

## **Semester B: Environmental micropollutants & emerging contaminants**

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### **Background**

Micropollutants are biological or chemical contaminants that make their way into ground and surface waters in trace quantities (at or below the microgram per liter level) because of human activities. These contaminants include natural and synthetic organic compounds, many of which are labeled as “emerging” largely due to traditionally being unmonitored or unregulated in environmental samples. Many of them have become of public health concern in recent years. These include pharmaceuticals and personal care products (PPCPs), industrial chemicals (including per- and polyfluoroalkyl substances (PFAS)), cleaning detergents, steroid hormones, and pesticides in addition to micro and nano plastics. Source waters can also be contaminated with micropollutants that are biological in nature, such as viruses and bacteria. In certain instances, chemicals are added to source water to render the final drinking water product safe for consumption, but creating in the process undesired chemicals, namely disinfection by-products (DBPs). Due to the potential of these contaminants (and many more) to cause health, economic, and environmental impacts, they have become an issue of national and global concern. The course will discuss the source, fate and transport and treatment of specific micropollutants and will address their characterization and possible treatment approaches.

### **Goals of the course:**

1. Understand the specific types of micropollutants (pharmaceuticals, antimicrobials, illicit drugs, and personal care products) and their application and sources
2. Understand the generation and the fate and transport of micropollutants in the environment, with emphasis on soil and water matrices.
3. Understand the health and environmental impacts of micropollutants
4. Describe analytical methods for micropollutants quantification
5. Describe treatment and removal approaches including advanced oxidation processes, membranes, adsorption, and biological treatment approaches.

### **Grading policy:**

Attendance -10%, Quiz – 20%, presentation 20%, Final exam - 50%