EXTENDED LECTURE OUTLINE

FND6 312 **Food Analysis** **(2+1)**

Sl. No.	Lecture Outline	Hours
1.	**FOOD ANALYSIS :** i. Introduction and Definition ii. Reasons for Analyzing Foods	1
2	**Terminologiesassociatedwithfoodanalysis** 1. Basic Terminology in Food Analysis: Food analysis, Analyte, Sample, Matrix, Sampling, Representative sample, Homogenization, Qualitative analysis, Quantitative analysis, Proximate analysis 2.Measurement and AnalyticalTerms : Measurement, Result, Concentration, Mass fraction, Molarity (M),Molality (m),Normality (N),Percentage (% w/w), Percentage (% w/v), Percentage (% v/v), Dilution, Standard solution, Stock solution, Blank, Aliquot 3. Accuracy, Precision and Errors: Accuracy,Precision,Repeatability,Reproducibility, Error,Systematic, error,Random, error, Gross error, Bias, Mean, Standard deviation, Coefficient of variation, Recovery, Detection limit, Limit of quantification 4. Titrimetric and Gravimetric Terms: Titration, Titrant, Titrand, End point, Equivalence point, Indicator, Primary standard, Secondary standard, Standardization, Gravimetric analysis, Precipitate, Constant weight 5. Instrumental Analysis Terminology: Instrumental analysis, Absorbance, Transmittance, Wavelength, Spectrophotometry, Colorimetry, Beer–Lambert law, pH, Electrophoresis, Chromatography, Retention time, Detector, Calibration, Calibration curve 6. Chromatographic Terminology: Stationary phase, Mobile phase, Eluent, Eluate, Rf value, Peak, Peak area, Resolution, HPLC, GC, GC–MS, TLC, UPLC/UHPLC 7. Food-Specific Terms: Moisture content, Ash, Crude protein, Crude fat, Crude fibre, Dietary fibre, Total solids, Titratable acidity, Total soluble solids (TSS), Brix (°Bx) ,Water activity (aw)	1
3	**Rulesandregulationoffoodanalysis** **I US FEDERAL REGULATIONS AFFECTING FOOD COMPOSITION** A. Food and Drug Administration (FDA) B. The National Marine Fisheries Service (NMFS) C. The Environmental Protection Agency (EPA) D. The United States Department of Agriculture (USDA) 1.Standards a.Mandatory Standards : Standards of Identity, Standards of Quality, Standards of Fill-of-Container b. Voluntary Standards	**2**

	2. Nutritional Labelling 3. Authenticity 4. Food Inspection and Grading **II. FOOD SAFETY** **III. QUALITY CONTROL** a. Characterization of raw materials b.Monitoring of food properties during processing c. Characterization of final product d. A system known as Hazard Analysis and Critical Control Point (HACCP) **IV RESEARCH AND DEVELOPMENT**	
4	**Different official methods of analysis** 1. Association of Official Analytical Chemists (AOAC) 2. American Association of Cereal Chemists (AACC) 3. American Oil Chemists' Society (AOCS)	**1**
5	**Familiarization to terms and calculations used inpreparation of various standard solutions** **Concentration of solutions:** Definition, and calculation used in preparation of following solutions 1. Saturated solution 2. Percent solution 3. Molar solution 4. Molal solution 5. Normal solution 6. Standard solution 7. Parts per million	**2**
6	**Sample and sampling techniques.** **I. Definitions of samples, population, sampling, Laboratory samples** **II.SelectionOf Sampling Procedures** 1. Homogeneous vs. heterogeneous population 2. Manual vs. Continuous Sampling **III. Sampling Plan** 1. Definition and Factors Affecting the Choice of Sampling Plans 2. General Considerations In Taking The Laboratory Samples; a. Developing a Sampling Plan b. Sample size. **IV Sampling Techniques/Methods** Types of Sampling 1.Probability sampling:a. Simple random sampling; b. Systematic sampling; c. Stratified sampling; d. Cluster sampling; e. Composite sampling 2. Nonprobability sampling :a. Judgment sampling; b. Convenience sampling; c. Quota sampling 3. Mixed Sampling **VPreparation of Laboratory Samples** a.Making Samples Homogeneous	**3**

	b. Reducing Sample Size : c. Enzymatic Inactivation. d. Lipid Protection. e. Microbial Growth and Contamination	
7	**Principles, techniques and applications of:** a. spectrophotometer: What is spectrometer, Principle of spectrometer, working of spectrometer and uses of spectrometer b. colorimeter: What is colorimeter, Principle of colorimeter, working of colorimeter and Applications of colorimeter c. pH meter**:** Principle, Parts of the pH meter and Guidelines for Use of pH Meter d. Refractometer**:** What is the refractive index, techniques and applications e. Electrophoresis**:** Principle, technique and applications f. centrifuge:Introduction, Principle of Centrifugation, Type of centrifuges g. High performance liquid chromatography (HPLC):Introduction, Components of HPLC with diagram and applications of HPLC h. Gas Liquid chromatography (GLC) : Introduction, principle, Instrumentation, applications and advantages i. Thin Layer chromatography(TLC) : What is Thin Layer chromatography, Principle, Components of Thin Layer chromatography with diagram j. Gas Chromatography-Mass Spectrometry (GC-MS): what is Gas Chromatography, Mass Spectrometry and applications k. Ultra PerformanceLiquid Chromatography (UPLC): Introduction, principle, Instrumentation and applications l. Atomic Absorption Spectroscopy (AAS)**:** Principle, Instrumentation and applications m. Atomic Emmission spectroscopy (AES) **:** Principle, Instrumentation and applications.	**11**
8	**Proximatecompositionanalysismethods**. **1. Moisture analysis**- Importance of Moisture Assay a. direct methods**:** Oven drying method, distillation method, Karl Fischer method, b. Indirect methods: refractometry, infrared drying **2. Protein analysis method** a. Dumas method: Principle, procedure, Advantages and diadvantages b. Biuret method: Principle, procedure, applications, Advantages and disadvantages c. Lowry's method: Principle, procedure, applications, advantages and disadvantages d. dye binding method: Principle, procedure, applications, Advantages and disadvantages e. Spectroscopy method : Principle and applications **3**. **amino acid analyzer:** Introduction,principle and applications	**5**

9	**Mineral analysis-** a. Ashing and Importance of Ash in Food Analysis b. Dry ashing : Principles and Considerations, Instruments and glassware and Procedures c. Wetashing:Principle, Materials, and Applications, advantages, disadvantages and procedure d. Titrimetric method e. Gravimetric method f. colorimetric method and g. instrumental methods-AAS and AES.	**4**
10	**Physical characteristic of foods** a. Specific Gravity/Density b. Specific Heat Capacity c. Viscosity d. Refractive Index e. Filth f. Particle Size g. Texture h. Colour analysis **Rheologicalpropertiesoffood** a. Rheology of Wheat Flour Dough b. Microscopic Structure of Dough c. Molecular Structure of Gluten d. Instruments for Rheological Measurements: Farinograph, Extensigraph and Amylograph	**2**
11	**Anti-nutrientsinfoods:** Basic principles and analysis of phytate,tannins,oxalates,saponins,trypsin andchymotrypsin.	**2**
12	**Animalassay:**Principles,techniquesandapplications.	**1**
13	**Principlesforestimation of Vitamin Analysis:** water-soluble vitamins and fat-soluble vitamins. a. Importance of Analysis b. Methods of Analysis: Bioassays, Microbiological assays and Chemical Methods c. Vitamin C and Vitamin A Analysis	**1**

References:

1. Nielsen, S. Suzanne., Food Analysis, Fourth Edition, Purdue UniversityWest Lafayette, IN, USA
2. Pomeranz, Y. and Meloan, C.E., 2004, Food Analysis Theory and Practice, Third Edition, CBS Publishers and Distributors, New Delhi