

Course participants

The course is mainly dedicated to engineers, analysts and researchers in the area of reliability and risk analysis, and to developers and users of systems for Diagnostics, Prognostics and Health Management (PHM) and Condition Based Maintenance (CBM), including Controls/Diagnostic Engineers, Engineering Supervisors, Operator/Maintenance Engineers, and Program Managers.

Training Format

Lectures will be held in English. All participants will receive a complete set of the presentation slides with specific examples and case studies, selected reference lists and resources in electronic format, and a participant certificate.

The first part of the course is devoted to the presentation of advanced methods for the availability, reliability and maintainability analysis of complex systems and for the development of Prognostics and Health Management (PHM) and Condition Based Maintenance (CBM) approaches. In this respect, the basics of Monte Carlo Simulation, nonlinear regression and filter models (Artificial Neural Networks, Principal Component Analysis, Auto Associative Kernel Regression, Ensemble Systems) and evolutionary optimization methods (Genetic Algorithms) are illustrated. In the second part of the course, exercise sessions on Monte Carlo simulation, Artificial Neural Networks and Genetic Algorithms provide the participants with the opportunity of directly applying the methods to practical case studies. Finally, in the last part of the course, real applications of the advanced methods are illustrated. The applications range from the evaluation of maintenance costs taking into account the reliability and availability of equipment, to the application of Monte Carlo Simulation for availability analysis and condition-based maintenance management, to the use of regression and classification techniques for fault detection, classification and prognosis in complex industrial plants.

Course location and date

The course will be held from 9.00 to 17.00 on November 21-24, 2016 in Politecnico di Milano, Campus Bovisa, Via Lambruschini 4, Milano, Italy.

Mission and goals

The goal of this course is to provide participants with the methodological competences and the computational tools necessary to tackle critical problems in the areas of reliability, availability, maintainability, diagnostics and prognostics of industrial equipment. The course presents proven methods to improve safety, increase efficiency, manage equipment aging and obsolescence, automate maintenance and reduce maintenance costs of industrial equipment and systems.

Contents

Methods:

- Monte Carlo Simulation,
- Nonlinear regression and filter models (Artificial Neural Networks, Principal Component Analysis, Auto Associative Kernel Regression, Ensemble Systems),
- Evolutionary optimization methods (Genetic Algorithms).

Exercise sessions:

- Monte Carlo simulation for reliability analysis,
- Artificial Neural Networks for fault diagnosis in components and sensors,
- Genetic Algorithms for maintenance strategy optimization.

Applications:

- Evaluation of maintenance costs taking into account reliability and availability of equipment,
- Monte Carlo Simulation for availability analysis and condition-based maintenance management,
- Regression and classification techniques for fault detection, classification and prognosis in complex industrial plants.

Lecturers [to be confirmed]:

Piero Baraldi

*Associate professor
Energy Department
Politecnico di Milano*

Francesco Cadini

*Assistant professor
Energy Department
Politecnico di Milano*

Michele Compare

*PostDoc Researcher
Energy Department
Politecnico di Milano Italy*

Francesco Di Maio

*Assistant professor
Energy Department
Politecnico di Milano*

Enrico Zio

*Chair on Systems Science and Energetic Challenge
Fondation EDF (Electricite' de France)
CentraleSupelec*

Full Professor

*Energy Department
Politecnico di Milano*

**Advanced methods for reliability, availability,
maintainability, diagnostics and prognostics of
industrial equipment**
XIX Edition

Registration Form

Return the registration form before November 13, 2016 to courses-deng@polimi.it enclosing a copy of the bank transfer. Minimum number of participants: 6. Maximum number of participants: 30. In the case that the course will be deleted because of insufficient number of registered participants, the registration fee will be reimbursed.

Name & Surname _____

Title _____

Position _____

Company _____

Address _____

Phone _____

E – mail _____

Date & Signature _____

I authorise the processing of my personal information under D.Lgs. 196/03.

➤ DO YOU NEED THE INVOICE? YES NO

IN CASE OF INVOICE ISSUED TO YOUR COMPANY, PROVIDE THE FOLLOWING INFORMATION (in CAPITAL LETTERS):

Company Name _____

Legal Addressed in _____

VAT Number _____

IN CASE OF INVOICE ISSUED TO YOURSELF, PROVIDE THE FOLLOWING INFORMATION (in CAPITAL LETTERS):

Personal Address _____

VAT Number or Fiscal Code _____

Date and place of birth _____

Organizer institute:

Energy Department,
Politecnico di Milano

Course director

Profs. Piero Baraldi and Enrico Zio

Duration

4 days

Location

Politecnico di Milano, Via Lambruschini 4
20156 Milano, Italy

Number of participants expected: 20

The registration fee is € 1200 (full registration fee), € 750 (PhD students) to be paid via bank transfer:

- Beneficiary: Politecnico di Milano - Dipartimento di Energia
- IBAN: IT93C0569601620000001880X58 SWIFT: POSO IT 22
- Banca Popolare di Sondrio – Agenzia 21 - Via Bonardi, 4 - 20133 Milano
- reason to specify for payment: "Advanced methods for reliability, availability, maintainability, diagnostics and prognostics of industrial equipment and your name".

→ PHD STUDENTS SHOULD ATTACH TO THE REGISTRATION FORM THE ENROLLMENT CERTIFICATION PROVIDED BY THEIR UNIVERSITY.

Scholarships

The European Safety and Reliability Association (ESRA, www.esrahomepage.org) supports the course with two scholarships to be awarded to PhD students. Scholarships will be assigned considering the affinity of the research to the topics of the course, the CV and the number and impact of publications in the field.

→ IF YOU ARE INTERESTED, PLEASE ATTACH YOUR CV TO THE REGISTRATION FORM.

Scientific secretarial:

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Continuing education course
**Advanced methods for reliability, availability,
maintainability, diagnostics and prognostics of
industrial equipment**

XIX Edition

November 21-24, 2016

POLITECNICO DI MILANO



Energy Department
Politecnico di Milano

Sponsorship:

- ESRA (European Safety and Reliability Association)

Support:

- ARAMIS Srl, Milano, Italy
- Chair on Systems Science and the Energy Challenge, Fondation EDF, Ecole Centrale and Supélec, Paris, France
- CRESCI (Center for Reliability and Safety of Critical Infrastructures), Beihang University, Beijing, China
- Cluster S2D2 (Cluster Security, Safety, Defense, Disaster Management and Recovery) of Politecnico di Milano
- IEEE – Reliability Society, Italian Chapter

www.lasar.polimi.it