**Bioinspired soft materials systems for controlling cellular microenvironments: from synthetic extracellular matrices to multidimensional disease models**

Prof. April M. Kloxin, Ph.D.

Centennial Development Associate Professor of Chemical & Biomolecular Engineering

Departments of Chemical & Biomolecular Engineering and Materials Science & Engineering, University of Delaware, Newark, Delaware, U.S.A.

The properties of the microenvironment in which cells reside, from structure and mechanics to biochemical content, increasingly are recognized as important drivers of cell function and fate, including in the onset and progression of disease (e.g., late cancer recurrence and fibrosis). Soft materials inspired by these complex systems and designed to mimic key features of them offer unique opportunities to probe and direct cellular functions in multiple dimensions and to test hypotheses about the role of specific extracellular cues relevant to both tissue regeneration and disease processes. In this seminar, I will share our recent efforts to design reductionist synthetic mimics of complex collagen-rich microenvironments, from their integrin binding sites and hierarchical structures to their dynamic and non-linear viscoelasticity. Specific applications of these and other engineered systems will be discussed for the creation of relevant multidimensional controlled cell culture models that can be interrogated with a range of molecular tools for unique insights into cellular responses. This multipronged approach to understanding cell-microenvironment interactions is providing new materials-based tools and mechanistic insights for addressing currently intractable diseases, including lung fibrosis and late cancer recurrence.