Fundamentals of PSCAD and General Applications

The Professional's Power Systems Transient Simulator

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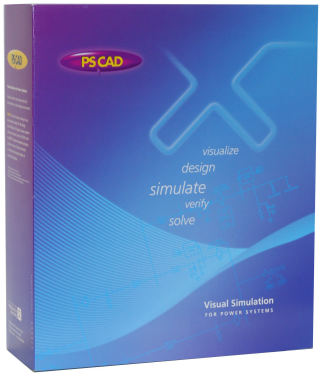

Course Benefits

PSCAD V5 introduces the new era of toolsets for the simulation of electric power systems, distribution systems, and power electronic systems. This course is designed to familiarize users with the general operation of PSCAD. With numerous hands-on examples, users will be able to develop proficiency with PSCAD V5 and its applications. While this course is aimed at new and novice users, the last 2 ½ days of the course can be quite informative for most PSCAD users.

Modern power, distribution, and electronic systems are becoming increasingly complex. Traditional single-frequency-based study and design software is unable to deliver the precision needed to confidently deliver the best engineering solution. This course will help you improve your engineering skills in this rapidly developing, competitive world.

Course Outline: 4 ½ Days

Tutorials	**Concepts/Topics/Skills learned**
Day 1: (9.00 am – 5.00 pm)	
Introduction:	About Nayak Corporation/HVDC Research Center EMT/ Dommel's Algorithm EMT Vs Steady State Vs Transient Stability PSCAD/EMTDC structure Selection of the simulation time step Studies that require simulation tools
PSCAD Environment Overview and PSCAD Useful Features:	PSCAD menu options and features in the latest version
Tutorial 1 – Getting Started and Basic Features of PSCAD:	Create, Save, and Open cases PSCAD Master Library and component ribbon tab Modelling control Modelling an electrical circuit Plots and meters Plot data export
Tutorial 2 – Simple AC System:	Modeling three three-phase electrical circuit

Transformer model
- Saturation
- Transformer energization – Inrush Current

Single line and three-phase view.
Interactive Input controls
Breaker model
Error debugging (compile and build errors, runtime errors)
Search and search results

Day 2: (9.00 am – 5.00 pm)

Tutorial 3 – Adding a Transmission Line:

Transmission line and cable model
- Transmission line data and solution methods
- Tower data
- Ground plane data
- Line constant outputs

Ferranti effect
Travelling wave
Tandem line
Subsystem splitting and parallel computing (PNI)
Multirate simulation

Tutorial 4 – Induction Machine:

Induction Machine model
- Motor starting characteristics
- Voltage dips and sags
- Component Internal Output Variables

Modelling load torque using control blocks
PI section model for cabling
Fixed load model

Tutorial 5 – Development and Validation of an AC System Model for EMT Studies

- Voltage Source Initialization
- Load flow validation
- short circuit validation
- Introduction to PRSIM

Day 3: (9.00 am – 5.00 pm)

Tutorial 6 – Page Modules and Blackbox

Page modules – Creating subpages
Blackbox
Resources Branch
Creating a custom library

Tutorial 7 – Useful PSCAD Features for Efficient Simulations

Batch Mode Simulations – Multiple Run Component
Snapshot feature - Start a case from pre-initialized settings
Voltage and current harmonic calculation
Black boxing page modules
Data arrays, merging, and Tapping
Simulating AC System Faults

- Fault model
- Fault clearing
- Switching transients
- Breaker re-closing
- DC offset in fault current
- Point on wave impact
- Trapped charge

Day 4: (9.00 am – 5.00 pm)

Tutorial 8 – Power Electronics and Renewable Power Modelling:

Power electronics devices
Gate pulse generation logic
Pulse width modulation
Single-phase full-wave rectifier
Voltage Source Converters Basics
Harmonics
Renewable Power Modelling

- Solar PV example
    - Essential components in a plant model
    - Inverter control
    - Inverter aggregation
    - Power plant controller
    - Typical Tests

Tutorial 9: Insulation Coordination:

Insulation Coordination

- Switching Over Voltages
- Temporary Overvoltages
- Network Resonance

Surge Arrestor Model

- PSCAD Surge Arrester Model
- Arrester V-I curve
- Arrester non-linear characteristics and TOV capability curve

Network Impedance and Resonance

- Frequency analysis of the network
- PSCAD Harmonic Impedance Scan Component
    - How to perform in PSCAD
    - Limitations and assumptions of the static impedance scan component in PSCAD
- System Impedance Vs Frequency Plots
    - Series Resonance Points
    - Parallel Resonance Points

PSCAD Script Feature

Day 5: (9.00 am – 1.00 pm)

Tutorial 10 - Protection	Automated generation of a large number of fault waveforms in COMTRADE format for real-time relay testing Detailed current transformer (CT) saturation models Modeling a simple relay scheme
Tutorial 11 – Synchronous Machine and Controls:	Synchronous machine model • Start-up and initialization Exciter, Governor, and Turbine models Custom generator controls Introduction to the Multi-mass model

Computer Requirements

Please bring your own laptop for the hands-on workshop. The latest version of PSCAD Professional Edition will be installed on your computer. Recommended system requirements:

- O/S supported: Windows 7 SP1 64-bit and 10 and 11 64-bit
- 8GB RAM or more of fast, high-quality RAM
- Solid State hard drive
- 64-bit operating system
- MS TCP/IP network protocol installed (i.e., a network card must be installed)
- One USB 2.0 port
- Microsoft .NET Framework 4.6.1 Full
- Microsoft Visual C++ 2017 Redistributables x86 and x64
- GNU FORTRAN 95 compiler (Public License) (GFORAN 4.21, 4.6.2, and 8.1) is included
- Optional Intel Visual Fortran
- For a complete list, click here

Cost

The course will cost US$3,000 (US$ Three Thousand) for the 4 ½ days. We will provide tutorial notes with tutorial examples. Participants are required to bring their own laptops. Lunches are provided on site. Hotel accommodation and local travel are the responsibility of the participant.

Travel and Accommodation

Hamilton is located equidistant from New York City and Philadelphia. The most convenient airports are Newark (EWR) and Philadelphia (PHL) airports. Please check the following links for local accommodation. Also, feel free to contact us if you need further assistance.
https://www.visitprinceton.org/hotels/

Cancellation

Since the course has significant hands-on content, attendance is limited to 10 participants to allow maximum one-on-one interaction with the instructors. So please try to respond as soon as possible and reserve your place. The course may be cancelled if we do not have at least 3 participants. Students will be notified two weeks prior to commencement if the course is cancelled.

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Course Date: ……..

Enrollment

(Please fill out a separate form for each participant and fax, email or mail it to Nayak Corporation)

Name	
Title	
Company	
Mailing Address	
Phone	
Fax	
Email	

Payment

- A minimum enrollment is required. Students will be notified two weeks prior to commencement if the course is cancelled.
- All prices are in US Dollars
- All prices do not include any applicable sales taxes
- Terms of payment: Net 30 days from date of invoice
- Acceptable forms of payment are Bank Draft, Wire Transfer, Check, or Credit Card.
- 4.5% convenience fee applicable for credit card payment

Credit Card Authorization

Amount (Invoice Amount)	
Credit Card #	
Expiration Date	
Name on Card	
Billing Address with Zip	
CVV #	
Signature & Date	I agree to pay the total amount shown above in compliance with the card holder agreement