

# Department of Electrical and Computer Engineering Electric Power and Power Electronics Institute

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## Short Course

### CONDITION MONITORING AND FAULT DIAGNOSIS OF ELECTRIC MACHINE

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#### Summary

This half day tutorial course will summarize various faults in electric machines. It would also cover the commonly used monitoring approaches in the industry to monitor the health of electric machines. Topics include a wide variety of competing approaches including vibrations and audible noise, thermal aspects, stator current monitoring for machine faults, shaft flux and broken rotor bar detection techniques. Attention is also paid to the use of modern computer based signal processing and data analysis. Several approaches to machine protection are indicated. This tutorial is designed for engineers who are interested in condition monitoring and fault diagnosis of electric machinery. A set of course notes are included as part of tutorial fee.

#### Contents

- An overview of fault detection in electrical machines.
- Description of faults in various types of electric machinery: synchronous machines, induction machines, dc machines.
- Methodologies of fault detection, past and present: Describing age-old methods such as chemical, thermal, etc. to modern techniques such as machine current signature analysis (MCSA) and other non-invasive schemes, vibration analysis, etc.
- An in-depth coverage of the non-invasive schemes with the description of various kind of fault signatures with particular emphasis on induction motors.
- Sensors and instruments used for fault detection and diagnosis in electric machines.
- Machine modeling under fault condition.
- Description of state of the art tools for diagnosis such as neural networks, artificial intelligence, fuzzy logic, expert systems, identification, observers, genetic algorithms, new signal processing techniques.
- An overview of various monitoring and diagnosis tools used in industry such as current monitoring based equipment, vibration based tools, partial discharge techniques, and etc.