REGISTRATION FORM

In order to apply for this course please click the link below
https://www.polimi.it/index.php?id=5782&uid=4135
and insert your application as requested.
The deadline for the application is 27th November 2019.

Minimum number of participants: 8.
Maximum number of participants: 25.
Once the minimum number of participants is reached, you will receive a communication from the organization with all information for the bank transfer and invoice.

Pursuant to and for the impact of the new EU General Regulation on the protection of personal data n. 679/2016, the personal identification data communicated and provided to the Politecnico di Milano - Department of Energy will be processed directly and / or through delegated third parties, exclusively for the following purposes:
- registration and management of the continuing education events
- statistical purposes
- sending information and promotional material on continuing education events
The data will not be disclosed to third parties except for the purposes indicated above. The use of data for statistical purposes is also authorized in compliance with the procedures and authorizations provided for by the aforementioned legislation. The information on the processing of data and the rights of the interested party is available on the website www.polimi.it/privacy

COURSE DIRECTORS
Prof. Piero Baraldi and Prof. Enrico Zio

DURATION
4 days
9-12 December 2019

LOCATION
Politecnico di Milano, Campus Bovisa - La Masa
Via Giuseppe La Masa 34, 20156 Milano, Italy

REGISTRATION FEE
€ 1400 (full registration fee)
€ 800 (PhD students)
PhD STUDENTS SHOULD ATTACH TO THE REGISTRATION FORM THE PHD ENROLLMENT CERTIFICATION PROVIDED BY THEIR UNIVERSITY.

SCHOLARSHIP
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 candidates’ research to the topics of the course and the quality of the candidates’ CV and the number and impact of publications in the field.
IF YOU ARE INTERESTED, PLEASE ATTACH YOUR CV TO THE REGISTRATION FORM.

COURSE PROGRAM CHAIR
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POLITECNICO
MILANO 1863
DIPARTIMENTO DI ENERGIA

RAM&PHM 4.0: Advanced methods for Reliability, Availability, Maintainability, Prognostics and Health Management of industrial equipment
XXII Edition
09-12 December, 2019

Sponsorship:
ESRA (European Safety and Reliability Association) www.esrahomepage.eu

Patronage:
ARAMIS Srl, Milano, Italy www.aramis3d.com
Cluster S2D2 (Cluster Security, Safety, Defense, Disaster Management and Recovery) of Politecnico di Milano
CRESCI (Center for Reliability and Safety of Critical Infrastructures), Beihang University, Beijing, China
IEEE – Reliability Society, Italian Chapter
Laboratory of Signal Analysis and Risk Analysis www.lasar.polimi.it
COURSE PARTICIPANTS
The course is mainly dedicated to control, process, quality, reliability, safety and maintenance engineers, data scientists, data miners, researchers and PhD students in the area of Reliability, Availability, Maintainability (RAM) and fault diagnostics and Prognostics and Health Management (PHM).

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, Hilbert Huang and Wavelet transforms) 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 illustrated in the course are presented. 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 system availability analysis and condition-based maintenance management, to the use of regression and classification techniques for fault detection, classification and prognosis in industrial equipment.

COURSE LOCATION AND DATE
The course will be held in December 2019 at Politecnico di Milano, Campus Bovisa - La Masa, Room L.1.0 (Building B12).

MISSION AND GOALS
In recent years, the volume of data and information available in the industry has been growing exponentially and more sophisticated and performing analytics have been developed to exploit them.

This exciting situation offers great opportunities of optimized, safe and reliable productions and products, including optimal predictive maintenance for “zero-defect” production, with reduced warehouse costs and improved system availability with “zero unexpected shutdowns”. To grasp some opportunities, new system analysis capabilities and data analytics skills are needed. The goal of this course is to provide participants with advanced methodological competences, analytical skills and computational tools necessary to effectively operate in the areas of reliability, availability, maintainability, diagnostics and prognostics of industrial equipment. The course presents advanced analytics to improve safety, increase efficiency, manage equipment aging and obsolescence, set up condition-based and predictive maintenance.

CONTENTS
Methods:
- Statistical techniques for system reliability/availability estimation (Monte Carlo Simulation)
- Machine learning techniques for PHM (Artificial Neural Networks, Deep Learning, Principal Component Analysis, Auto-Associative Kernel Regression, Ensemble Systems, Hilbert Huang and Wavelet transforms)

Decision support systems to provide the asset managers with optimal portfolios of solution choices for reliable, safe and resilient system and process design, operation and maintenance

Models of Life Cycle Cost and optimization tools to improve the profitability of production

Exercise sessions:
- Monte Carlo simulation for system reliability/availability analysis
- Artificial Neural Networks for component fault diagnostics and prognostics

Applications:
- Evaluation of system maintenance costs taking into account the reliability and availability of equipment
- Monte Carlo Simulation for system availability analysis and condition-based maintenance management
- Regression and transform techniques for fault detection, classification and prognosis in industrial equipment

COURSE LECTURERS
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Eminent Scholar, Kyung Hee University, Department of Nuclear Engineering, College of Engineering, Republic of Korea