FST-443 Applications of Nanotechnology in Food Science 3(3-0)

Educational Objectives

The objective of the course is to learn the basic concepts, principles, and components of nanotechnology, creation and characterization of nanomaterials. The application of nanotechnology in agriculture, food, and environment. It will assist the student to learn about toxicology of engineered nanoparticles (EPs) and current methods of assessment

Course Outcomes

- At the end of the course all students will be able to describe basic theory of nanoscience and nanotechnology.
- At the end of the course all students will be familiar with methods for characterizing important properties of nanomaterials commonly used in agriculture and the environment.
- At the end of the course all students will be able to apply nanotechnology to solve some problems in the fields of food, agriculture, and environment
- At the end of the course all students will be able to understand potential impact of EPs and conduct simple environmental risk assessmen

Theory:

- Introduction to Nanotechnology
- Nanotechnology: Definition & Concepts, Organic Nanoparticles, Inorganic Nanoparticles, Hybrid Nanoparticles
- Synthesis of Nanoparticles
- Application of Nanotechnology in Food Ingredients:, Naturally occurring nano-ingredients in food
- Addition of Nano-emulsions & nano-ingredients in food
- Nanoencapsulation of active ingredients
- Gelling agents, nano gels in food system application
- Nanoparticles for flavor and aroma enhancement
- Application of Nanotechnology in improving Food Quality and Packaging
- Nanomaterials for food preservation
- Nanomaterials for nutraceutical delivery
- Shelf-life improvement via nanotechnology
- Nanocomposites in food packaging

- Nanoparticles as anti-microbial agents in food packaging
- Nanosensors in Food Science
- Nano-biosensors: Types and properties
- Fluorescent nanoparticles as quality sensors
- Nanoelectromechanical systems in food sensing
- Metallic nanoparticle for sensing and separation of food borne pathogens
- Nanosensors in detection of mycotoxins in food
- Smart use of nanomaterials for monitoring of food spoilage
- Nanotoxiciology
- Bioavailability of nano-neutrients safety and potential hazards
- Toxicological concerns of nanotechnology
- Effect of nanoparticles in GIT
- Regulations for safe use of nano-materials in food science
- Future of nano-foods

Recommended Books:

Rai VR & Bai JA. Nanotechnology Applications in the Food Industry. ISBN 9781498784832. CRC Press; Taylor & Francis, 2018.

Grumezescu AM. Novel Approaches of Nanotechnology in Food. ISBN 9780128043080, Academic Press; Elsevier, 2016.

Jafari SM. Handbook of Food Nanotechnology. ISBN 9780128158661, Academic Press; Elsevier, 2020.

Axelos MA & Van de Voorde MH. Nanotechnology in Agriculture & Food Science. ISBN 9783527697724 , Wiley-VCH, 2017.