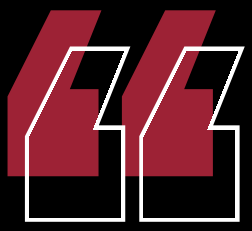

PROFESSIONAL
EDUCATION
Digital Plus+
Programs
Professional Certificate Program in
Sustainability



We are truly at one of the most critical points in human history. We are teetering on irreversible environmental destruction, and governments and businesses around the world are racing to implement sweeping policies related to sustainability.

Prof. John E. Fernández

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What is Sustainability?

In a complex and unpredictable world,organizations rise to the occasion when they:Apply strategies to design and develop product families on a common platform. **Sustainability means analyzing, advocating for, and factoring in environmental issues when making decisions and developing strategies.** This typically means considering the long-term impact of an organization's footprint rather than simply focusing on short-term profits.

Sustainability is rapidly expanding as a priority for businesses and organizations as awareness of its necessities for the future of civilization and the planet increases among the public. As this priority is raised across the public, so is **the need for knowledgeable sustainable management across a multitude of fields**. Organizations are looking for leaders who can translate this ambition into concrete plans that mesh with other business goals.

Olivier de Weck
Professor of Aeronautics and Astronautics and Engineering Systems, MIT

"How we choose to design and build the future infrastructure systems will play a large role in terms of the survival and well-being, not just of us as a civilization, but our planet as a whole".

About this Certificate

Will you lead the charge forward towards a more optimized and sustainable future? Why is sustainability so important for industry and the world at large? The full scope of 'Sustainability' covers a range of topics from our global environment to industries and infrastructure, to complex geopolitical dynamics. All are inextricably interconnected.

Understanding the limitations of our outdated systems at every level, in every field, is a critical first step in understanding how we can begin to envision a better way forward.

Sustainable companies are more profitable than their less sustainable counterparts, performing above the market average in over three to five year's time. Many organizations have exceptionally ambitious goals, but the challenge is deciding what to do, and where to invest first, and how to achieve the wanted level of sustainability. In this present situation, having a good understanding of sustainable management will be crucial for future business leaders.

12 months | 8-10 hours a week | Online

Certificate Structure

Realizing our current state of sustainability is essential. From here we must highlight how to evolve, enhance, and implement our systems for the future. MIT Professional Education's Professional Certificate in Sustainability is designed to integrate the totality of this knowledge and its application under one umbrella so that professionals can better execute sustainable practices in their chosen sectors or areas of influence.

This professional certificate has been tailored to address the past, present, and future of sustainable management in a modality that addresses what must realistically be done for the well-being of posterity, as well as the planet at large.

APPLY NOW

Core Courses

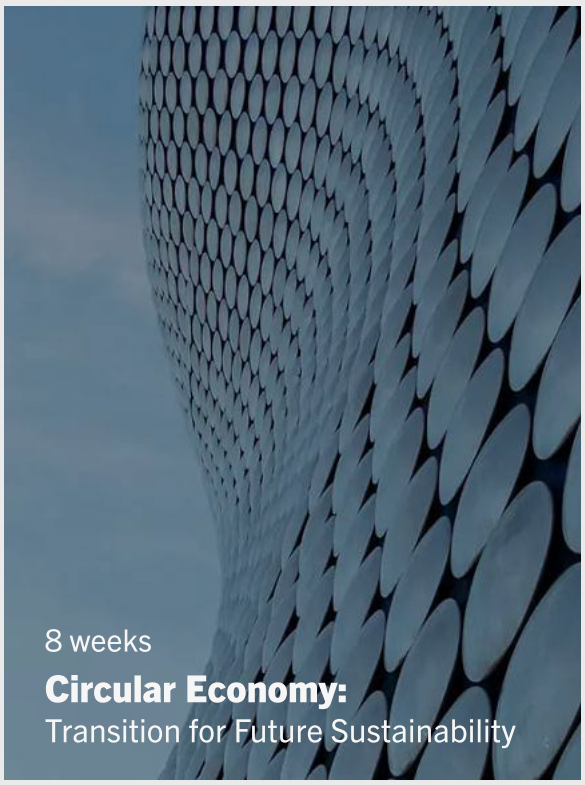
In this 12-month online program, participants will explore these five courses in-depth, to discover how to better understand and implement Sustainability.

At this critical point in our planet's history, we must work to correct the environmental damage that we are causing as a collective species. Further, it is essential to understand how we can optimize our sustainable practices as an integrated component of business and industry. Learn to adopt the necessary tools for improving sustainability in your own business operations, exploring history, measurements, and implementation tactics.

Discover how to plan and implement sustainable infrastructure systems for the future. Inadequate and dilapidated infrastructures pose a grave threat to human life and stifle economic potential. In the US alone, underinvestment in infrastructure negatively impacts GDP, employment, personal income, and global trade, costing the typical household an average of $3300 per year.* With systems theory as a basis, you will learn how to measure sustainability, study interlinkages, and extract data for planning to create optimized infrastructure systems.

*American Society of Civil Engineers' Failure to Act Report

Life Cycle Assessment (LCA) is a process to evaluate the environmental burdens associated with a product, process, or activity by identifying and quantifying energy and materials usage and environmental releases, to assess the impact of those and to evaluate and implement opportunities to effect environmental improvements.



This course provides a fundamental understanding of the meaning and evolution of a circular economy and the roles of material science, economic and institutional structures, and technology. We will begin with a global perspective of circularity and its measurement and assessment at this scale, carefully comparing and contrasting biotic and abiotic cycles. We will then look at circular economies through a systems approach, examining frameworks and policy at an institutional level and making use of analytical tools that allow us to evaluate circularity. Finally, we will explore innovation and evolution in this area with a focus on circular economies at the corporate level, through specific examples like water, metals and waste recycling and others.

Effective strategies for climate change mitigation through data-informed analysis are essential. Using insights to make strategic decisions will secure a healthy future for our planet by supporting a transition toward clean energy systems. This course presents a holistic and quantitative picture of climate change solutions to meet emissions reduction targets providing you with a deeper knowledge of the climate problem, current solutions, and pathways for reaching climate goals set by governments and companies.

APPLY NOW

The Learning Experience

At MIT Professional Education we believe in practical applications and encourage participants to implement what they have learned. Through our programs, participants are given the tools to make their learning experience as fulfilling as possible. Participants will have the chance to participate in an engaging and collaborative classroom environment with discussion forums and group activities.

The program is 100% online, and the virtual campus is available anytime, anywhere. It is a space for continuous learning, taking you beyond the limitations of a traditional classroom.

There are no prerequisites for this certificate. The certificate will guide and prepare you to understand all the content and complete the required activities.

Key Takeaways

MIT Professional Education's Professional Certificate in Sustainability seeks to equip professionals from various industries with the skills and expertise they need to improve sustainability in their given spheres of influence. As a participant, you will also discover the relevant datadriven tools necessary to convert the knowledge acquired from this program into real-world, actionable strategies to employ in your own organizations.

Throughout this professional certificate, you will:

01 **Identify the root causes of environmental decline** that have caused economic and social damage, leading to an increased and urgent need for sustainable practices.

02 Effectively **assimilate information from a wide range of fields** related to sustainability.

03 Explore **metrics and evaluation methods** for determining sustainability of the different components of systems.

04 Describe **key technologies that enable the circular economy** including materials recycling, water purification, and gas treatment.

05 **Analyze and critique the outputs of circular economy** models and simulations to gain confidence in existing outputs.

06 **Calculate different measurements** of sustainability.

07 **Map out interactions between components,** identifying feedback and potential unintended consequences, as well as system lock-in.

08 Estimate the **rates of change needed in determinants of greenhouse gas** (GHG) emissions.

09 Formulate **policies directed at promoting real-world,** effective sustainable practices.

Participant Profile

This Professional Certificate is designed for professionals from a multitude of backgrounds interested in climate change mitigation efforts and innovation opportunities, as well as those with a desire to make meaningful changes in the way they approach and implement Sustainable Practices regarding infrastructure and industry.

In this course, participants will examine the numbers and science behind climate change mitigation targets and will analyze solutions from engineering, policy, and business. The prospective participants poised to benefit most from the expertise and skills shared through this course include:

Engineers and technical professionals looking to take a data-informed approach to devising climate change mitigation solutions that are informed by an understanding of the role and evolution of various energy technologies.

C-suite executives and mid-to-senior-level managers seeking to develop an understanding of the concepts and key definitions of systems theory and its relation toinfrastructure development and engineering.

Policymakers and development agencies interested in gaining insights into sustainable infrastructure improvements and development to support economic growth while working toward targets such as the UN SDGs.

R&D, finance, and investment managers seeking insights into how to best optimize their energy-related portfolios through better anticipation of technological breakthroughs in the field.

Climate Consortium members who aim to vastly accelerate the implementation of large-scale, real-world solutions to meet climate change challenges, while inspiring transformative climate progress across industries and across the globe.

Consultants seeking to provide their clients with innovative and sustainable infrastructure solutions for business problems while demonstrating credibility and capability through a respected course.

Industries and sectors that are very material-intensive wanting to mitigate the impact that they have on the environment and seek out more sustainable and effective methods in the construction process of their materials.

Professionals in the fields of marketing, sales, business development, market analysis, consulting, policy, and entrepreneurship will also benefit from the resources offered in this program.

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Instructors

Dr. Afreen Siddiqi

Research scientist, MIT and AdjunctbLecturer in Public Policy, Harvard Kennedy School

Dr. Afreen Siddiqi is a research scientist at MIT and an adjunct lecturer of Public Policy at Harvard Kennedy School.

Her research develops systems-theoretic methods, with data-driven analysis, for novel insights to inform design and policy for engineered systems. The methods combine simulation, optimization, and decision analysis.

Her recent work has focused on new hydropower, desalination, wasteto- energy, and agriculture systems, and on understanding the systemic interconnections between water, energy, and food security.

"As we optimize resource extraction and energy production and use, we need to shift our focus to understanding the interconnectedness of our finite resources."

Siddiqi earned her S.B. in mechanical engineering, S.M. in aeronautics and astronautics, and Ph.D. in aerospace systems, all from MIT.

She received the Rene H. Miller Prize in Systems Engineering and was a recipient of the Amelia Earhart and Richard D. Dupont fellowships.

Siddiqi has co-authored one book and over 90 publications in some of the world's foremost technical and scientific journals.

Prof. Elsa Olivetti

Associate Director, MIT Climate and Sustainability Consortium

Esther and Harold E. Edgerton Associate Professor, Department of Materials Science and Engineering, MIT

Elsa Olivetti is the associate director of the MIT Climate and Sustainability Consortium and the Esther and Harold E. Edgerton Associate Professor in MIT's Department of Materials Science and Engineering at MIT. Her research centers on improving the environmental and economic sustainability of materials in the context of growing global demand.

Her interests span three levels of materials production: operational level, industrial network level, and market-level strategies. She is focused on two areas with the potential for significant environmental benefits: improving the sustainability of materials through increased use of recycled and renewable materials, recyclingfriendly material design, and intelligent waste disposition; and understanding the implications of substitution, dematerialization, and waste mining on materials markets.

Olivetti earned a BS in engineering science from the University of Virginia, and a Ph.D. in materials science and engineering from MIT.

"Life cycle assessment is a key tool for firms and governments to evaluate environmental footprints and develop pathways to achieve the net zero future we so desperately need."

Dr. Jeremy Gregory

Executive Director, MIT Climate and Sustainability Consortium

Dr. Jeremy Gregory is the Executive Director of the MIT Climate and Sustainability Consortium. He studies the economic and environmental implications of engineering and system design decisions, particularly in materials production and recovery systems.

Gregory's research topics include product and firm environmental footprinting, manufacturing and life-cycle cost analysis, and characterization of sustainable material systems. He has applied these methods, often with industry partners, to a range of products and industries, including cement, buildings, automobiles, electronics, consumer goods, and waste treatment and recovery. He earned a BS in mechanical engineering from Montana State University, and an MS and PhD in mechanical engineering from MIT.

"I have always been drawn to life cycle assessment because of its holistic perspective and power to illuminate the drivers of impact for a product, process, or firm."

Professor Fernández is, first and foremost, a practicing architect who has designed more than 2.5 million square feet of new construction in major cities around the world including New York City, Tokyo, and Shanghai.

His work in sustainability began with research regarding materials for high performance buildings, low-energy residences, and urbanization.

Prof. John E. Fernández

Director of the MIT Environmental Solutions Initiative and Professor of the Building Technology Program in the Department of Architecture at MIT.

> "The sustainable future is a sociopolitical, economic, and cultural reality that values human life and makes resources available to the generations of today and tomorrow."

Founded the MIT Urban Metabolism Group to focus his research on the resource intensity of cities as well as on design and technology pathways for future urbanization, taking part in projects across four continents.

A member of more than 15 organizations, the most prestigious of which is his role on the Board of Directors of the Building Envelope Technology and Environmental Council of the National Institute of Building Science; New Ecology, Inc; and the Center for Sustainable Energy of the Fraunhofer Institute.

A proud author of two books and numerous articles in scientific and design journals, as well as a speaker for conferences and symposia around the world

Prof. Olivier de Weck

Professor, Aeronautics and Astronautics and Engineering Systems, MIT

Olivier De Weck is a leader in systems engineering research. He focuses on how complex man-made systems such as aircraft, spacecraft, automobiles, printers, and critical infrastructures are designed and how they evolve over time. In addition, he studies strategic properties that have the potential to maximize lifecycle value and reduce programmed obsolescence.

Since 2001, his group has developed novel quantitative methods and tools that explicitly consider manufacturability, flexibility,
commonality, and sustainability, among other characteristics. In his research, de Weck emphasizes excellence, innovation, and combining theory and practice.

“Technology is the deliberate creation and use of objects and processes to solve specific problems”.

De Weck holds a degree in industrial engineering from ETH Zurich and an M.S. in aeronautics and astronautics from MIT

He earned his Ph.D. in aerospace systems from MIT.

Previously, he was an engineering program manager on the F/A18 aircraft program at McDonnell Douglas.

Prof. Jessika Trancik

Professor, Institute for Data, Systems, and Society, MIT

Jessika Trancik is an associate professor in the Institute for Data, Systems, and Society at the Massachusetts Institute of Technology. Her research examines the impacts of technologies and the reasons behind technological change.

She has developed theory and predictive models to understand why some technologies improve faster than others, and what technology features enable rapid innovation.

Trancik has developed models for forecasting technological change, which inform engineering design, public policy, and investment portfolios. Several of her theories and models have been applied to new and developing energy technologies, such as solar energy and batteries, and to electricity and transportation systems. Her models have also been used to inform government innovation policy, and applied in diverse industries, including finance, healthcare, manufacturing, software, and consumer products. Her work has been published in journals such as Nature, Proceedings of the National Academy of Sciences, Nature Energy, Nature Climate Change, and Environmental Science and Technology, and has been featured by news outlets such as the New York Times, Washington Post, Financial Times, and NPR.Washington Post, Financial Times, and NPR.

> “To succeed in reducing global greenhouse gas emissions, one should use the most powerful tool for amplifying the benefits of each investment: technology innovation.“

Professor Trancik received her B.S. from Cornell University and her Ph.D. from the University of Oxford as a Rhodes Scholar.

Trancik develops data-informed models to evaluate the economic and environmental impacts of energy technologies over time and space.

Trancik’s models for forecasting technological change have informed engineering design, public policy, and investment portfolios.

Program Outline

Course 1

Sustainability: Strategies and Opportunities for Industry

- Sustainability
- Materials and energy I
- Materials and energy II
- Circular economy for sustainable production and consumption
- Cities, resources, and the global economy
- Ethics of Sustainability
- Global opportunities in the Anthropocene
- Sustainable development and the grand transition

Course 2

Sustainable Infrastructure Systems: Planning and Operations

- History and Pioneers of Systems Research
- Systems Theory: Definitions and Concepts
- Sustainability and Infrastructure
- Infrastructure Planning: Decision Analysis with Multiple Objectives

Course 3

Life Cycle Assessment: Quantifying Environmental Impacts

- Life Cycle Assessment Overview
- Goal and Scope
- Life Cycle Inventory
- Life Cycle Impact Assessment
- Interpretation to Support Decisions
- Case Studies

Course 4

Circular Economy: Transition for Future Sustainability

- The Circular Economy Concept and Aspiration
- Systems Theory: Definitions and Concepts
- Sustainability and Infrastructure
- Infrastructure Planning: Decision Analysis with Multiple Objectives
- Planning Under Uncertainties Toward Understanding Dynamics: Mapping Interactions
- Measuring and Monitoring: Target Setting and Monitoring
- Adaptability for Sustainability: Path Dependence, Lock-In, and Flexibility
- Systems Analysis Case Studies

Course 5

Clean Energy Solutions: Technological Change to Meet Emissions Reduction Targets

- Emissions Scenarios and Climate Change
- Evaluation of Energy Systems
- Technology Change Trajectories in Energy
- Models to Inform Investments in Clean Energy and other Climate Solutions
- Energy and Climate Change Policy

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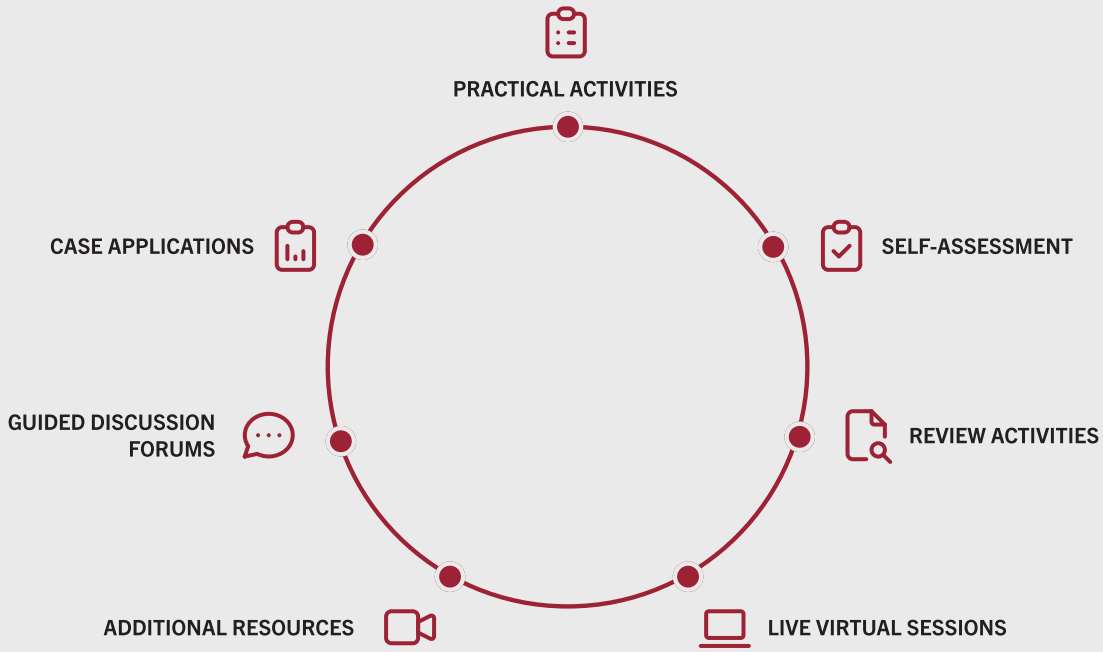
Methodology and Assessment

All the courses included in the Professional Certificate in Sustainability take place in highly collaborative environments, fostered by discussion forums and group activities. In this practical, results-driven program you will get a hands-on learning experience based on the case method. Plus, you will acquire skills and tools that you can immediately use to benefit your organization and your career.

Participants will be guided throughout all courses by expert facilitators who will be on hand to answer any questions and respond to comments.



Impact Project

The Impact Project is a cross-cutting project that runs throughout the Professional Certificate. It is group work, which serves as a culminating academic experience.

This project is designed for the student to reflect on the topics covered throughout the certificate, make a practical application of such knowledge, integrate, and connect the knowledge acquired in each of the courses and perform, together with their working group, a presentation, and defense of the proposed solution to the business challenge posed

In addition to the above, the project has several additional objectives such as enhancing teamwork, verbal communication skills, research skills, planning and the ability to solve complex problems.

Learning Facilitators

The program will be supported by Learning Facilitators. These senior consultants are subject matter experts, with vast industry experience. They will be available to answer questions, to probe to generate deeper discussion, and to facilitate a collaborative, positive learning experience via discussion forums and live video sessions.

Professional Development Webinars

Throughout the professional certificate, participants will be able to participate in 4 professional development webinars with subject matter specialists. Each of these sessions, which will last 1h, will take place in the fourth week of each module, distributed as follows:

- Fourth week of the program in **Sustainability. Strategies and Opportunities for Industry program.**
- Fourth week of the program in **Infrastructure Systems. Planning and Operations.**
- Fourth week of the program in **Life Cycle Assessment: Quantifying Environmental Impacts**
- Fourth week of the program in **Circular Economy. Transition to the Sustainability of the Future**

The topics to be covered in these sessions are as follows:

Session One	Personal Branding
Session Two	Communication Skills
Session Three	Negotiation skills
Session Four	Networking and the headhunter ecosystem

* Sessions may change depending on the availability of the speaker and MIT Professional Education's academic portfolio

Certificate of Completion

All participants who successfully complete the **Professional Certificate Program in Sustainability** will receive an MIT Professional Education Certificate of Completion. In addition, they will also earn 36.6 Continuing Education Units (MIT CEUs*).

In order to obtain MIT CEUs, participants must complete a required MIT CEU confirmation form. MIT CEUs are calculated based on the number of learning hours in each course.

The Continuing Education Unit (CEU) is defined as 10 contact hours of ongoing learning to indicate the amount of time they have devoted to a non-credit/non-degree professional development program. To understand whether or not these CEUs may be applied toward professional certification, licensing requirements, or other required training or continuing education hours, please consult your training department or licensing authority directly.

Welcome to the gateway

to MIT knowledge and expertise for professionals around the world.

155

Participants from 155 countries

+1600

More than 1,600 online activities

92%

92% of Professional Alumni rated their experience as outstanding

About MIT Professional Education

MIT Professional Education fosters the development of innovative leaders equipped to address complex problems globally

MIT Professional Education provides continuing education courses and lifelong learning opportunities for science, engineering, and technology professionals at all levels, from around the world. Worthy of note is that **MIT professors and lecturers lead and teach all MIT Professional Education offerings**. Some of our programs have a long history. Others are relatively new.

Our Digital Plus Programs go beyond online, blending innovative content delivered using the best of online technology and traditional classroom instruction in a flexible, collaborative learning environment.

MIT Professional Education is central to MIT's vision. It fulfills the mandate to connect practitioner-oriented education with industry and incorporate industry feedback and knowledge into MIT education and research.

The Institute is committed to generating, disseminating, and preserving knowledge while working with others to apply this **knowledge for the benefit of humankind.**

Bhaskar Pant
Executive Director of MIT Professional Education

"MIT Professional Education's goal is to make education accessible to everyone everywhere. We welcome everyone who wants to advance in their career or grow their business to unite and be part of the MIT Professional Education all-inclusive community."

Corporate Courses

At MIT Professional Education, we are committed to accompanying organizations as they aspire to provide their professionals with the ongoing education critical for **success in today's competitive environment**. That's why we offer plans for companies who wish to train their professionals with us.

Which program best suits your organization's needs?

1

Standard Program:
Teams or groups of at least 10 people will obtain special conditions in their registration for any of our programs.

2

Custom Programs:
Custom-made to meet the specific needs of each organization and its professionals.

3

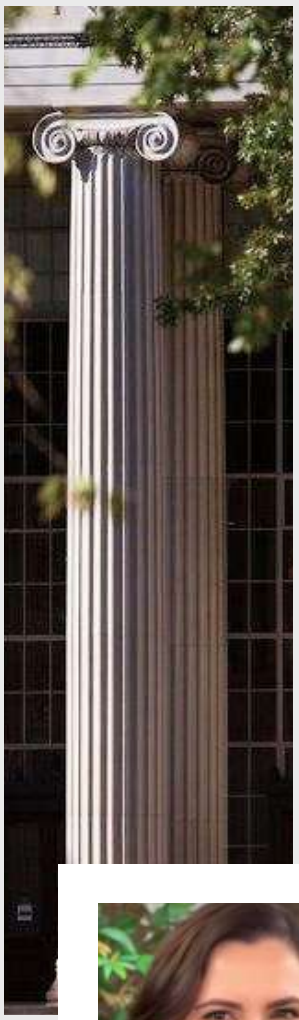
Private Cohorts:
Available in Open Enrollment courses with a minimum of participants.

For more information on our Programs for Organizations, please contact us at: **professionalprograms@mit.edu**

The Beyond Online Methodology

MIT Professional Education is **revolutionizing the digital learning experience**. In fact, we are no longer talking about online-only, but rather an **interactive and collaborative learning experience** that's digitally powered: a **Beyond Online experience.**

You will have access to one of the most innovative e-learning platforms that utilizes the latest technology.You will also have an opportunity to meet and work with some of the world's leading subject matter experts in their respective fields.



With MIT Professional Education, you'll have an opportunity to:

- Attend select live webinars with MIT Instructors.
- Collaborate and engage with world-renowned MIT Instructors.
- Learn from expert learning facilitators, guest speakers, and subject matter experts from industries.
- Weekly live webinars from learning facilitators.
- Fulfill your reskilling and upskilling needs in this fast-changing environment.
- Master the technical and human skills necessary for effective leadership.
- Meet and network with other program participants from all around the world.

Clara Piloto
Director of Global Programs at MIT Professional Education

"MIT Professional Education's programs tackle all the technologies that are at the heart of the digital transformation, enabling dedicated professionals to meet new challenges in the Fourth Industrial Revolution and lead change within theirorganizations."

Benefits of Joining the Alumni Community

MIT Professional Education offers **a number of benefits for participants** who successfully complete our courses:

1. **Certificate Award Ceremony at MIT's Campus in Cambridge**, Massachusetts, where participants will receive a physical diploma
2. **Two years' access to the virtual campus once the program is completed.**
3. **Unlimited news updates.**
4. **Unlimited access to webinars.**
5. **15 % discount for MIT Professional Education** online programs and short duration in-person programs.
6. **Exclusive announcements** of new courses, programs, and events through our **virtual Alumni Campus: Professional Network.**
7. Invitation to the **MIT Professional Education Alumni LinkedIn group.**
8. **Networking opportunities** with other MIT Professional Education Alumni.
9. In addition to **academic facilitator,** you'll be assigned a coach.

APPLY NOW

PROFESSIONAL EDUCATION
Digital Plus+ Programs

Are you ready to positively impact your sphere of influence with profound sustainable changes?

Frequently Asked Questions

For more information, please contact us:
+1 617 870 0270
Email: **professionalprograms@mit.edu**
Website: **https://professionalprograms.mit.edu**

global alumni
-excellence or nothing-