



THE UNIVERSITY
of
WISCONSIN
MADISON

COLLEGE OF ENGINEERING
DEPARTMENT OF ENGINEERING
PROFESSIONAL DEVELOPMENT

**Design of
Transmission
Lines**



PLS-CADD



Two practical courses in transmission line design for design engineers and technicians...

Design of Transmission Lines, Structures, and Foundations

- Gain a solid understanding of transmission line design and behavior
- Learn how to design new transmission lines and upgrade existing ones

March 15–19, 2010 in Las Vegas, Nevada

November 8–12, 2010 in Madison, Wisconsin

Computerized Transmission Line Design: PLS-CADD Hands-On Training

- Learn how to use advanced integrated software to expedite your design and upgrade projects
- Practice using transmission line design software at your own computer

March 22–26, 2010 in Las Vegas, Nevada

December 6–10, 2010 in Orlando, Florida

Design of Transmission Lines, Structures, and Foundations

A comprehensive study of transmission design principles

March 15–19, 2010 in Las Vegas, Nevada

November 8–12, 2010 in Madison, Wisconsin

Computerized Transmission Line Design: PLS-CADD Hands-On Training

A specialized course focusing on computer-aided design

March 22–26, 2010 in Las Vegas, Nevada

December 6–10, 2010 in Orlando, Florida

Two important courses for transmission line design engineers, structural engineers, consulting engineers, design and drafting technicians, and others needing a thorough understanding of the engineering principles of transmission line design and behavior

Course Summaries

Design of Transmission Lines, Structures, and Foundations

This in-depth course will provide you with the latest criteria and practical techniques used in the design of transmission lines, structures, and foundations. Your instructors first will explain transmission design concepts and then illustrate them with design examples using traditional design methods and modern computer software. **This course does not include training in how to use the PLS-CADD computer program.**

Course topics include:

- Single and multiple pole structures
- Latticed steel towers
- Conductor design and behavior
- Line assessment and upgrading concepts
- Strength analysis for joint use
- Foundation design

This up-to-date course applies to the design of new transmission lines and the upgrade of existing ones.

Earn 3.4 Continuing Education Units (CEU) or 34 Professional Development Hours (PDH).

Computerized Transmission Line Design: PLS-CADD Hands-On Training

The purpose of this course is to teach you how to use the PLS-CADD computer program. This computer lab course includes background theory and hands-on computer modeling. Lectures will present the basic concepts, and computer exercises will illustrate them. Numerous case studies will provide a range of real-life examples.

Course topics include:

- Software system overview and terrain modeling
- Conductor design and modeling
- Structures modeling by allowable spans
- Interactive line design and generation of construction documents
- Modeling existing lines, assessment, and refurbishment
- Using detailed structure models for strength verification

This course will provide you with the training you need to be more proficient with the computer software that will make you more effective on your job.

Earn 3.2 Continuing Education Units (CEU) or 32 Professional Development Hours (PDH).

Expert Instructors

The instructors for these courses are recognized experts in their fields. They are experienced design engineers with many years of practical experience in transmission line and foundation design.

Otto Lynch

Principal Instructor

Otto Lynch is a civil/structural engineer and the primary instructor and course coordinator for both of these courses. Mr. Lynch is recognized throughout the industry as an expert in transmission line design and is one of the developers of the widely used transmission line design software program, PLS-CADD. You will benefit from his expert teaching abilities and his career-long experience in transmission line design.

Real-Life Examples

The concepts presented in these courses will be reinforced with case studies from the actual work history of your experienced instructors. These practical applications of engineering design techniques will assist your learning and show you how to apply the knowledge you gain in these courses to real-life problems you face on the job.

Design of Transmission Lines, Structures, and Foundations

March 15–19, 2010 in Las Vegas, Nevada

November 8–12, 2010 in Madison, Wisconsin

Learn How to Design New Transmission Facilities and Upgrade Existing Ones

A comprehensive design guide

At this technical course you will learn the latest criteria and practical techniques for the design of transmission line structures and their foundations. You will study various types of supporting structures, including wood, concrete, and tubular and latticed steel. You will also learn about conductor design and behavior under various operating temperatures and weather conditions. You will examine concepts for assessing and upgrading the capability of existing transmission lines. This course does not include training in how to use the PLS-CADD computer program.

Transmission capacity in short supply

Deregulation has changed the way the electric grid is being used. Power transfers have increased transmission flows and taxed the capacity of existing lines. In addition, loads have grown substantially over the last decade while few new transmission lines were built. These factors have produced a shortage of transmission capacity in many areas of the United States.

More capacity needed

New transmission lines will need to be built to meet the requirements of growing loads and operation under changing competitive markets. Where right-of-way is at a premium and new lines cannot be built, existing lines will need to be upgraded to meet growing needs.

Learn transmission design principles

Construction of new lines and upgrading of existing ones will require comprehensive knowledge of transmission line conductors, structures, and foundations. This course will give you the knowledge you need to effectively design new lines and modify existing ones to meet the future needs of the electric transmission system.

Bring Your Own Laptop Computer

Classroom exercises in transmission line design and foundation design will be computer-based. For this purpose, we ask that students bring their own laptop computers. See computer hardware and software requirements below. If you prefer to rent a computer, please indicate that choice on the enrollment form. Contact Program Director John Raksany (raksany@epd.engr.wisc.edu; 800-462-0876) if you have questions.

Computer Hardware and Software Requirements

Your laptop must have Microsoft Windows 7, XP or Vista installed. It must also have a 1 GHz or faster processor, a minimum of 512 MB of RAM, and 200 MB of available disk space. An external two-button mouse is also recommended. You must have administrative rights on your computer so that the transmission design exercise software, PLS-CADD/LITE, and the foundation design exercise software, FAD Tools 5.0, can be installed. A CD of PLS-CADD/LITE will be supplied at the course, along with a free six-month license to use this software. A FAD 5.0 set up file will also be available at the course, and you will receive a free 30-day license to use this software.

Key Course Topics

- Design criteria and loads
- Wind, ice, and broken conductor loads
- Basic sag and slack equations
- Survey data and clearance requirements
- Spotting transmission structures
- Conductor design and behavior
- Assessing existing capability
- Structural analysis for upgrading/reconductoring
- Strength analysis for joint use
- Foundations for single poles, frames, and towers

You'll Learn How To

- Analyze single and multiple pole structures
- Apply basic buckling equations to wood pole designs
- Model and analyze steel latticed towers
- Check structure strengths and line clearances
- Apply NESC overload factors

Not a Computer Software Training Course

We want to emphasize that this first course is not intended to give you advanced training on how to use the PLS-CADD transmission line design software. The companion course, *Computerized Transmission Line Design: PLS-CADD Hands-On Training*, will do that. This first course gives you a thorough review of all the major civil and mechanical engineering concepts and methods used in the design of transmission lines and foundations. The instructor introduces you to the classical analytical design methods and develops the force and moment equations using traditional lecture and Q & A techniques. He then uses PLS-CADD software to illustrate the concepts and design examples presented in this course.

Course Instructors

Dr. Anthony M. DiGioia Jr. is president of DiGioia, Gray & Associates LLC and former president and chairman of GAI Consultants. Dr. DiGioia manages major projects in various areas of civil engineering, including soil mechanics, foundation engineering, and probabilistic analysis and design of transmission lines, structures, and foundations. As an assistant professor of civil engineering at Carnegie Mellon University, he taught courses on various subjects, including soil mechanics, foundation engineering, and bridge foundation design. He is currently an adjunct professor in the Civil & Environmental Engineering Department of CMU and a member of ASCE, SAME, ASTM, CIGRE and IEEE.

Otto J. Lynch PE is a civil/structural engineer and vice president of Power Line Systems, Inc., Madison, Wisconsin. Prior to joining Power Line Systems, Mr. Lynch was with Black & Veatch for over 12 years doing civil/structural design for substations and transmission lines. He has designed several families of lattice steel transmission towers, participated in their full-scale testing programs, and worked on transmission projects ranging from 69kV through 500kV and utilizing wood, tapered tubular steel, lattice steel, concrete, and laminated wood structures throughout the world. Mr. Lynch is an experienced project manager of large turn-key transmission projects through 345kV. In addition to his real-world transmission design experience, Mr. Lynch also has extensive knowledge of computer applications related to design and analysis of transmission lines and structures. Since joining Power Line Systems in 2000, he has taught many courses and seminars on overhead line design and analysis.

Benefit from Case Studies

Your instructors, experienced design engineers, will use case studies and design examples to illustrate (1) actual applications of the concepts discussed in this course and (2) the real-world design issues you may face in the field.

Computer Software Included with Course

The transmission design concepts presented in this course will be illustrated through design examples using the line design program PLS-CADD, developed by Power Line Systems, Inc. You will receive a CD and instructions for a free six-month license to use a subset of that program (PLS-CADD/LITE) that calculates sags, tensions, loading trees, and thermal rating of overhead conductors.

The foundation design classroom exercises in this course will be worked using the foundation design software, FAD Tools 5.0. You will be able to load the FAD Tools 5.0 software on your laptop during class, and you will receive a free 30-day license to use this software. FAD Tools 5.0 is used to analyze and design direct embedded pole, drilled shaft foundations for axial, lateral, and moment loading. It is also used to analyze and design H-frame structure foundations for axial, lateral, and moment loading during uplift and compression.

Who Should Attend

This course will benefit those people involved in the design and construction of transmission line structures and their foundations. This includes:

- Transmission line design engineers
- Structural engineers
- Consulting engineers
- Design and drafting technicians
- CAD technicians
- Surveyors

Experienced individuals and those recently assigned to transmission line projects will benefit from this course.

Past Attendees Say...

"THIS HAS BEEN THE BEST TECHNICAL SEMINAR THAT I HAVE ATTENDED. THE INFORMATION WAS PROVIDED IN A MANNER THAT MAKES IT APPLICABLE TO THE DAILY ENGINEERING ACTIVITIES OF THE UTILITY INDUSTRY."

Brandon Boone, Lead Service Planner, Sumter Electric Cooperative, Inc., Sumterville, FL

"THE COURSE AND NOTEBOOK ARE EXCELLENT! THE NOTEBOOK WILL BE A GREAT DESIGN REFERENCE FOR ME IN MY DAILY JOB OF DESIGNING TRANSMISSION LINES. I REALLY LIKED THE INTEGRATION OF USING PLS-CADD, TOWER, ETC. INTO THE COURSE. VERY HELPFUL AND INTERESTING."

Michael Braithwaite, Civil Engineer, Nevada Power

"I HAVE ATTENDED SEVERAL SHORT COURSES AND THIS HAS BEEN THE BEST. ORGANIZATION, PRESENTATION, AND CONTENT WERE SUPERB. THE SPEAKERS WERE VERY EFFECTIVE IN COMMUNICATING THE MATERIALS."

Jeremy Pettus, EIT, Tennessee Valley Authority, Chattanooga, TN

Upcoming Related Courses in Madison and Orlando

Fundamentals of Substation Equipment and Control Systems

February 17–19, 2010, Orlando, FL
Course #L128

November 1–3, 2010, Madison, WI
Course #L380

Principles of Substation Design and Construction

February 22–24, 2010, Orlando, FL
Course #L129

October 27–29, 2010, Madison, WI
Course #L304

National Electrical Safety Code IEEE C2-2007

October 19–21, 2010, Madison, WI
Course #L303

To learn more about these and other courses, please contact us.

Web: <http://epd.engr.wisc.edu/utilitypower>

E-mail: custserv@epd.engr.wisc.edu

Phone: 800-462-0876

Design of Transmission Lines, Structures, and Foundations

March 15–19, 2010 in Las Vegas, Nevada

November 8–12, 2010 in Madison, Wisconsin

Course Outline

Monday

7:30 Registration

March 15–19 in Las Vegas:

The Riviera Hotel and Casino
2901 Las Vegas Boulevard South

November 8–12 in Madison:

The Pyle Center
702 Langdon Street

8:00 Welcome

John A. Raksany PE

Program Director

Department of Engineering Professional
Development

University of Wisconsin–Madison

8:15 Instruction Begins

Otto Lynch

1. Design Criteria and Loads

- Design philosophies
- Codes and standards
- Wind and ice loads
- Longitudinal loads
- Concepts of wind and weight spans

2. Behavior of Suspended Cables

- Basic sag and slack equations
- Ruling span concept
- Offset clipping
- Interaction between structures and cables

3. Loading Tree

4:30 Adjournment

Tuesday

8:00 Instruction Continues

Otto Lynch

4. Conductor Design and Behavior

- Conductor types
- Creep and permanent elongation
- Sag-tension calculations
- High-temperature effects
- Current vs. temperature relationships
- Vibration and galloping

5. Basic Structure Spotting

- Strength considerations
- Clearance requirements

6. Computer Analysis and Design Tools

- PLS-CADD/LITE
- 3-dimensional line modeling
- Examples

4:30 Adjournment

7:00 Optional Evening Session

Advanced Computer Analysis and Design Tools

- Design examples that illustrate modern computer design capabilities through use of the PLS-CADD software tool

9:00 Adjournment

Wednesday

8:00 Instruction Continues

Otto Lynch

7. Design of Wood Poles

- Unguyed and guyed

8. Design of Tubular Steel Poles

9. Design of Concrete Poles

10. Design of Wood H-Frames

11. Line Assessment and Upgrading Concepts

- Assessing existing capability
- Elevated temperature operation
- Re-tensioning/re-sagging
- Pole joint use issues
- Structural analysis for upgrading/reconductoring

12. Case Studies

4:30 Adjournment

Thursday

8:00 Instruction Continues

Otto Lynch

13. Design of Steel Latticed Towers

- Tower configurations
- Modeling for analysis
- Detailed design criteria
- Examples

Dr. Anthony M. DiGioia

14. Foundations

- How to specify, analyze, and use soil investigations
- Types of foundations

15. Foundations for Single Poles

- Analysis and design methods
- Examples

4:30 Adjournment

“EXCELLENT COURSE. THIS COURSE PROVIDED INFORMATION ESSENTIAL TO ANYONE INVOLVED IN TRANSMISSION ENGINEERING AND DESIGN.”

Richard Goddard, Manager, Transmission Engineering and Project Management, Portland General Electric

“I LIKED THE CLASS PROBLEMS—THEY PROVIDED IMMEDIATE OPPORTUNITIES TO APPLY THE THEORY.”

Richard Jinkerson, Director of Engineering, Trinity Structural Towers, Inc., Fort Worth, TX

“I REALLY APPRECIATED THE HANDS-ON CLASSROOM EXERCISE OF DOING THE LINE DESIGN MANUALLY USING TEMPLATES.”

Simon Pang, Structural Engineering Specialist, ATCO Electric Ltd., Edmonton, Alberta, Canada

“BOTH SPEAKERS ARE VERY WELL VERSED IN THE DESIGN OF TRANSMISSION LINES AND FOUNDATIONS, AND IT WAS VERY GOOD FOR ME TO REVIEW THE NUMEROUS DESIGN POINTS, ASSUMPTIONS, AND FORMULAS.”

Dennis McAninch, Staff Engineer, NV Energy, Las Vegas, NV

Friday

8:00 Instruction Continues

Dr. Anthony M. DiGioia

16. Foundations for Frames and Towers

- Factors influencing type of foundations
- Analysis and design methods
- Examples

17. Guy Anchors

3:00 Final Adjournment

Daily Schedule

The daily schedule for both courses will include morning and afternoon refreshment breaks and lunch at noon. The courses will be conducted in a smoke-free environment.

Computerized Transmission Line Design: PLS-CADD Hands-On Training

March 22–26, 2010 in Las Vegas, Nevada

December 6–10, 2010 in Orlando, Florida

Learn How to Use PLS-CADD Through Computer Exercises

The purpose of this course is to teach you how to use the PLS-CADD computer program. The course emphasizes hands-on computer modeling. Your instructor will first explain a basic transmission design concept and then demonstrate how to implement that design principle using the PLS-CADD software. Students will then execute the same design principles on their own computers. Numerous case studies will provide a range of real-life examples.

Benefit from Advanced Computer Technology

Advanced software aids transmission design process

Advanced computer programs are available to aid the transmission design engineer in the structural and geometric design of electric power lines. Computer software also makes it possible to more easily produce related construction documents such as plan-and-profile drawings and material lists.

Software not always used to full potential

While computer tools are available to greatly increase the design engineer's productivity and work quality, they are often not used to their full potential. One reason is a lack of training or understanding of advanced survey techniques, proper design criteria, line behavior, structural analysis, and drafting. A second reason is an ineffective integration of these new design tools.

Learn how to use integrated software

At this course you will have hands-on training on how to use advanced transmission design software that has integrated the various surveying, engineering, drafting, and material management functions. Your training will help you become proficient at using this advanced software and help you be more productive when using it in your work.

Get the Training You Need To Be More Effective on Your Job

The purpose of this course is to teach design engineers and technicians how to use the PLS-CADD computer program. Case studies will provide real-life examples. This course will provide you with the training you need to more effectively use PLS-CADD software on your job.

Special Features of This Course

- Background theory and computer exercises
- Review of basic line design concepts
- State-of-the-art integrated software
- Case studies

Hands-On Training...Limited Enrollment

Because this course features intensive hands-on computer training, we limit enrollment to 20 students. Enroll early to ensure your place in the class.

Computer Software Used in This Course

The computerized design tool capabilities presented in this course will be illustrated through design examples using the programs PLS-CADD, PLS-POLE and TOWER, developed by Power Line Systems, Inc. These programs and classroom example files will be installed on each classroom computer for students to use during class.

"I REALLY LIKED THE INTERMINGLED COMBINATION OF HANDS-ON COMPUTER WORK, ILLUSTRATIONS OF PRACTICAL SITUATIONS, AND UNDERSTANDABLE EXPLANATIONS OF THE ASSOCIATED PHYSICS. EXCELLENT COURSE, I LEARNED A LOT!"

Mark Hiple, Supervising Engineer, Ameren IP

Who Should Attend

This course is intended for transmission engineers, technicians, and managers who are using or planning to use computerized line design tools. This includes:

- Transmission line design engineers
- Structural engineers
- Consulting engineers
- Design, drafting, CAD technicians
- Surveyors

Bring Your Own Laptop

We ask that students bring their own laptop computers for these courses. See computer hardware requirements below. If you prefer to rent a computer, please indicate that choice on the enrollment form. Contact Program Director John Raksany (raksany@epd.engr.wisc.edu; 800-462-0876) if you have questions.

Computer Hardware Requirements

If you are already a PLS-CADD user, please bring a laptop on which you have previously run the PLS-CADD software. Your laptop must have Microsoft Windows 7, XP or Vista installed. It must also have a 1 GHz or faster processor, a minimum of 512 MB of RAM, 200 MB of available disk space, and an available USB port for hardware key connection. An external two-button mouse is also recommended. If you have not previously installed PLS software on your computer, you must have administrative rights on your computer so that the hardware key drivers can be installed. Detailed computer hardware and software information will be e-mailed to you several weeks before the course starts.

Computerized Transmission Line Design: PLS-CADD Hands-On Training

March 22–26, 2010 in Las Vegas, Nevada

December 6–10, 2010 in Orlando, Florida

Course Instructor

Otto J. Lynch PE, vice president of Power Line Systems, Inc., Madison, Wisconsin, is responsible for the technical sales and development of overhead line software. He is an expert in the PLS-CADD computer program and has conducted numerous seminars and training sessions in its use and applications. A pioneer in integrating LiDAR aerial survey data into the PLS-CADD program for transmission line rerating and reconductoring projects, Mr. Lynch is an expert in all the computer programs used throughout the course.

Course Outline

Monday

7:30 Registration

March 22–26 in Las Vegas:

The Riviera Hotel and Casino
2901 Las Vegas Boulevard South

December 6–10 in Orlando:

International Palms Resort and Conference Center (formerly The Holiday Inn–International Drive Resort)
6515 International Drive

8:00 Welcome

John A. Raksany PE

Program Director

University of Wisconsin–Madison

8:15 Instruction Begins

1. Overview and Terrain Modeling

- PLS-CADD system overview
- Presentation of projects
- How to organize project files
- View commands, opening of windows, viewing of phases and sags
- Needed terrain data and surveying techniques
- Prepare a terrain model
 - generate and edit feature codes data
 - import/generate and edit terrain files: XYZ or PFL models
 - digitize existing drawings

1.1 LiDAR Aerial Surveying

- How to use 3-dimensional survey data
- Building design models from LiDAR data
- Identifying clearance limits and potential for clearance upgrades

5:00 Adjournment

Tuesday

8:00 Instruction Continues

2. Conductor Design and Modeling

- Various conductor types
- Conductor properties: advantages and disadvantages
- Permanent deformation from overloading and creep
- Effects of high temperature on creep and strength reduction
- Conductor models in PLS-CADD
 - stress-strain charts
 - where to get conductor data
- Aeolian vibrations: how to limit
- Temperature vs. ampacity
- Line thermal rating

3. Design Criteria

- Weather data
- Wind and ice loads: gust response factors, etc.
- Conductor limits of use
- Conditions for automatic sagging
- Structure loads and safety factors
- Conditions for checking clearances
- PLS-CADD/LITE: simplified PLS-CADD module
 - quick sag/tension calculations
 - various sagging methods
 - create load files for TOWER and PLS-POLE

5:00 Adjournment

Wednesday

8:00 Instruction Continues

4. Structures Modeling by Allowable Spans

- Available structure models
 - allowable spans method
 - full analysis method
- Material lists, parts lists
- Create and edit allowable span structures

5. Interactive Line Design

- Spot structures interactively
- String and sag conductors: demonstrate four sagging methods
- Check clearances: vertical, between phases, galloping, etc.
- Check overall design efficiency

6. Generate Construction Documents

- Plan-and-profile sheets, staking lists, stringing charts, offset clipping, etc.

5:00 Adjournment

“I THOUGHT THAT THE CLASS AND CONTENT WERE WONDERFUL. OTTO LYNCH DID A GREAT JOB TEACHING THIS COURSE!”

Scott Higley, Engineering Technician,
Springfield Utility Board, Springfield, OR

Thursday

8:00 Instruction Continues

7. Modeling of Poles and Frames by Analysis

- Overview of structure programs; PLS-POLE
- Create and edit wood, steel and concrete poles/frames
- Determining allowable spans of existing structure designs

8. Modeling Existing Lines, Assessment and Refurbishing

- Modeling existing lines and structures
- Assessment, reconductoring, refurbishing, etc.
- Joint use issues and modeling
- Links to SAPS
 - limits of validity of ruling span concept
 - unbalanced ice, RSL after broken conductor, marker balls, structure deflection, etc.

5:00 Adjournment

Friday

8:00 Instruction Continues

9. Automatic Optimum Spotting

- Theory and examples

10. Checking Detailed Tower Models

- Brief overview of TOWER program capabilities
- Linkage between PLS-CADD and TOWER
- Checking and modifying older tower designs

12:00 Final Adjournment

Hotel Room Availability in Las Vegas

Please note that hotel rooms may be scarce in Las Vegas during this March period. If you plan, or tentatively plan, to attend this course, please reserve your hotel room early and before the cut-off dates listed in the accommodations section.

Four Easy Ways to Enroll

Need to Know More?

Call toll free 800-462-0876 and ask for

Program Director: John A. Raksany PE
raksany@epd.engr.wisc.edu

Program Associate: Mary Danielson
danielson@epd.engr.wisc.edu

Or e-mail custserv@epd.engr.wisc.edu

General Information

Fees

March 15–19, 2010 and November 8–12, 2010 Design of Transmission Courses: Fee of \$1995 covers course materials, break refreshments, lunches, and certificate.

March 22–26, 2010 and December 6–10, 2010 PLS-CADD Courses: Fee of \$2095 covers course materials, break refreshments, lunches, and certificate.

Cancellation

March 15–19, 2010 and November 8–12, 2010 Design of Transmission Courses: If you cannot attend, please notify us at least 7 days prior to the first day of the course, and we will refund your fee. Cancellations received after that date and no-shows are subject to a \$150 administrative fee. Due to the possibility of H1N1 influenza outbreaks, exceptions to this policy will be made for personal health reasons. You may enroll a substitute at any time before the course starts.

March 22–26, 2010 and December 6–10, 2010 PLS-CADD Courses: *These limited enrollment courses require fee payment at time of enrollment. If you cannot attend, please notify us at least 7 days prior to the first day of the course, and we will refund your fee. Cancellations received after this date and no-shows will be charged the full course fee. Due to the possibility of H1N1 influenza outbreaks, exceptions to this policy will be made for personal health reasons. You may enroll a substitute at any time before the course starts.

Location

March 15–19, 2010 and March 22–26, 2010 Design of Transmission and PLS-CADD Courses: The Riviera Hotel and Casino, 2901 Las Vegas Boulevard South, Las Vegas, Nevada. Phone messages: 702-734-5110.

November 8–12, 2010 Design of Transmission Course: The Pyle Center, 702 Langdon Street, Madison, Wisconsin. Phone messages: 608-262-1122.

December 6–10, 2010 PLS-CADD Course: International Palms Resort and Conference Center (formerly The Holiday Inn—International Drive Resort), 6515 International Drive, Orlando, Florida. Phone messages: 407-351-3500.

Accommodations

March 15–19, 2010 Design of Transmission Course: We have reserved a block of sleeping rooms at a reduced rate for course participants at the Riviera Hotel and Casino, 2901 Las Vegas Boulevard South, Las Vegas, Nevada. To reserve a room, call 800-634-6753 or 702-794-9412 and indicate that you will be attending this course under group code University of Wisconsin—Madison. Room requests made later than February 23 will be subject to availability.

March 22–26, 2010 PLS-CADD Course: We have reserved a block of sleeping rooms at a reduced rate for course participants at the Riviera Hotel and Casino, 2901 Las Vegas Boulevard South, Las Vegas, Nevada. To reserve a room, call 800-634-6753 or 702-794-9412 and indicate that you will be attending this course under group code University of Wisconsin—Madison. Room requests made later than March 2 will be subject to availability.

November 8–12, 2010 Design of Transmission Course: We have reserved a block of rooms for course participants at the Campus Inn, 601 Langdon Street, Madison, Wisconsin (\$115 single/\$130 double). To reserve a room, call the Campus Inn at 800-589-6285 or 608-257-4391 by October 16 and ask for “Design of Transmission Lines” group reservation 91304.

December 6–10, 2010 PLS-CADD Course: We have reserved a block of rooms for course participants at International Palms Resort and Conference Center (formerly The Holiday Inn—International Drive Resort), 6515 International Drive, Orlando, Florida. To reserve a room (\$97 sgl/quad), call 407-351-3500 by November 4 and mention the event: “PLS-CADD Hands-On Training.” Room requests made after November 4 will be subject to availability and at prevailing rates.



Internet:
<http://epd.engr.wisc.edu/>



Phone:
800-462-0876 or
608-262-1299 (TDD 265-2370)

Mail to:

Engineering Registration, The Pyle Center
702 Langdon Street, Dept. 108
Madison, Wisconsin 53706

Fax:
800-442-4214 or 608-265-3448

Course 1 Information

**Enroll Early.
Save \$100!**

- Please enroll me in **Design of Transmission Lines, Structures, and Foundations**

Course #L233 March 15–19, 2010 in Las Vegas, NV

Fee by February 15: \$1895 Fee after February 15: \$1995

Save \$100! Enroll by February 15

- I will bring my own laptop computer
 I want to rent a computer for a \$300 weekly fee

- Please enroll me in **Design of Transmission Lines, Structures, and Foundations**

Course #L287 November 8–12, 2010 in Madison, WI Fee: \$1995

Team discount: \$1795 per person when three or more enroll from the same organization at the same time.

Save \$200! Enroll with your colleagues.

- I will bring my own laptop computer
 I want to rent a computer for a \$300 weekly fee

- Bill my company P.O. or check enclosed



Cardholder's Name _____

Card No. _____ Expires _____



Course 2 Information

- Please enroll me in **Computerized Transmission Line Design: PLS-CADD Hands-On Training**

Course #L234 March 22–26, 2010 in Las Vegas, NV

(Enrollment limited to 20: fee payment required at time of enrollment; *see cancellation policy for this course)

Fee by February 22: \$1995 Fee after February 22: \$2095

Save \$100! Enroll by February 22

- I will bring my own laptop computer
 I want to rent a computer for a \$300 weekly fee

- Please enroll me in **Computerized Transmission Line Design: PLS-CADD Hands-On Training**

Course #L381 December 6–10, 2010 in Orlando, FL Fee: \$2095

(Enrollment limited to 20: fee payment required at time of enrollment; *see cancellation policy for this course)

- I will bring my own laptop computer
 I want to rent a computer for a \$300 weekly fee

- P.O. or check enclosed



Cardholder's Name _____

Card No. _____ Expires _____



Personal Information (Please print clearly.)

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

Phone (_____) _____ Fax (_____) _____

E-mail _____