Time	Monday	Tuesday	Wednesday	Thursday	Friday
7-7:45 am	REGISTRATION				
3-9:30 am	Introduction: Materials by Design, from Atoms to Structures, Advanced Computing to Manufacturing L1	Materiomics: Fundamentals and Applications of Bioinspired Design by Categorization Case study: Molecular mechanics of viral proteins In-class 3D printing – setting up (various additive methods and integration with computing and computer vision) L5	Advanced Simulation Methods: Reactive Force Fields, Chemical Modeling, Quantum Training and Machine Learning, High-throughput material screening (materials genome) L7	Performance of Materials in Extreme Conditions: Resilience, Stability, Catastrophic Failure: Connecting Experiment, Modeling and Theory Case study: Molecular mechanics and earthquakes L9	Materiomics Case Study III: Natural and Synthetic Spider Webs in 2D and 3D; Experiment, Modeling and Additive Manufacturing of Advanced Materials Live dissection of a hierarchical spider web structure, neural network modeling (GAN and NLP) and structure generation L11
9:30-9:45 am	COFFEE BREAK	COFFEE BREAK	COFFEE BREAK	COFFEE BREAK	COFFEE BREAK
9:45-12:30:	Hierarchical Materials & Structures: Biological Design, Feynman Paradigm and Artificial Intelligence (AI): Nanoengineering hierarchical materials to meet industrial needs L2	Predictive Design: Multiscale Self- assembly & Additive Manufacturing; Fundamentals, Implementation, and Examples In-class design studio and 3D printing of optimized materials (continuum optimization and microstructural modeling) L6	Materiomics Case Study II: Modeling, Design, Manufacturing and Characterization of <i>De Novo</i> Hierarchical Composite Materials – turning weakness to strength In-class coding exercise – machine learning convolutional classifier development, cloud computing demonstration L8	Survey of Quantitative Multiscale Experimental Tools; Translational paradigms; Modeling in Science, Art and Music and Cross- disciplinary Synthesis, category theory Vibrational material model live demonstration L10	Supercomputing Tools, Code and Software Architecture; Cloud Simulations, Big Data & Analytics, Machine Learning and AI, neuromorphic computing, quantum computing, outlook L12
12:30-1:00 pm	LUNCH (on your own)	LUNCH (on your own)	LUNCH (on your own)	LUNCH (on your own)	Concluding Lecture: Future Opportunities
					L13
1:00-2:30 pm	Fundamentals of Computational Materials Science: Concepts, Implementation and Examples, Physics and Data-driven Methods L3	LAB 1: Hands-on Molecular Modeling – From the Bottom Up (includes simulation case studies, data analysis, visualization)	LAB 2 INTRO LECTURE: Bioinspired Materials & Additive Manufacturing; Hands-on Application of Machine Learning and AI in Materials Design, Virtual and Augmented Reality (AR/VR)	MATERIALS DESIGN CLINIC 1: MIT.Nano Lab tour 1-1:30pm Machine learning, data collection, feasibility. Working with problems shared by participants for real-world solutions.	Adjourn
2:30-2:45 pm	COFFEE BREAK	COFFEE BREAK	COFFEE BREAK	COFFEE BREAK	
2:45-4 pm	Introduction to machine learning clinic Materiomics Case Study I: Bio-inspired Surface Engineering (Gecko Nanotechnology & Adhesion), industrial applications of multiscale modeling and AI in materials engineering L4	LAB 1 (cont'd): Interactive Case Studies (participants give short presentations, interactive discussion)	LAB 2 (cont'd), 2-4pm: Bioinspired Materials & Additive Manufacturing, Materials Processing Laboratory (virtual interactive lab tour, videos, and live demo by the instructor)	LAB 3: Presentations and Discussions, time for open Q&A (interactive group activity)	Color code: Black font – lecture activity, blue font – interactive work, lab tour/activity dark blue = reception/networking In-class interactive simulations performed via in-browser cloud computing (access to internet via browser required)
4-5:30 pm	RECEPTION (includes participant introductions) 1-236 (Spofford Room)	Optional: Time for Group Work and Assignments (can be arranged within groups at other times), Instructor is available for personal meetings	Optional: Time for Group Work and Assignments (can be arranged within groups at other times); Instructor is available for personal meetings		