Carbohydrates (or glycans) are the most abundant class of biomolecules on the planet that are known to play critical metabolic, structural, and functional roles in all biological systems. Given the dense coating of diverse glycan molecules on essentially all cell membrane (e.g., O-linked glycoconjugates displayed on the glycolalyx of mammalian cells or polysaccharides embedded within plant cell walls) and biomolecule surfaces (e.g., N-linked glycoproteins), it is not surprising that glycans play a critical role in cell biology such as mediating interfacial interactions of host cells with infectious or symbiotic agents (e.g., bacteria, viruses), drugs, antibodies, hormones, enzymes, and intercellular signaling receptors amongst numerous other functions. But we are still far from elucidating the role of glycans in the design, engineering, and regulation of biological systems spanning from the molecular to organismal level, unlike other fields of biotechnology like genomics and proteomics. The role of glycans in living systems can be better understood by creating robust biotechnology and analytical toolkits that can uncover the ‘sweet’ rules of life governing the biosynthesis, organization, and ultimately deconstruction of these complex biomolecules.

The Chundawat Research Group at Rutgers University is developing protein and glycan engineering (or broadly glyco-engineering) toolkits along with applying advanced bioprocessing and biophysical techniques to address fundamental scientific and engineering problems relevant to healthcare, bioenergy, and biomaterials research. Here, the speaker will highlight key advances being made in the broader areas of glyco-engineering and biomanufacturing using Carbohydrate-Active enZymes (CAZymes). He will specifically highlight some novel strategies being developed in his group to evolve CAZymes for chemoenzymatic synthesis of designer oligosaccharides as prebiotics/antibiotics, autonomous N-linked glycoproteins characterization for enabling continuous biological drugs manufacturing, single-molecule imaging & visualization of how CAZymes/cells assemble and deconstruct cell wall polysaccharides, and designing supercharged CAZymes for efficient bioconversion of waste cellulosic biomass to fermentable sugars for biofuels production.

BIO: Dr. Chundawat is a tenured associate professor at the Department of Chemical and Biochemical Engineering at Rutgers University – New Brunswick (New Jersey, USA). He has 18 years of multidisciplinary expertise working with carbohydrate-active enzymes (CAZymes), protein modeling and engineering, carbohydrate chemistry, biomanufacturing, and developing novel analytical techniques for characterization of glycans and protein/CAZymes-glycan interactions. He received his B.Tech. in Chemical Technology from the Institute of Chemical Technology (Mumbai, India) in 2004 and his Ph.D. in Chemical Engineering from Michigan State University (East Lansing, Michigan, USA) in 2009. He held a postdoctoral staff scientist position at the Great Lakes Bioenergy Research Center from 2009-2011 and at the University of Wisconsin-Madison (Department of Biochemistry, Wisconsin, USA) from 2012-2014. He also held a joint adjunct/research assistant professor position at the Department of Chemical Engineering & Materials Science at Michigan State University before joining Rutgers University in January 2015.