

FST-411, Instrumental Techniques in Food Analysis 3(1-2)

Educational Objectives:

This course is designed to expose undergraduates to the understanding of the principles and theory of selected instrumental methods as used in food analysis. This course introduces the principles and applications of instrumental methods in food analysis. The covers spectrochemical analysis methods that use absorption of electromagnetic radiation (molecular ultraviolet-visible spectroscopy, fluorescence, infrared spectroscopy, atomic absorption/emission spectroscopy); chromatographic methods, such as HPLC and GC; thermal analysis, and electrophoresis methods. Upon successful completion of this course, students should be able to gain basic instrumental food analysis background at a theoretical level, that they have the capability to design and carry out experiments for instrumental analysis of food.

Course Outcomes:

1. Describe the basic principles of instrument, theories and operations of key components of the instrument used for food component analysis.
2. Compare different instrumental methods for specific food analysis.
3. Demonstrate practical analysis of food by interpreting analytical data with reference to food regulations and standards.
4. Deliver principles, theories and methods of food analysis in clear and effective manner verbally and in written form.
5. To apply instrumental analysis methods to various foods.
6. To be informed about application areas of instrumental analysis in food industry.
7. To understand the importance of instrumental analysis among chemical analysis methods.

Course Contents:

- Lab safety requirements.
- Food analysis: significance and techniques.
- Sampling techniques, handling and storage.
- Physical tests: appearance, texture, specific gravity, refractive index, viscosity, rheology.
- Chemical analysis: moisture, ash, protein, lipid, carbohydrates, fiber, acidity,

pH, sugars, mineral elements, vitamins.

- Introduction to instrumental techniques:
- Supercritical fluid extraction.
- Chromatography: paper, thin layer, gas (GC),
- high performance liquid (HPLC),
- liquid chromatography mass spectrometry (LC-MS),
- preparatory layer and ion chromatography.
- Spectroscopy: Ultraviolet-visible, atomic emission, atomic absorption, fluorescence,
- Infrared Fourier-transform infra red, near infra red, nuclear magnetic resonance. Electrophoresis.
- Differential scanning calorimetry: types, principles, applications.
- Rotor-stator spinning disc reactor.
- Enzyme-linked immunosorbent assay (ELISA).
- Application of ultrasound and nanotechnology in food analysis.

Recommended Books:

1. Haynes, Anita, 2014, Advances in food analysis research, Nova Science publishers
2. S. Suzane Nielson, 2017, Food analysis, Springer
3. S. Suzane Nielson, 2017, Food analysis laboratory manual, Springer
4. Adriana S. Franca, Leo M.L. Nollet, 2018, Spectroscopic methods of food analysis, CRC Press
5. Nollet, Leo M. L.; Siddiqi, K. S, 2019, Fingerprinting techniques in food authentication and traceability
6. J Delarue, B Lawlor, M Rogeaux, 2015, Rapid Sensory Profiling Techniques: Applications in New Product Development and Consumer Research, Woodhead publishing