HOW TO PARTICIPATE
In order to apply for this course please click the link below:
https://www.polimi.it/index.php?id=5782&uid=4612&L=1

and insert your application as requested.
The deadline for the application is **10 January 2021.**

Minimum number of participants: 10
Maximum number of participants: 40
Once reached the minimum number you will receive a communication from the organization with all information about bank transfer and invoice.

DELIVERY STRUCTURE
Dipartimento di Energia – Politecnico di Milano

COURSE DIRECTORS
Prof. Enrico Zio - Department of Energy, Politecnico di Milano
Prof. Piero Baraldi – Department of Energy, Politecnico di Milano

DURATION AND MODE
The course is held **ONLINE** from 14/1/2021 to 4/2/2021 - each Tuesday and Thursday from 14:30 to 18:30 (Rome time).

REGISTRATION FEE:
€ 1400 (full registration fee)
€ 800 (PhD students)
PHD STUDENTS SHOULD ATTACH TO THE REGISTRATION FORM THE CERTIFICATE OF ENROLLMENT IN THE PHD PROGRAM OF THEIR UNIVERSITY.

SCHOLARSHIP
The European Safety and Reliability Association (ESRA, www.esrahomepage.eu) 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 quality of the 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

XXIII Edition
14 January – 4 February, 2021

Organizers:
Laboratory of Analysis of Signals and Analysis of Risk (LASAR) (www.lasar.polimi.it)
Energy Data and Information Lab (EDILAB)

Sponsorship:
ESRA (European Safety and Reliability Association)

Support:
ARAMIS Srl, Milano, Italy
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
Kyung Hee University, Department of Nuclear Engineering, College of Engineering, Republic of Korea
MINES ParisTech, PSL Research University, CRC, Sophia Antipolis, France

COURSE PARTICIPANTS

The course is mainly dedicated to control, process, quality 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.

One 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, Monte Carlo Simulation, nonlinear regression and filter models (Artificial Neural Networks, Principal Component Analysis, Auto-Associative Kernel Regression, Ensemble Systems, Deep Learning, Convolutional Neural Networks, Reservoir Computing, Particle Filter) are illustrated. In another part of the course, hands-on sessions 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 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.

MISSION AND GOAL

In recent years, the volume of data and information collected by the industry has been growing exponentially, and more sophisticated and performing analytics have been developed to exploit their content.

This offers great opportunities for 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 these 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 modern industrial equipment. The course presents advanced techniques and 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);

Bayesian filtering for prognostics (Particle Filter).

Exercise sessions:

Monte Carlo simulation for system reliability/availability analysis;

Auto-Associative Kernel Regression for fault detection;

Artificial Neural Networks for component fault diagnostics and prognostics;

Particle Filter for failure time prediction;

Applications:

Monte Carlo Simulation for system availability analysis and condition-based maintenance management

Regression and classification techniques for fault detection, classification and prognosis in industrial equipment

LECTURERS (to be confirmed)

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