



Course Offerings

Copyright

Notice

Copyright 2009 GP*Allied*, LLC. All rights reserved. Any unauthorized use, sharing, reproduction or distribution of these materials by any means, electronic, mechanical, or otherwise is strictly prohibited. No portion of these materials may be reproduced in any manner whatsoever, without the express written consent of the publisher.

To obtain permission, please contact:

GP*Allied*, LLC.

4360 Corporate Rd, Suite 110

Charleston, SC 29405

www.gpallied.com

888-335-8276



GPAllied is the most diverse reliability and operations consulting and services company in the world. Combined, our unrivaled technical expertise, solutions portfolio and global reach help you achieve rapid bottom-line improvement and sustained cultural change.

GPAllied diversity and expertise result from joining together firms with experts in Maintenance and Reliability, Operational Excellence, and Workforce Development. This winning team allows us to offer you expertise in the fields of Lean, Reliability Engineering, Six Sigma, Condition Monitoring, Change Management, Maintenance Planning and Scheduling, Workforce Development and Maintenance Craft Skills training. However, only GPAllied can offer you solutions that fully integrate these specialties.

To ensure that GPAllied provides you with latest thinking and proven best practices, we have attracted recognized experts to our team, benchmarked best-in-class operations and connected with thought leaders throughout the industry. Furthermore, we ensure that our project team members have technical expertise, as well as expertise as trainers and mentors through a rigorous qualification process and the establishment of work execution standards.

GPAllied has modeled their deliverables based on the following core beliefs:

- The reason our clients are in business is to make money
- The first step to ensuring profitability is to have reliable “systems”
- The term “system” speaks to the combination of the people who operate the equipment, the processes they follow to operate the equipment and the equipment itself
- The definition of reliable is: the ability to perform a given task, at a stated rate, for a given period of time, under a given set of circumstances
- The organization must be motivated and prepared for any change to be sustainable
- Having successfully attained reliability, sustaining the improvements is paramount to on-going success
- Optimization is achieved through the use of a culture of continuous improvement
- Clients require a rapid return on investments

To that end, GPAllied offers you a complete suite of solutions in the following categories:

- Sustained Reliable Operations
- Reliable Capital Delivery
- Reliable Maintenance Execution

GPAllied prides itself on two (2) things: our passion for helping the client and the flexibility of delivery methods.

Our passion is driven by *the satisfaction of seeing our company help our customers build, utilize and realize the power of the Return on Asset Reliability (ROAR™).*

Our flexibility in delivery methods comes in any one of four (4) different ways. Each way specifically customized to meet the unique needs of the client. Those four (4) ways are:

Training

GPAllied offers all of our deliverables as classes for the client who prefers to implement using their own people.

Coaching

For the client who wants more than a training solution, but still prefers to implement using their own personnel, GPAllied offers a combination training/coaching package. The training class is augmented by a regimen of coaching and mentoring by our experienced consultants.

Services

Some clients prefer to contract out certain functions. GPAllied can deliver our services to the client in one of two forms:

- Project Based – GPAllied personnel are on-site for the duration of the project
- Full Time Equivalent (FTE) – GPAllied personnel are on-site, full time as contracted employees

Consulting

Whether you are starting a major change initiative or looking for the best way to improve performance, GPAllied's consultants guide you as you set your direction, design and deploy your approach, and realize results.

The GPAllied vision is to be the premier global provider of sustainable transformation driving improved customer operational and reliability excellence. To that end, we believe the best way to make our vision a reality is to optimize customer business performance through customized solutions utilizing our experienced people, innovative processes, and proven technologies.



Thus achieving operational and reliability excellence sustained through the use of cultural change management with the relentless pursuit to deliver the highest return on investment.

GP*Allied's* expert team provides unparalleled solutions. You can count on us to provide the following:

- A strong foundation to ensure that your organization's systems reliably meet customer needs with lower cost
- A roadmap to build upon that foundation to streamline your processes and help you achieve a culture of sustained continuous improvement
- Effective training to develop your people
- Consultants and trainers with technical expertise, interpersonal skills, and drive to work effectively with your team
- Solutions customized to fit your needs, drawing from a diverse range of methods and services
- A rapid return on your investment

Training Classes

At GP*Allied*, we understand that you are not interested in "training for training's sake". You need hard-hitting, impactful training that addresses the specific need of your employees, delivers value for your training dollars, and produces bottom-line results.

That's what we deliver.

In today's increasingly competitive business environment, your training investment only makes sense if it yields a tangible improvement in KPI's like:

- Production efficiency
- Employee retention
- Labor costs
- Asset downtime
- Safety
- Quality control

With over 200 courses that can be easily customized to your equipment and processes, we are the one-stop shop for all of your technical and change management training needs. We offer these classes on-site at your facilities, for your employees; or periodically around the world on an open-enrollment basis.

When you select us for your training, you receive:

- Training from practitioners and implementers who are also skilled trainers.
- Courses designed with your learning objectives in mind using professional instructional system design combined with our subject-matter expertise.

You can obtain most of the courses in a format that works best for you:

- **Off the Shelf**— you can select our standard training if a generic course suits your needs.
- **Customized** — you can ask us to make minor modifications to better fit your organization's existing terminology and culture (which we can do quickly and cost-effectively), or you can ask us to develop a truly custom curriculum.

- **Public Courses** — you may decide to attend one of our expanding list of publicly offered courses, including those offered through Macomb Community College Workforce Development Institute in Warren, MI.
- **e-Learning** — for certain courses; you can select e-Learning, or a blended solution of e-Learning, instructor-led training, and coaching.

Motor Control

DESCRIPTION

This course provides information on the concepts associated with AC and DC motor fundamentals, motor control fundamentals, control of motor starting, and motors and motor controllers. The lessons cover a wide range of topics such as motor enclosures, nameplate data, AC motors, DC motors, magnetic contactors, control circuits, Wye-Delta starters, speed controllers, AC/ DC machine maintenance, and motor control circuit maintenance. Upon completion of this course, the participants will be able to explain the function, design, and construction of motor controllers; install, remove and maintain motor controllers; and identify the causes of motor controller failure.

RECOMMENDED AUDIENCE

This course is recommended for electrical maintenance technicians.

YOU WILL LEARN:

- Define motor control terms (Ampacity, Branch circuit, Circuit breaker, Controller, Duty, Equipment, Full load amps, Ground-fault circuit interrupter, Interrupting rating, Motor circuit switch, NEMA design letter, Nonautomatic, Overcurrent, Overload, Power factor, Rated full load speed, Rated horsepower, Remote control circuit, Service factor, Thermal cutout, Thermal protector).
- Describe the various types of motor enclosures.
- Describe how the rated voltage of a motor differs from the system voltage.
- Describe the basic construction and components of a three-phase squirrel cage induction motor.
- Explain the relationship between speed, frequency and number of poles in a three-phase induction motor.
- Describe how torque is developed in an induction motor.
- Explain how and why torque varies with rotor reactance and slip.
- Define percent slip and speed regulation.
- Explain how a three-phase motor's direction is reversed.
- Describe the component parts and operating characteristics of the three-phase wound-rotor induction motor.
- Describe the component parts and operating characteristics of the three-phase synchronous motor.
- Define torque, starting current, and armature reaction as they apply to DC motors.
- Explain how the direction of rotation of a DC motor is changed.
- Describe the design and characteristics of a DC shunt, series, and compound motor.
- Given a set of initial data, determine how a synchronous motor can correct the lagging power factor of induction motors by; Calculating watts, volt-amperes, and lagging vars of induction motors, Calculating watts, volt-amperes, and leading vars

of a synchronous motor, Calculating the total load of the system, Calculating the corrected power factor.

- Describe dual voltage motors and their application.
- Describe the methods for determining various motor connections.
- Describe general motor protection requirements as delineated in the National Electrical Code.
- Describe the common types of motor controller enclosures.
- Define manual control, semiautomatic control, and automatic control.
- Identify the basic symbols used in motor control circuits.
- Explain the difference between manual starters and automatic starters.
- State the effects of voltage variations on magnetic contactors.
- State the possible cause of AC hum of a magnetic contactor.
- Describe magnetic blowout contactors.
- Explain the term starting sequence.
- Describe the operation of main and auxiliary contacts.
- Define seal-in contacts.
- Describe the difference between two-wire and three-wire control.
- State the conditions under which a 120-volt control circuit may operate ungrounded.
- Describe how interlocking for reversing control is accomplished.
- Identify standard symbols on MCC feeder prints and MCC one-line diagrams.
- Identify the function of various devices using standard symbology and device numbers.
- Develop a control circuit using a variety of common control features.
- Describe the following types of voltage starting circuits; Line resistance starter, Line reactance starter, Autotransformer starter, Wye-Delta starter, Increment resistance starter, Part-winding starter, Full voltage starter.
- Describe the methods of acceleration control.
- Given an electric print of a motor starting circuit, troubleshoot basic problems associated with motor control circuits.
- Given an electrical print, identify power supplied for motor primary power and control power.
- Describe the function of two-speed consequent pole controllers.
- Describe the operation of wound-rotor motor controllers.
- Identify the reason why out of step relays are used in synchronous motor controllers.
- Explain the operation of an automatic synchronizer.
- Describe the function and operation of a counter-EMF controller.
- Describe the function and operation of a DC magnetic time limit controller.
- Describe variable frequency drives.
- Describe the operation of a vacuum contactor.
- List the most common items in motor controller inspection and maintenance.
- Distinguish between normal contact wear and abnormal contact wear.
- Identify the possible causes and suggested remedies of various contactor troubles.
- List and briefly explain six causes for rotating machinery failure.

- Describe the following types of rotating machinery maintenance; Visual inspection, Tightness check, Air gap distance, Lubrication and bearing replacement.
- Describe the following rotating machinery tests; Insulation resistance, Continuity, Vibration analysis, DC high potential, Power factor, Thermography.
- Describe the following types of brush and brush rigging maintenance; Brush rigging inspection and adjustments, Brush arm spacing, Brush inspection, Brush replacement and installation, Neutral plane setting.
- Describe the following types of commutator and slip ring maintenance; Film conditions, Surface cleaning, Resurfacing rotating conductor surfaces, Mica undercutting and repair
- List and describe various commutating surface problems, including brush flashover.
- Describe motor and generator maintenance guidelines as defined by the National Electric Testing Association (NETA).
- Describe the following types of motor control circuit maintenance and tests; Visual inspection, Tightness check, Insulation resistance, Continuity testing, Relay maintenance, Protective device functional checks, Alarms and warning lights functional test, System operational testing.
- Describe how to troubleshoot a motor control circuit fault.

CLASS DURATION

20 hours