

**DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY**

**UNIVERSITY OF KASHMIR**

**Ph. D Programme**

**Paper I: Advances in the subject**

**Marks: 100**

**UNIT I: Advances in Food Processing and Evaluation**

- Pulse Electric Field: Principle, Mechanism, Application and safety aspects of PEF.
- Cold plasma technology: Recent developments, principle and applications in food safety and preservation.
- Supercritical fluid extraction: Principle and Application of SCFE in food processing.
- Supercritical fluid chromatography: Principle and application of SCFC in food analysis.
- Encapsulation: Method of encapsulation, applications in nutraceuticals, packaging, probiotics, and advances in this field.

**UNIT II: Food Biotechnology**

- Nutrigenomics: Definitions, significance in health and disease, advances in the science and future perspectives.
- Genetically modified foods, their safety concerns: (Allergenicity, toxicity and genetic hazards).
- Food allergy: Main sources of food allergens, Diagnosis and management of nut allergy.

**UNIT III: Food Packaging**

- Edible and biodegradable films: Mechanical properties, chemical resistance, and chemistry of degradation, structures, active functions, and trends in the use of edible films and coatings.
- Biodegradable materials: Polyesters, aliphatic co-polymers, poly lactide, polyhydroxy alkanoates, starch, chitosan, alginate, microbial origin.

- Active Packaging: Antioxidant packaging applications, Antimicrobial agents (essential oils, plant extracts, enzymes, chitosan, bacteriocin, inorganic nanoparticles), effect on mechanical and barrier properties of packaging.
- Intelligent packaging

#### **UNIT IV: Advances in Food Safety**

- Metabolomics: Interventions for developing functional foods and nutraceuticals.
- Novel food authentication techniques: Application of nucleic acid-based techniques in food authentication. Trends and emerging approaches.
- Non-destructive assessment of food quality: Ultrasound as food processing and preservation technique and impact on food properties.

#### **Suggested Readings:**

1. Sun, D. W. (2014). Emerging technologies for food processing. Elsevier.
2. Jia, J., Liu, D., & Ma, H. (2019). Advances in Food Processing Technology. Springer.
3. Sharma, T. R., Deshmukh, R., & Sonah, H. (2020). Advances in Agri-Food Biotechnology. Springer Singapore.
4. Robertson, G. L. (2016). Food packaging: principles and practice. CRC press.
5. Ahvenainen, R. (2003). Novel food packaging techniques. Elsevier.
6. Sofos, J. (2013). Advances in microbial food safety. Elsevier.

**Unit I:**

**Methods of Data Collection:**

- Defining and formulating research problem, selecting the problem, importance of literature review in understanding and defining the problem
- Primary data and secondary data, methods of primary data collection, classification and organisation of data.

**Sampling Methods:**

- Sampling, Need for sampling, unit, population, sample, sampling error, sampling methods; Simple, Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling and Multistage Sampling. Sample size, Standard Error.

**Normal Distribution:**

- Measures of Central Tendency (Mean, Median and Mode). Measures of dispersion (Range, Standard Deviation, Standard Error, Coefficient of Variation).

**UNIT II: Statistical Analysis of Experimental Data**

- Correlation Analysis: concept and significance Karl Pearson's coefficient correlation.
- Regression analysis: Lines of regression and regression equation
- Analysis of Variation (ANOVA)
- Testing of Hypothesis; (Tests of significance, 't' Test,)

**Unit III.**

- Principles and applications of atomic absorption spectroscopy- components of atomic absorption spectroscopy.
- X-ray analysis of foods – Properties, Production and Detection, X ray tubes, Detectors, Sources, Applications in food industry.
- FTIR spectroscopy- Principles and application

**Unit IV**

- Electrophoresis- Applications, Principles of separation of neutral molecules, Capillary zone electrophoresis.

- Immunoassays- applications in food with special reference to ELISA
- Differential scanning calorimetry.

**Suggested Readings:**

1. Kothari C.R., (1985) Research Methodology Methods and Techniques by New Age International Publishers, 2nd Edition.
2. Arya, P.P. and Pal, Y. (2001). Research Methodology in Management: Theory and Case
3. Chap T. Le., (2003). Introductory Biostatistics. A John Wiley & Sons Publication.
4. Aggarwal BL. 2003. *Basic Statistics*. New Age.
5. Mann, P. S. (2007). Introductory statistics. John Wiley & Sons.
6. Pomeranz, Y. (2013). Food analysis: theory and practice. Springer Science & Business Media.
7. Jacobs, M. B. (1951). The chemical analysis of foods and food products. The chemical analysis of foods and food products., (2nd edition).