

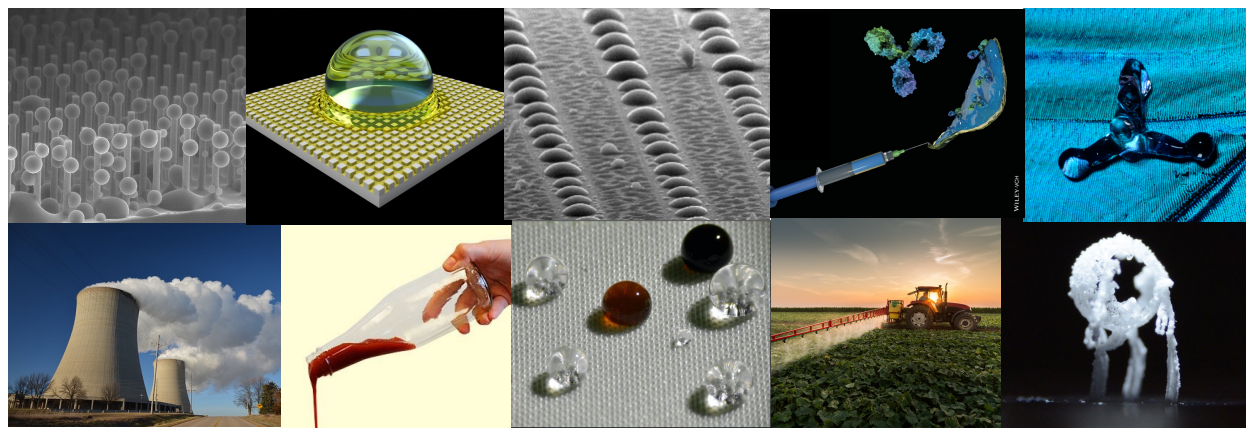
2.S984 – Interfacial Engineering – Fall 2021

Mechanical Engineering
Massachusetts Institute of Technology

Lectures: Monday – Wednesday 11-12.30

Instructor: Prof. Kripa K. Varanasi

Units: 12 (3-0-9)



Course Description:

Interfacial interactions are ubiquitous in multiple industries including energy, water, agriculture, medical, food processing, transportation, and consumer packaging. Many transport processes are typically bottlenecked at interfaces and designing them appropriately can significantly enhance performance. This course will address how surface/interface chemistry, morphology, thermal, and electrical properties can be engineered across multiple length scales for significant efficiency enhancements. Topics include surface tension and wetting phenomena, thermodynamics of interfaces, surface chemistry and morphology, nonwetting and superwetting surfaces, super-slippery surfaces, drop bouncing, charged interfaces and electric double layer, intermolecular forces, Van der Waals and electrostatic double-layer forces, DLVO theory, electrowetting and electro-osmotic flows, surfactants, phase transitions, condensation and boiling, adhesion of ice and crystals, and bio-interfaces. Manufacturing and scale-up approaches, robust materials and processes, and entrepreneurial efforts to translate these technologies into useful products and markets will also be discussed. Specific examples of industrial relevance and applications to energy, water capture, agriculture, and consumer products will be discussed throughout the course.