Schedule – Predictive Multiscale Materials Design Short Course 2020

Instructor: Markus J. Buehler (email: mbuehler@MIT.EDU). *This course will be delivered in a live virtual format.*

Time	Monday 6/1	Tuesday 6/2	Wednesday 6/3	Thursday 6/4	Friday 6/5
8-8:45 am	**REGISTRATION**				
9-10:15 am	Introduction: Materials by Design, from Atoms to Structures, Advanced Computing to Manufacturing **L1**	Materiomics: Fundamentals and Applications of Bioinspired Design by Categorization **L5**	Advanced Simulation Methods: Reactive Force Fields, Chemical Modeling, Quantum Training and Machine Learning **L7**	Performance of Materials in Extreme Conditions: Resilience, Stability, Catastrophic Failure: Connecting Experiment, Modeling and Theory **L9**	Materiomics Case Study III: Natural and Synthetic Spider Webs in 2D and 3D; Experiment, Modeling and Additive Manufacturing of Advanced Materials **L11**
10:15-10:30 am	**COFFEE BREAK**	**COFFEE BREAK**	**COFFEE BREAK**	**COFFEE BREAK**	**COFFEE BREAK**
10:30-noon:	Hierarchical Materials & Structures: Biological Design, Feynman Paradigm and Artificial Intelligence (AI) **L2**	Predictive Design: Multiscale Self-assembly & Additive Manufacturing; Fundamentals, Implementation, and Examples **L6**	Materiomics Case Study II: Modeling, Design, Manufacturing and Characterization of *De Novo* Hierarchical Composite Materials **L8**	Survey of Quantitative Multiscale Experimental Tools; Translational paradigms; Modeling in Science, Art and Music and Cross-disciplinary Synthesis **L10**	Supercomputing Tools, Code and Software Architecture; Cloud Simulations, Big Data & Analytics, Machine Learning and AI, Outlook **L12**
12:00-1:00 pm	**LUNCH (on your own)**	**LUNCH (on your own)**	**LUNCH (on your own)**	**LUNCH (on your own)**	Concluding Lecture, Future Opportunities Group Discussion; Certificates **L13**
1:00-3:00 pm	Fundamentals of Computational Materials Science: Concepts, Implementation and Examples, Physics and Data-driven Methods **L3**	**LAB LECTURE 1**: Hands-on Molecular Modeling – From the Bottom Up (includes simulation case studies, data analysis, visualization)	**LAB LECTURE 2** INTRO LECTURE: Bioinspired Materials & Additive Manufacturing; Hands-on Application of Machine Learning and AI in Materials Design	**LAB 3**: Participants work on Group Assignments (work done in groups, in the classroom, mentored by the instructor)	*Adjourn*
3:00-3:15 pm	**COFFEE BREAK**	**COFFEE BREAK**	**COFFEE BREAK**	**COFFEE BREAK**	
3:15-5 pm	Materiomics Case Study I: Bio-inspired Surface Engineering (Gecko Nanotechnology & Adhesion) **L4**	**LAB 1**: Interactive Case Studies (participants give short presentations, interactive discussion)	**LAB 2:** Bioinspired Materials & Additive Manufacturing, Materials Processing Laboratory (virtual lab tour, videos, and live demo by the instructor)	**LAB 3 (cont'd):** Presentations and Discussions, time for open Q&A (interactive group activity)	