

Educational Seven-Week Course

For Commercial and Industrial Customers

Motors and Motor Controls

This seven-week course focuses on how to optimize industrial and commercial system reliability using your motors and motor drive systems. This in-depth course will cover the following topics:

- *Direct-current motors*
- *Electrical codes*
- *Induction motor fundamentals*
- *Motor maintenance*
- *Motor controls*
- *Motor drive system efficiency*
- *Overcurrent and overload protection*
- *Starting, braking, speed control*
- *Synchronous motors*
- *Variable frequency drives*

This course will equip participants to better:

- *Understand the principles of motor fundamentals, single-phase motors, three-phase motors, motor speed control and variable frequency drives*
- *Improve motor drive systems efficiency*
- *Enhance system reliability*
- *Identify system energy savings opportunities*

Credits

Attendees may be eligible for Oregon Electrical Continuing Education Units (CEU), professional development credit hours, and will receive a certificate of completion.

- **Oregon Electrical CEU:** *21 hours. The State of Oregon Electrical Board requires attendance at all seven classes to receive full credit.*
- **Professional Development Hours:** *21 class hours. All professional engineers who work with motors and motor control systems may earn PDH credits toward license renewal, as required by the Oregon State Board of Engineering Examiners. The Oregon Section of IEEE has endorsed this course for PDH credits.*
- **Certificate of Completion:** *A certificate will be presented to participants attending at least six of the seven classes.*

Who should attend?

Designed for professionals, such as mechanical engineers, who work with HVAC or process systems involving motors and motor controls, this course will be useful to anyone who wants to improve their knowledge of electric motor drive systems.

- *Energy managers*
- *Facility managers*
- *Electrical contractors*
- *Electrical engineers*
- *HVAC technicians*
- *Lighting systems contractors*
- *Maintenance technicians*
- *State-licensed electricians*

Instructors

Each has more than 25 years experience in this industry. Your instructors bring practical, current motor system equipment and operation experience to the training. Their backgrounds include design, selection, operation, maintenance, and troubleshooting.

Time and Location

Wednesdays, Sept. 22 – Nov. 3, 2010

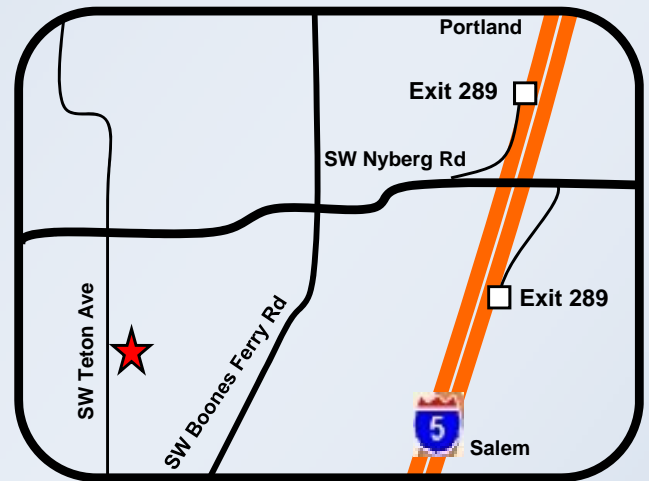
6:00 p.m. - 9:00 p.m.

Plumbers and Steamfitters UA Local 290 facility

20210 SW Teton Ave., Tualatin, OR 97062

Cost

\$495 per person; includes course manual, dinner, snacks and beverages. Groups of five or more from the same organization receive a 20 percent discount. This course is not limited to PGE Customers; it is open to all utility customers.



Registration

RSVP is requested as soon as possible.

Step One:

Email PGE.Seminars@pgn.com with the subject "Motors and Motor Controls Course." Include contact information: your name, company name, phone and mailing address, title and department, or call **503-464-8020** and press "1" with the same information.

Step Two:

Mail a \$495 tuition check payable to Portland General Electric
c/o Customer Technical Services Dept.
3WTC-BR09
121 SW Salmon Street,
Portland, OR 97204

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For more information on additional classes for PGE business customers, visit our Web site at PortlandGeneral.com/Classes. Classes may be added throughout the year. If you'd like to receive e-mail notices of new class offerings, e-mail PGE.Seminars@pgn.com.



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