

SPRING 2024

# MSE 690 SEMINAR SERIES

FRIDAY, MARCH 1ST | 3:30 REFRESHMENTS | 3:45PM SEMINAR | ARMS 1010

## *“Future Topics in Materials Science: From the Digital Transformation to Programmable Materials”*

**Abstract:** The talk will be structured into two parts and given by two presenters.

The digital transformation of Materials Science and Engineering represents a paradigm shift in how we conduct research and brings forth many opportunities as well as challenges. This evolution seeks to expedite materials development, processing, lifetime predictions, and the sustainable practices of reuse and recycling, paving the way for a circular economy. A cornerstone of this paradigm shift is the collaborative creation of a materials knowledge graph grounded in aligned ontologies, coupled with a distributed FAIR data research platform.

Second part: Programmable Materials represent a new frontier in MSE, as they incorporate algorithms into their design and structure, thus enabling them to have functionalities and abilities beyond just physical properties. The design of Programmable Materials means to facilitate changes within the crystalline, molecular as well as mesoscopic meta materials' structure to react e.g. on thermal or mechanical inputs. This allows a different quality of interaction with the environment. Furthermore, inspiration can be drawn from biological systems, which have complex physical computing mechanisms that allow them to adapt to changing environments, can self-repair, and even 'learn' from repetitive external stimuli. After a short introduction, we will show some examples and deep dive into one of them to explain the underlying ideas and challenges.



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