PROFESSIONAL EDUCATION

SMART MANUFACTURING

MOVING FROM STATIC TO DYNAMIC MANUFACTURING OPERATIONS

Navigate the Industry 4.0 revolution with MIT.

OVERVIEW

The Massachusetts Institute of Technology (MIT) was founded in 1861 in response to the increasing industrialization of the United States and the need for applied learning in the fields of science and engineering. Just as the invention of the continuous steam engine catapulted society to new heights in the late 18th century, new technologies are pushing us towards another industrial revolution—this time, based on cyber-physical production systems. Welcome to Industry 4.0.

Smart manufacturing is a convergence of modern data science techniques and artificial intelligence to form processes that could be used in the factory of the future. Smart manufacturing is about increasing efficiency and eliminating pain points in your system. It's characterized by a highly connected, knowledge-enabled industrial enterprise where all organizations and operating systems are linked, leading to enhanced productivity, sustainability, and economic performance.

MIT Professional Education's Smart Manufacturing online program brings together cutting-edge technology like machine learning, Internet of Things, and data analytics to understand the current transformation of the manufacturing sector.

In keeping with MIT's founding principle Mens et Manus (Mind and Hand)—the synergy of theory and practice being at the heart of the learning experience—you'll learn by doing. The program centers around a smart machine—a fiber extrusion device, fondly referred to as FrED—to demonstrate concepts as well as incorporate problem-solving skills into the curriculum.

Furthermore, you'll have a chance to engage with your peers and expert learning facilitators to explore how these concepts can be leveraged in your organization. Regardless of where you are on your smart manufacturing journey, this program provides the latest thought leadership in smart manufacturing techniques. The factory of the future is here.

Leverage MIT's 100+ years of collaboration with industry to implement smart manufacturing principles. Learn how sensors, software, and systems create a smart enterprise at any scale.

WHO IS THIS PROGRAM FOR

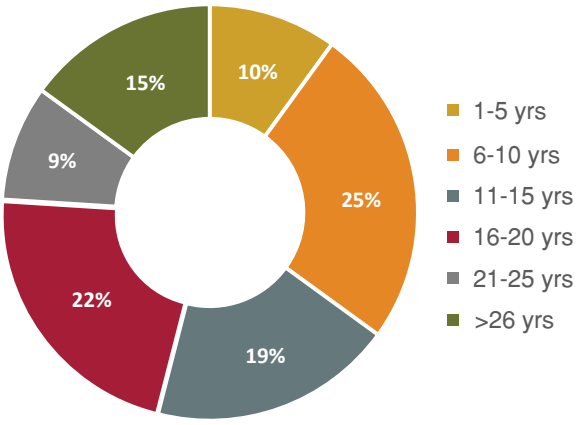
This program includes a technical element, and participants will need to quickly learn how to visualize data using Excel. However, the program material is highly accessible for those new to smart manufacturing concepts, while also being valuable for those who already have some experience with these concepts. There are no prerequisites for this program. It is designed for:

- plant managers working in manufacturing
- design and manufacturing engineers seeking to learn about data and modelling in a manufacturing environment
- data scientists looking to apply their craft to the growing field of smart manufacturing
- consultants who want to add value around the latest technology transformations in manufacturing
- functional and cross-functional teams are encouraged to attend together to accelerate the smart manufacturing adoption process

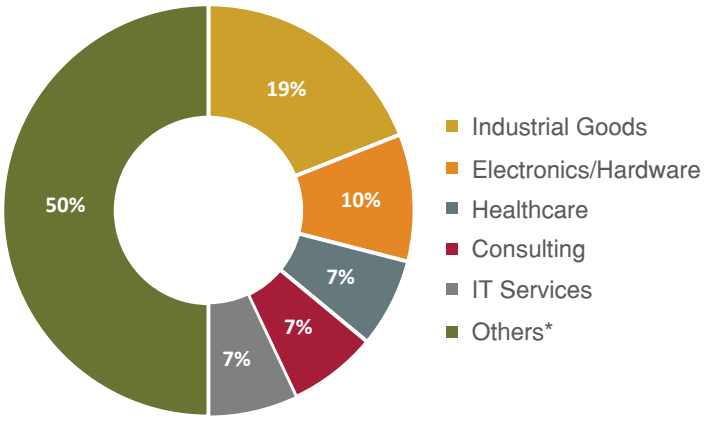
PARTICIPANT PROFILE

On your journey to learning MIT Professional Education's *Smart Manufacturing: Moving From Static to Dynamic Manufacturing Operations* online program, you'll be in good company. Past participants come from a wide range of industries, job functions, and management levels.

Work Experience



Industry



Others - includes Automotive, Packaging, Education, Energy, Telecommunications, Agriculture, E-commerce, IT Products, Fast Moving Consumer Goods, Aerospace, Defense and more*

Representative Companies

- Microsoft
- Apple
- Deloitte
- BCG
- The Boeing Company
- US Air Force
- Amazon
- McElroy Manufacturing
- Procter and Gamble
- Caterpillar
- Johnson & Johnson
- BMW Manufacturing
- Merck
- Accenture
- LnT Infotech

Representative job titles

- CEOs and Managing Directors
- Director of Automation
- CTOs and CIOs
- Design Engineer
- Chief Engineer
- Quality Engineer
- Manager of Operations
- Manufacturing Engineer
- Data Scientist
- Information Architect
- Simulations Manager
- Electrician
- Mechanic
- Graduate Research Assistant
- Global Manufacturing Analyst

PARTICIPANT TESTIMONIALS

“This course has imbibed in me the importance of data analysis and vision systems and how to efficiently and optimally use the available resources for process improvement. It has also given me a better systems-thinking approach and made me aware about the latest technology available in the market, the knowledge of which I plan to pass on to my fellow team members.”
-Tirth Shah, Manufacturing Engineer, Insulet Corporation

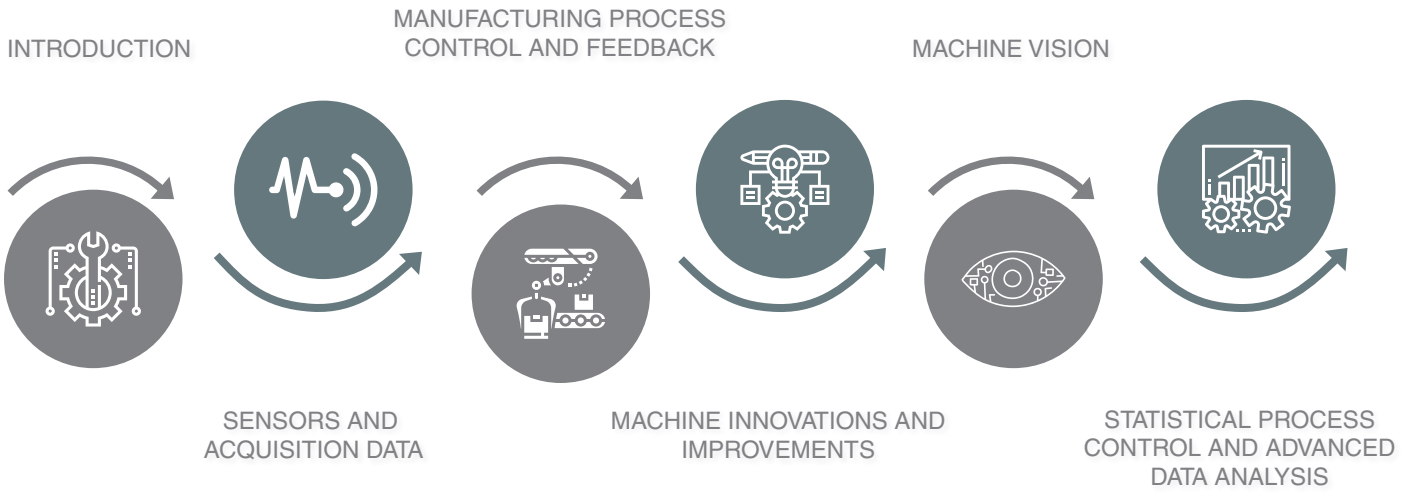
“This course has provided me the ability and capacity to build the Smart Manufacturing ecosystem, will develop and learn how to implement it.”
-Chandeshwar Singh, MES Developer, Tata Consultancy Services Ltd

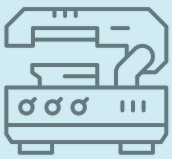
“The new knowledge will help effectively answer the common question of "what can you do" with modern systems and tools.”
-Andrew Chastain, Application Engineer, Braas Company

YOUR LEARNING JOURNEY

Which is smarter: your home or your factory? Technology assists us at home with everything from adjusting the lights and temperature to creating our shopping and music playlists. While smart technology at home is helpful, implementation in the factory or enterprise setting is transformational.

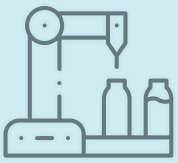
After attending this program, you will be able to understand the basic principles of smart manufacturing. You will also have seen some technologies available in the marketplace that enable manufacturing process improvements, and be able to identify areas in your work setting that would benefit from smart manufacturing techniques.





APPLICATION: FrED, ITERATING THE SMART MACHINE

Learn the basic tenets of smart manufacturing as Dr. Brian W. Anthony and his team of researchers continuously improve FrED's software and hardware components.

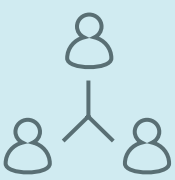


APPLICATION: INDUSTRY EXAMPLES

Explore how smart manufacturing principles have had a real impact in sports and medicine.

GUIDED LEARNING

Explore with expert learning facilitators how concepts can be applied to your organization.



PEER LEARNING

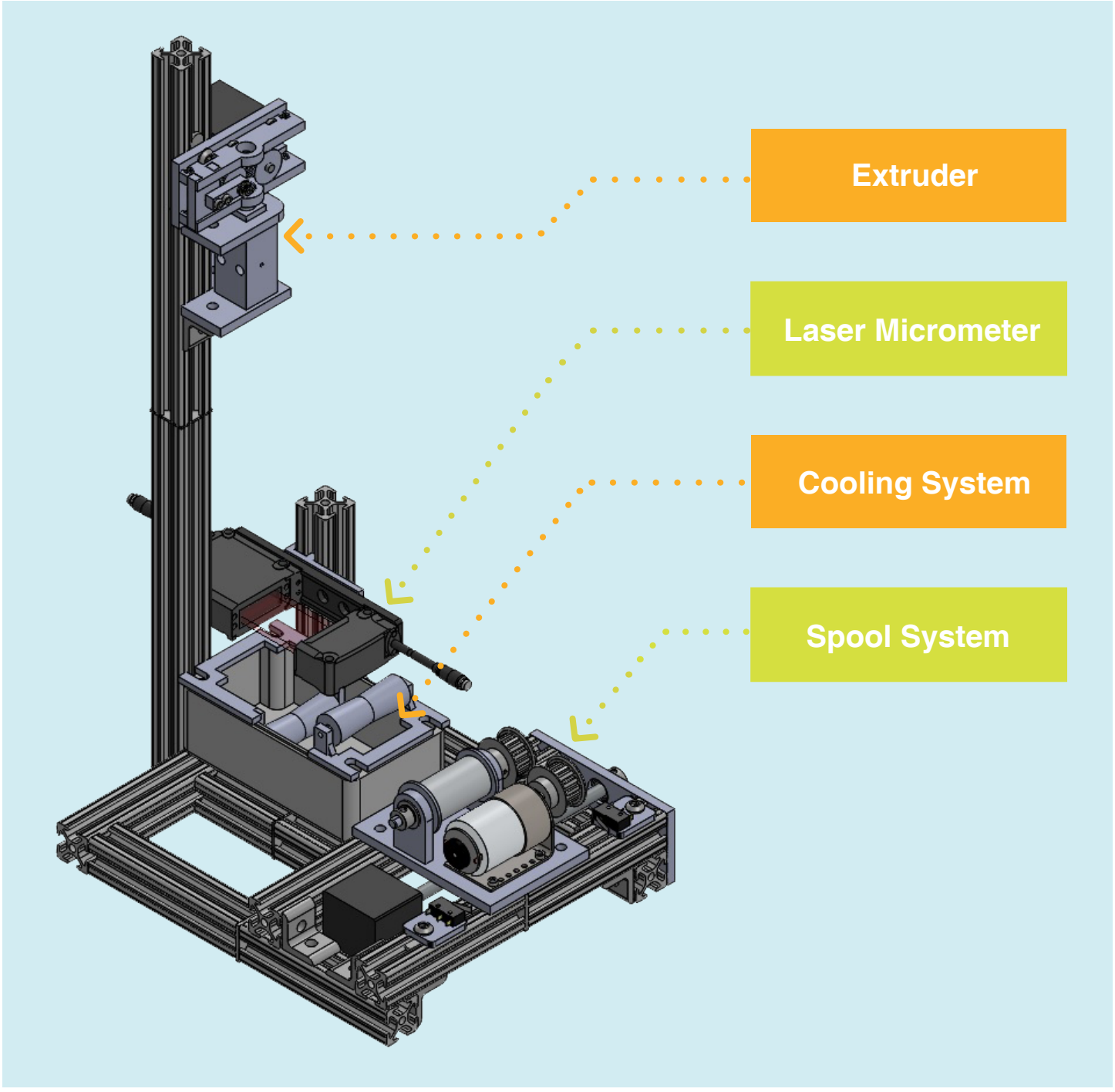
Share resources, engage in online discussions, and participate in live webinars with peers from around the world.

Note: MIT Professional Education reserves the right to change the curriculum and delivery of the program to improve the participant experience.

PROGRAM USE CASE: FrED THE SMART MACHINE

This online program is an exploration of various methods that could be applied in the factory of the future. To illustrate the key concepts, it's centered around a machine—a fiber extrusion device—fondly referred to as "FrED". The program explores FrED as a smart machine to demonstrate concepts, enabling participants to troubleshoot various aspects of FrED's sensors.

Participants collect and analyze data from FrED to generate ideas for improving the machine through an iterative process. As a result, participants can apply this same iterative process to their own situations.



PROGRAM MODULES

Module 1: Introduction to Smart Manufacturing and FrED

- Identify global trends bringing major changes to society, products, and the manufacturing process
- Learn how FrED serves as a prototype for innovations that are possible within smart manufacturing

Module 2: Analyzing Data: A Visualization Approach

- Explore the convergence of manufacturing expertise and data science expertise in the field of smart manufacturing
- Use time series analysis to understand FrED

Module 3: Modeling to Make Sense of Data

- Build models to examine and improve FrED
- Explore how the length of a production run can affect results

Module 4: Sensors

- Review the integral role that sensors play in smart manufacturing
- Evaluate sensors and assess the types of data that sensors produce

Module 5: Control of Manufacturing Processes

- Explore manufacturing process control, the role of feedback, process modeling, and monitoring
- Discuss actual versus predicted dynamics

Module 6: Machine Vision

- Take test measurements using a camera
- Explore how machines use cameras and images to inform decisions and improve the manufacturing process

Module 7: Applications of Machine Vision

- Explore applications of machine vision to video search, sports and medicine
- Discuss applications of machine vision in additional contexts

Module 8: Model Fitting and Sensitivity Analysis

- Make the connection between machine vision as a tool and statistical process control
- Explore the process of discovering best fit for a model

Module 9: Statistical Process Control

- Apply statistical process control to a manufacturing setting
- Integrate deterministic and random variation

Module 10: Advanced Data Analysis

- Work with datasets derived from manufacturing process to control multiple machines
- Explore concepts in cloud computing to control multiple machines

Note: While we make every effort to share accurate information, this curriculum is subject to change at the discretion of MIT faculty and its learning team.

PROGRAM FACULTY

DR. BRIAN W. ANTHONY

Associate Principal Research Scientist, MIT Institute of Medical Engineering & Science

Principal Research Scientist, MIT Mechanical Engineering

Director, Master of Engineering in Manufacturing Program, Massachusetts Institute of Technology

Co-Director, Medical Electronic Device Realization Center

Director of MIT.nano, MIT

Dr. Anthony is the co-director of MIT's Medical Electronic Device Realization Center and associate director of MIT.nano. With over 25 years of experience in product realization, Dr. Anthony designs instruments and techniques to monitor and control physical systems. His work involves systems analysis and design, calling upon mechanical, electrical, and optical engineering, along with computer science and optimization.

He has extensive experience in market-driven technology innovation, product realization, and entrepreneurship and commercialization at the intersection between information technology, design, and advanced manufacturing. Dr. Anthony spent the first part of his career as an entrepreneur. He advanced and directed the development of products and solutions for the industrial and scientific video markets. He has been awarded 20 patents, published over 50 peer-reviewed articles, and won an Emmy from the Academy of Television Arts and Sciences for innovations in sports broadcasting.
Dr. Anthony holds the following degrees:

- PhD in Engineering, Massachusetts Institute of Technology
- MS in Engineering, Massachusetts Institute of Technology
- BS in Engineering, Carnegie Mellon University

CERTIFICATE

Get recognized! Upon successful completion of the program, MIT Professional Education grants a certificate of completion to participants. This program is scored as a pass or no-pass; participants must receive 80 percent to pass and obtain the certificate of completion.

Participants will be awarded 6.0 continuing education units towards professional development.

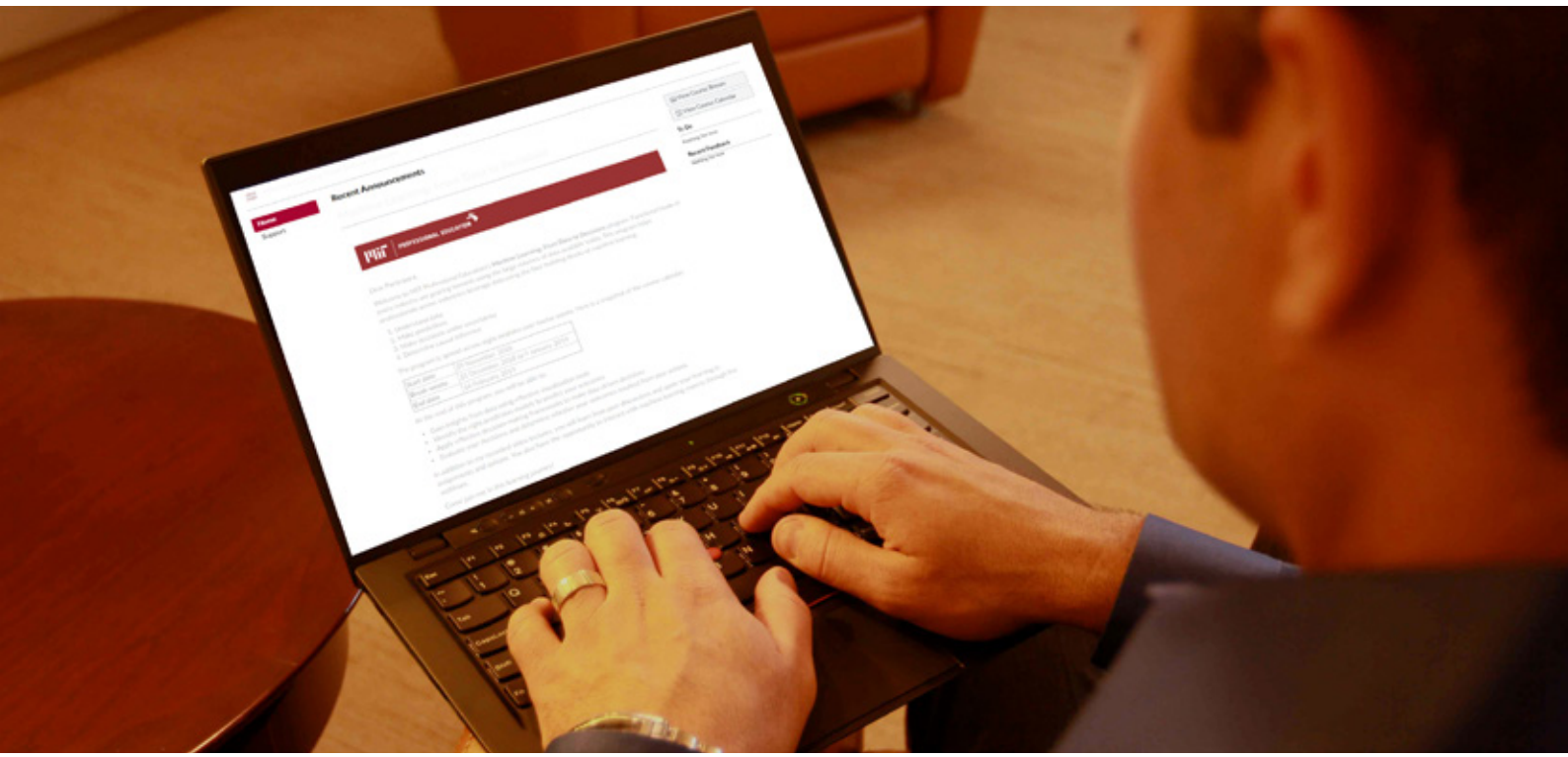
SPECIAL ACHIEVEMENT AWARD

MIT Professional Education Fire Hydrant Award

It is part of the MIT culture for students and faculty to immerse themselves in their studies and research. Attending MIT is often likened to "drinking from a fire hose" of information. For those participants who display extraordinary efforts in exhibiting that MIT ethos and demonstrate leadership by going above and beyond in their program participation, they'll be considered to receive the coveted MIT Professional Education Fire Hydrant Award. This award can be displayed in professional bios, such as on LinkedIn. Decisions are made by the program team based on active participation and behaviors that exemplify leadership and contribution to the overall program experience for the cohort.

THE LEARNING EXPERIENCE

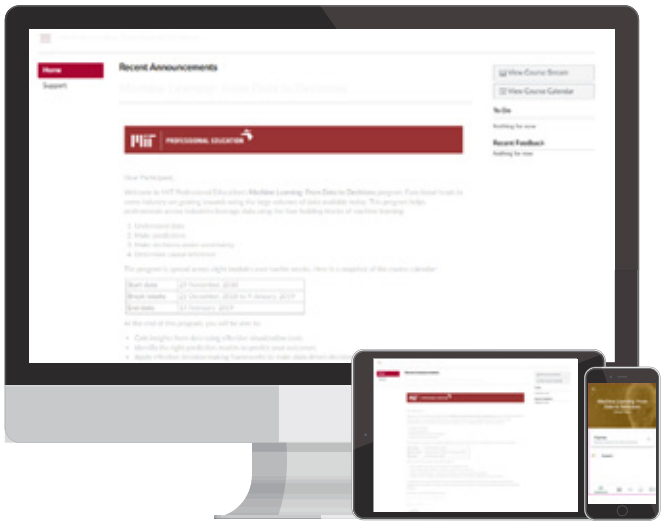
Our programs are designed to meet the needs of individual learning styles, while also leveraging the power of peer learning. This is achieved through a user-friendly learning platform that enables participants to easily navigate the program content to achieve learning objectives.



KEEPING IT REAL

Our pedagogical approach is designed to bring concepts to life, including:

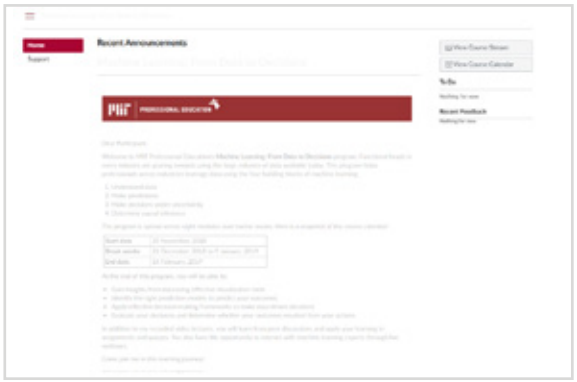
- Byte-sized learning techniques
- Real-world application
- Peer learning discussions
- Simulation
- Live interactive teaching



KEEPING IT CONVENIENT

Access to program content is flexible and available through multiple devices, allowing working professionals to easily manage schedules and learn remotely—anytime, anywhere. Participants enrolled in the program obtain access to learning materials in a modular approach, with new content released weekly. Program modules include a variety of teaching instruments, such as:

- Video lectures
- Discussions
- Class materials
- Assessments
- Assignments



To further personalize the program modules, live teaching sessions are scheduled during the program, often with Q&A. For participants who are unable to attend these sessions live, a recording is made available so nothing is missed. Our industry-leading learning platform allows participants to create a profile, connect and collaborate with peers, and interact with learning facilitators. Assignments are often linked to participants' real-world situations, making these concepts inherently practical.

Our globally-connected classrooms enable participants to seamlessly interact with their peers to complete group assignments and stay on track towards program completion—having some culturally enriching encounters along the way.

Program Requirements

To access our programs, participants will need the following:

- Valid email address
- Computing device connected to the Internet: PC/ laptop, tablet, or smartphone
- The latest version of their preferred browser to access our learning platform
- Office suite and PDF viewer to read content such as documents, spreadsheets, presentations, PDF files, or transcripts

Other Requirements

Programs may necessitate the usage of different software, tools, and applications. Participants will be informed about these additional requirements at the registration stage or during program commencement. Our program advisors are also available to respond to any queries about these requirements.

PROFESSIONAL EDUCATION

DURATION

10 weeks, online
excluding orientation
4-6 hours/week

PROGRAM FEES

$2,800

Delivered in collaboration with

EMERITUS

CONNECT WITH A PROGRAM ADVISOR

Email: mit@emeritus.org

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