CVEN 5594: Water Reuse

Course Description:
Globally ~ 800 million people do not have access to clean drinking water. Here in United States population growth, climate change, and extreme weather events (including severe droughts and wildfires) are putting great stresses on many water supplies. This is leading to water scarcity and water quality issues. At the same time, several billions of gallons of wastewater are discharged to the environment every day. In addition, more stringent nutrient limits on these wastewater discharges to protect rivers, lakes, and estuaries are placing additional burdens on utilities throughout the country, many of which are facing affordability issues. Innovative solutions are needed to solve the nation’s water crisis in a sustainable manner. Treating and reusing wastewater for potable and non-potable needs (termed water reuse) is one such solution.

This course will explore the issues surrounding water reuse. In addition to discussing the theory and application of advanced treatment processes, this course will cover the social, regulatory, safety, and operational aspects of direct potable reuse and other reuse applications. Design of treatment facilities and several case studies will be covered. The goal is to provide a theoretical and practical understanding of various physical/chemical unit operations, with direct application of these operations to the design and operation of water reuse treatment systems. Students will be able to use the concepts learned in this class to better understand the design and operation of engineered treatment systems in the context of a sustainable future that will allow them to pursue careers in the consulting, utility, or regulatory fields. Classes will be supplemented with field trips and outside speakers.

Instructor: William Becker, PhD, PE, BCEE
- Corporate Water Practice Leader at Hazen and Sawyer
- 25 years consulting experience
- 5 years utility experience
- Formerly adjunct professor at Columbia and Johns Hopkins University
- Consulted for several large utilities including New York City, Philadelphia, Los Angeles, and Denver on a variety of water issues

Schedule: Mondays 5:30 pm – 7 pm at SEEC (note that the time will likely be moved earlier after the start of the semester)

Topics to be covered:
- Drivers for water reuse and sustainable utilities
- Why and how we treat water and wastewater
- Types of reuse: potable (“toilet-to-tap”), nonpotable (e.g. irrigation, industrial, etc.)
- Contaminants of emerging concern
- Ensuring safety and water reuse regulations
- How to design treatment plants and develop cost estimates
- Membrane-based treatment systems (microfiltration/reverse osmosis/UVAOP)
- Non-membrane-based systems (ozone/biological filtration/GAC/advanced oxidation)
- Operational considerations
- Case studies