

FT201 FOOD CHEMISTRY

Course Description & Objectives:

This course will impart knowledge to the students on the chemistry of micronutrients & macronutrients and its application in food industry.

By the end of the course, the students will be able to gain knowledge on different chemical & enzymatic reactions occurring in foods, understand Industrial application of different macronutrients and apply their knowledge of biomolecules to understand the changes that occur in foods during processing

Course Outcomes:

1. *Analyse and predict how the composition and conditions within a food influence the functional properties of food molecules.*
2. *Analyze and predict how the composition of foods with regard to carbohydrates, lipids, protein and water influence their stability.*
3. *Examine and assess implications for food formulations for achieving objectives of food quality and palatability, cost and healthfulness.*
4. *Analyze and interpret the role of food chemistry in practical food situations.*

UNIT I - Introduction to Food Chemistry

Food chemistry - Definition, Introduction, Importance and History of Food Chemistry. Moisture in foods – Role and type of water in foods. Water activity and sorption isotherm - Role of water activity in enhancing the shelf life of foods -Humectants - Role of Humectants in enhancing the shelf life of foods. Dispersed systems of foods - Colloidal system - Types of colloidal system. Sols - Types of sols, lyophilic sols, lyophobic sols, Preparation, purification and Properties of sols. Gels-Types of Gels, properties of gels, Food gels. Emulsions - Types of emulsions, Preparation and properties of emulsions. Foam - Formation and structure Changes of carbohydrates on cooking - Changes in pectic substances, Changes in starch. Starch - Starch granules, Granule gelatinization (Gelatinization of starch), Hydrolysis of starch, Crude fibre. Browning reactions - Enzymatic browning and non-enzymatic browning.

UNIT II - Protein

Functional properties of sugars. Pure proteins of plant and animal origin with their functional characteristics. Plant proteins - cereal proteins, tuber proteins and pulse storage proteins. Milk proteins - Casein, whey proteins and colostrums. Egg proteins - Egg white proteins, Egg yolk proteins. Lipids - Introduction - Fatty acids, Acylglycerols, Phospholipids. Classification of edible fats - Milk fats, lauric acids, vegetable butters, oleic-Linoleic acids, linolenic acids, Animal fats, Marine oils. Physical aspects of lipids - Crystallization, Consistency. Chemical aspects of lipids - Lipolysis, Auto-oxidation, Thermal decomposition, polymerization Edible fats and oils - Melting properties, chemical properties. Technology of edible fats and oils - Rendering, pressing, solvent extraction.

UNIT III - Chemistry of fat and oil processing

Chemistry of fat and oil processing: Refining, Hydrogenation, Interesterification. Frying technology of edible fats and oils - Chemistry of frying, Behaviour of frying oil. Behaviour of food during frying, chemical and physical changes, Tests for assessing the quality of frying oils. Anti-oxidants-Natural and synthetic anti-oxidants, Mechanism of action, examples and mode of application. Rancidity and its types, detection techniques. Enzymes in food industry - Carbohydrases-Amylases, pectinolytic enzymes, cellulases and hemicellulases. Proteases - Endopeptidases, Metallo peptidases. Lipid hydrolyzing enzymes - Lipases, Phospholipases. Chemical reactions of interest to food processing.

UNIT IV- Micronutrient

Introduction - Definition of Micronutrient, Classification of Micronutrients, Significance and Scope. Flavor - Definition, Methods for Flavor Analysis, Taste and Nonspecific Saporous Sensations, Taste Substances; Sweet, Bitter, Sour, and Salty sensations, Structural basis of taste modalities, Non specific Saporous substances; Flavour Enhancers, Astringency, Pungency and Cooling. Flavours related to spices, fruits and vegetables. Flavour volatiles. Pigments - Introduction - Pigments in animal and plant tissue - heme compounds, Chlorophyll, carotenoids, Flavonoids and other phenols, Betalains. Flavonoids and other phenols - Anthocyanins - Structure - Color and Stability of Anthocyanins. Factors affecting stability of Anthocyanins - Structural transformation and pH – Temperature – oxygen and Ascorbic acid - Light, Sugars and their degradation products, metals, Sulfur dioxide, Co

pigmentation, Enzyme reactions

UNIT V- Flavonoids

Other flavonoids - physical properties - Importance in foods. Vitamins - Introduction, Toxicity of vitamins - Different sources of vitamins – Dietary recommendations. Minerals - Introduction - Principles of mineral chemistry - Nutritional aspects of minerals - Essential mineral elements - Recommended Dietary allowances –Bioavailability. Thickeners and Stabilizers in foods - Chemical composition of Acacia gum, Agar, Alginic acid, Carrageenan, guar gum, Specific function and utilization in foods. Antinutritional factors in foods - Saponin, Phytic acid, hemagglutinins or lectins. Modification of food using enzymes. Role of endogenous enzymes in food quality - color - Texture - Flavor and aroma changes in foods - Nutritional quality. Enzymes in baking and brewing.

TEXT BOOKS:

1. HD. Belitz, Dr.W.Grasch 1987, *Food Chemistry* – Spirigerverl, Newyork.
2. Fenema O.R. Maraceladikllor, *Food Chemistry* – London.

REFERANCES:

1. Harry H. Sisler, Calvin: A.VanderWerf. *Food Chemistry*
2. N.A. Michael Eskin *Biochemistry of Foods* 2nd edition.
3. Dr. Ling HD. Belity, Dr.Ing, W.Grach 1987, *Food Chemistry* - Spirigerverl, New York.
4. Eeskin - herderson *Food Biochemistry* - Town send.
5. R. Marceladikllor, *Food Chemistry* - Fenema, London.
6. Meyer. *Food Chemistry - Food Chemistry* - HARRY H. SISLER, Calvin : A Vander werf.
7. Braverman *Introduction to the Biochemistry of Foods* - Elsevier Scientific Publishing Company
8. Sadasisivam - *Biochemical Methods*