personally welcome you to the OPAL-RT Academy. Our Field Application Engineers have been specifically selected as the academy instructors for their knowledge and presentation skills, to offer you the best learning experience. We assist our students through the steps required to achieve advanced knowledge of Hardware-In-the-Loop and Rapid-Control Prototyping. If you are looking for experienced and passionate professionals who are always ready to help, you’ve come to the right place.

For any questions, do not hesitate to contact us at:
www.opal-rt.com/academy

Training Format

**Head Office Trainings**
OPAL-RT hosts training sessions at our head office and subsidiaries.
- Network with other users
- Connect with a larger group of OPAL-RT specialists

**On-Site Trainings**
Our engineers travel the world to deliver personalized training sessions in your company or university’s meeting room.
- Choose a standard course or request a customized option
- Reduce travel expenses
- Train several employees at a time

**E-Learning**
The training sessions can be given online through our Web meeting platform.
- Optimize your training budget
- Attend at your convenience from anywhere
Fundamental Courses
Fundamental courses cover the essentials in real-time simulation, giving you a detailed overview of OPAL-RT’s two most important technologies: RT-LAB and HYPERSIM. For On-Site Trainings, the OPAL-RT Academy instructor sets up your laboratory.
OP-101
Fundamentals of Real-Time Simulation with RT-LAB

Duration: 2.5 days
Prerequisites:
• Basic knowledge of Matlab®/Simulink®

This course introduces OPAL-RT systems and applications using RT-LAB, including power electronics and power systems with eMEGAsim, eFPGA sim, and ePHASORsim. It also covers automotive applications, aerospace and mechatronics.

It includes a half-day lab set-up, where the instructor will configure the real-time simulator with the user’s lab environment.

GOALS:
■ Learn the fundamentals of real-time simulation
■ Get started with RT-LAB Software
■ Understand when and how to use distributed and parallel real-time simulation
■ Connect models with I/Os
Duration: 4 days
This course teaches the basics of the HYPERSIM real-time simulator and its operating principles.

It includes a half-day lab set-up, where the instructor will configure the real-time simulator with the user’s lab environment.

GOALS:
- Understand the operating principles of HYPERSIM and the electromagnetic transients algorithm used
- Understand the HYPERSIM software suite (TESTVIEW and SCOPEVIEW) and its modules
- Build and run a number of power system simulation cases showing the capabilities of HYPERSIM
- Connect models with I/Os and communication protocols
- Use TESTVIEW to automate the process of running simulation cases
- Use SCOPEVIEW to generate reports and analyze results

OP-102
Introduction to Power Systems
Real-Time Simulation with HYPERSIM
OP-103
Introduction to Power Electronics Real-Time Simulation with OPAL-RT Add-On for NI VeriStand

Duration: 3 days
This course covers the configuration of a real-time system using the OPAL-RT Power Electronics Add-On for NI VeriStand on the National Instruments hardware platform.

It includes a half-day lab set-up, where the instructor will configure the real-time simulator with the user’s lab environment.

GOALS:
- Learn the fundamentals of real-time simulation
- Review the basics of NI VeriStand and the NI hardware platforms
- Understand FPGA-based simulation of power electronics using the eHS solver
- Configure the real-time system using the OPAL-RT Power Electronics Add-On for NI VeriStand
- Connect to physical systems using I/O channels
Application-Oriented Courses
Application-oriented courses have been designed to cover OPAL-RT’s complete product portfolio based on our two main simulation platforms, RT-LAB and HYPERSIM.
OP-201
Real-Time Simulation for Automotive Applications

Duration: 2 Days
Prerequisites:
• OP-101: Real-Time Simulation Systems Fundamentals with RT-LAB

This course was designed after years of interaction with OPAL-RT Aerospace users and determining their specific needs. Test automation, specific I/O aerospace applications, serial communication, user interface, co-simulation as well as trim techniques will be covered in order to provide a full range of proficient real-time tools used by aerospace engineers.

GOALS:

- Understand the basics of test automation using Python
- Practice on specific Aerospace I/Os such as LVDT/RVTD, RTD, Speed Sensors, & Thermocouples
- Obtain an introduction to Orchestra for co-simulation and SIL
- Learn and apply specific aerospace communication protocols such as Arinc 429 and RS-232 or RS-485
Duration: 2 Days
Prerequisites:
• OP-101: Real-Time Simulation Systems Fundamentals with RT-LAB

This course is intended for professionals who want to simulate power systems with eMEGAsim by converting their Simulink’s SimPowerSystems™-based model into a complete HIL system.

GOALS:
- Learn how to run power systems models in real-time for HIL applications
- Take advantage of dedicated toolboxes for real-time simulation of power systems and power electronics
- Understand Artemis-SSN, State-Space Nodal solver, as well as its applications
- Learn how to improve the real-time simulation switching results with RT-EVENTS
- Learn how to adapt your SimPowerSystems model for real-time simulation
OP-203
Real-Time Simulation of Power Systems with eMEGAsim

Duration: 2 Days

Prerequisites:
• OP-101: Real-Time Simulation Systems Fundamentals with RT-LAB

This course is intended for professionals who want to simulate power systems with eMEGAsim by converting their Simulink’s SimPowerSystems™-based model into a complete HIL system.

GOALS:
- Learn how to run power systems models in real-time for HIL applications
- Take advantage of dedicated toolboxes for real-time simulation of power systems and power electronics
- Understand Artemis-SSN, State-Space Nodal solver, as well as its applications
- Learn how to improve the real-time simulation switching results with RT-EVENTS
- Learn how to adapt your SimPowerSystems model for real-time simulation
Duration: 2 Days

Prerequisites:
• OP-101: Real-Time Simulation Systems Fundamentals with RT-LAB

This course is intended for new ePHASORsim users who want to learn Phasor Domain real-time simulation. ePHASORsim simulates electro-mechanical transient stability phenomena of very large power grids with thousands of buses, generators, transformers, transmission lines, loads and controllers.

GOALS:

- Understand the concept of Phasor Domain simulation features, benefits and limitations
- Import PSS/E, DigSILENT or other model-based design tools into ePHASORsim
- Connect I/Os and communication buses with ePHASORsim
- Learn about the interaction of ePHASORsim and RT-LAB
OP-205
Power Electronics Real-Time Simulation with eFPGA sim - eHS

Duration: 1 Day

Prerequisites:
• OP-101: Fundamentals of Real-Time Simulation with RT-LAB

This course is intended for power electronics and control engineers who want to perform fast power electronics real-time simulation using the combined power of FPGA and OPAL-RT’s unique dedicated solver eHS.

GOALS
- Discover the features, flexibility and limitations of FPGA for power electronics real-time simulation
- Understand the overall architecture of real-time simulator between processors and FPGA
- Experience first-hand power electronics real-time FPGA applications using eHS solver
Duration: 1 Day

Prerequisites:
- OP-202: Power Electronics Real-Time Simulation with eFPGAsim – eHS
- Basic knowledge of FPGA technologies

RT-XSG (XILINX System Generator) is a Simulink toolbox that enables engineers to generate custom, application-specific models that can be implemented onto an FPGA device for multiple applications. This course covers the basic concepts needed to adapt an I/O to an FPGA model with eHS.

GOALS:
- Discover the features, flexibility and limitations of FPGA RT-XSG
- Understand the overall architecture of a real-time simulator between processors and FPGA
- Learn the floating point concept
- Learn how to generate and load your firmware on the FPGA for a new application
OP-207

Duration: 1 Day
Prerequisites:
• OP-101: Real-Time Simulation Systems Fundamentals with RT-LAB
• OP-202: Power Electronics Real-Time Simulation with eFPGAsim – eHS
• Basic knowledge of FPGA technologies

RT-XSG (XILINX System Generator) is a Simulink toolbox that enables engineers to generate custom, application-specific models that can be implemented onto an FPGA device for multiple applications. This course covers the basic concepts needed to adapt an I/O to an FPGA model with eHS.

GOALS:
- Discover the features, flexibility and limitations of FPGA RT-XSG
- Understand the overall architecture of a real-time simulator between processors and FPGA
- Learn the floating point concept
- Learn how to generate and load your firmware on the FPGA for a new application
OP-208
Communication Protocols in Real-Time Simulation

Duration: 0.5 days per protocol
OPAL-RT provides a wide range of communication protocols covering multiple fields of applications that are needed in various real-time simulation experiments. This course describes how to implement specific communication protocols, such as: Ethercat, OPC, CAN BUS, FLEXRAY, LIN, DNP3, IEC60870-5-104, IEC61850, Modbus, C37.118, Arinc 429, RS-232 or RS-485.

GOALS:
- Discover the features, flexibility and limitations of communication protocols
- Understand the architecture, modeling and operation of communication protocols through real-time simulation
- Perform hands-on exercises with communication protocols in a real-time application
OP-209
HYPERSIM Advanced Applications and Optimizations

Duration: 4 days (2h/day)
Prerequisites:
• OP-102: Introduction to Power Systems Real-Time Simulation with HYPERSIM

In the HYPERSIM Advanced Applications and Optimizations training, users will learn techniques for test automation, CPU and FPGA Simulation, benchmarking and optimizing a model, and much more. In addition, OPAL-RT will present a Hardware-in-the-Loop (HIL) demo with Arduino and Raspberry Pi.

GOALS:
- Discover new Techniques for Test Automation
- Learn the differences between CPU & FPGA Simulation
- Benchmarking and Optimizing a Model
- Practice on HIL simulation
Advanced Courses
Advanced courses are intended for users who have already acquired a basic knowledge of our Fundamental and Application-Oriented courses.
OP-301
Increasing Productivity with RT-LAB: Test Automation, Report, User Interface and API

Duration: 2 days

Performing 24/24 HIL test coverage, combining RT-LAB experimentation with another test platform or developing custom user interfaces are a few of the many applications that can improve testing efficiency. This class covers peripheral software applications which, combined with RT-LAB, will accelerate your experiments.

GOALS:

- Learn advanced Python scripting language for test automation
- Learn how to build complete user interfaces using Labview and how to perform accurate reports using ScopeView
- Discover the complete Application Programming Interface (API) architecture
- Perform hands-on exercises to develop your own customized testing interface
OP-302
Functional Mock-up Unit (FMU) Integration in ePHASORsim

Duration: 2 days

The FMU method extends the scope of study with ePHASORsim to allow users to integrate specific blocksets from an external power analysis software (PSSE, DiGSilent or others) into an ePHASORsim environment.

GOALS:
- Learn the basics needed to create an FMU for ePHASORsim using OpenModelica
- Understand the features, benefits and limitations of FMUs
- Perform hands-on exercises to create your very own FMU on ePHASORsim
OP-303

Real-Time Simulation of an Electrical Motor on FPGA

Duration: 2 days*

For HIL-testing of Electronic Control Units (ECUs), the real-time simulation of an electrical motor should be as close to reality as possible. Reaching a reliable implementation of HIL for Electric Vehicles (EV) requires a specific methodology and specific know-how. The objective of this course is to provide the notions required to succeed in your electrical motor HIL implementation.

GOALS:

- Learn FPGA electrical motor characteristics
- Successfully configure and calibrate I/Os
- Perform step-by-step implementation involving closed-loop control testing

*Two extra days are needed if implementation on a real ECU is required.*
Duration: 2 Days

RT-XSG (XILINX System Generator) is a Simulink toolbox that enables engineers to generate custom, application-specific models that can be implemented onto an FPGA device. This course is intended to design real-time FPGA applications according to your specific field of study.

Prerequisites:

GOALS:

- Discover the features, flexibility and limitations of FPGA RT-XSG
- Understand the overall architecture of real-time simulation between processors and an FPGA
- Learn the floating point concept
- Perform hands-on exercises to create a complete and accurate RT-XSG real-time simulation
OPAL-RT Academy Certifications
OPAL-RT offers a certification program for students who complete the Fundamental, Application-Oriented and Advanced Courses. Three certification levels corresponding to the three different course levels are provided. There are no final exams; the only requirements are to complete the necessary courses according to the certificate level. If, however, a student is absent for most of the training, the instructor reserves the right to determine whether a certificate should be awarded. Please contact your Sales Representative if you require custom training.

Fundamentals of Real-Time Simulation Certificate

Application-Oriented Real-Time Simulation Certificate

Advanced Real-Time Simulation Certificate
Additional Resources
Custom Training

At OPAL-RT, we believe the only limitation of real-time simulation is your imagination. We understand that needs vary and we are open to discussing any specific training that is not currently part of the existing course selections.

Please contact your Sales Representative if you require custom training.

OPAL-RT Knowledge Base

Our knowledge base is used to store simple to complex tips and tricks discovered by experienced users and Application Specialists from OPAL-RT.

Discover our knowledge base at: https://www.opal-rt.com/support-knowledge-base/

Live Events and Webinars

Complimentary technical sessions are presented live at local OPAL-RT events as well as virtually via webinars to help you obtain additional knowledge and to provide you with updates on the latest OPAL-RT product and technology developments.

Stay tuned for upcoming events and webinars at: www.opal-rt.com/events

Technical Support Resources

Technical support resources such as online product manuals and written tutorials are available on our website.

Access our resources directly at: www.opal-rt.com/technical-support

Obtain Support from an Engineer

Are you unable to gain the skill level required in the time allotted for your project? Rely on our Field Application Engineers to provide you with the service and resources you need to successfully complete your project on time.

Please contact your Sales Representative for more information.

To request a training, visit www.opal-rt.com/academy
About OPAL-RT TECHNOLOGIES

OPAL-RT is the world leader in the development of PC/FPGA Based Real-Time Digital Simulator, Hardware-In-the-Loop (HIL) testing equipment and Rapid Control Prototyping (RCP) systems to design, test and optimize control and protection systems used in power grids, power electronics, motor drives, automotive industry, trains, aircraft and other various industries, as well as R&D centers and universities.

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