PREDICTIVE MULTISCALE MATERIALS DESIGN

PROFESSIONAL EDUCATION

OVERVIEW

From AI to multiscale modeling, master the state-of-the-art computational methods that are revolutionizing the materials design world. Over the course of five days, you'll delve into innovative applications for polymers, metals, and ceramics, as well as composites and sustainable construction materials, as you:

- Explore a variety of computational tools, ranging from multiscale modeling to machine learning to artificial intelligence
- Discover strategies for coupling computational tools to manufacturing methods
- Learn how superior material properties in nature can be mimicked to create new technologies

Through lectures and hands-on labs, you'll gain the skills, strategies, and best practices you need to fabricate a vast array of advanced, innovative designs for a wide-range of applications.

This course was previously titled *Multiscale Materials Design*.

EARN A PROFESSIONAL CERTIFICATE IN DESIGN & MANUFACTURING

This course may be taken individually or as a part of the Professional Certificate Program in Innovation & Technology or the Professional Certificate Program in Design & Manufacturing. Learn more at **shortprograms.mit.edu/d&m**.

LEAD INSTRUCTOR:
Markus Buehler

COURSE DATES: June 1 - 5, 2020

COURSE LENGTH: 5 days

COURSE FEE: $4,500

CEUs: 2.9

WHO SHOULD ATTEND

This course is designed for scientists, engineers, managers, and policy makers working in the areas of materials design, development, manufacturing, or testing. Tailored to individuals who want to optimize material structure and performance, the course will be of particular interest to those in industries that build on a material interaction platform (such as pharmaceuticals, regenerative medicine, energy, or civil engineering). In addition, the course will encompass mechanical properties such as biomaterials and implants, adhesives, construction materials, and structural materials for the aero-astro, manufacturing, and automotive industries.

Computer Requirements: Laptops are required for this course. Software used will include Visual Molecular Dynamics and web-based tools. Please note that tablets will not be sufficient for the computing activities performed in this course.

REGISTER and learn more at **shortprograms.mit.edu/mmd** or email **shortprograms@mit.edu**

PREDICTIVE MULTISCALE MATERIALS DESIGN

PARTICIPANT TAKEAWAYS

- Discover practical problem-solving computational tools and experimental techniques used to probe, understand, and design the ultimate structure of materials
- Apply tools to predict mechanical properties such as strength, toughness, deformability, and elasticity, as well as optical, thermal, and electronic properties
- Leverage multiscale tools in energy recovery and sustainable materials and structures
- Demonstrate the synthesis of computationally designed hierarchical composites using 3D printing and other advanced manufacturing techniques, as well as conduct mechanical testing
- Evaluate the use of computational tools in materials design (synthesis and testing)—molecular mechanics, nanotechnology, multiscale and hierarchical materials, and emerging materials technologies
- Gain the best practices needed to perform state-of-the-art techniques, such as molecular dynamics, molecular mechanics, and coarse-graining

INSTRUCTOR

MARKUS J. BUEHLER is the McAfee Professor of Engineering and Head of the MIT Department of Civil and Environmental Engineering. He directs the Laboratory for Atomistic and Molecular Mechanics, leads the MIT-Germany program, and is Principal Investigator on numerous national and international research programs. Prof. Buehler's primary research interest is designing better materials from less, by using a combination of high-performance computing, new manufacturing techniques, and advanced experimental testing. In particular, Prof. Buehler blends bio-inspired materials design with high-throughput approaches to create materials with architectural features from the nano- to the macro-scale, and applies them to various domains that include automotive composites, energy technology coatings, and innovative and sustainable construction materials.

Prof. Buehler is a sought-after lecturer and has given hundreds of invited, keynote, and plenary talks throughout the world. His scholarly work is highly cited and includes more than 350 articles on computational materials science, biomaterials, and nanotechnology—many of which have been featured in high-impact journals such as *Nature* and *Proceedings of the National Academy of Sciences*. He authored two monographs in the areas of computational materials science and bio-inspired materials design, and is a founder of the emerging research area of materiomics. Prof. Buehler is a dedicated educator and a gifted teacher, and has appeared on numerous TV and radio shows to explain the impact of his research to broad audiences. In 2016, he was awarded the Foresight Institute Feynman Prize for his advances in nanotechnology.

PROFESSIONAL EDUCATION

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