

12. i) Preparation of urea-formaldehyde resin
- ii) Separation of monomers from polymers by solvation-technique.

REFERENCES:

- Harry R. Allcock, Frederick W. Lampe and James E. Mark ((2003) Contemporary Polymer Chemistry, 3rd ed. Prentice-Hall
- Fred W. Billmeyer (1984) Textbook of Polymer Science, 3rd ed. Wiley-Interscience,
- L. H. Sperling (2005) Introduction to Physical Polymer Science, 4th ed. John Wiley & Sons (2005)
- Malcolm P. Stevens (2005) Polymer Chemistry: An Introduction, 3rd ed. Oxford University Press.
- Gowarikar V.R., (2010) Polymer Science, New Age International Publishers Ltd.
- Ghosh P., (2010) Polymer Science and Technology: Plastics, Rubbers, Blends and Composites, Tata McGraw Hill.

Teaching Learning Process:

- Conventional chalk and board teaching,
- Class interactions and discussions
- Power point presentation on important topics.

Assessment Methods:

- Class Tests at Periodic Intervals.
- Written assignment (s) / Presentation by individual students
- End semester University Theory and Practical Examination

Keywords: Degree of polymerization, Glass Transition Temperature, Molecular Weight Distribution, Viscosity Average Molecular Weight.

11.2.4. Course Code: ANALYTICAL CHEMISTRY (DSE-AC4)

Course Title: Food Chemistry, Nutrition and Additives

Total Credits: 04 (Credits: Theory-02, Practical-02)

(Total Lectures: Theory- 30, Practical-60)

Objectives: The introductory course on food chemistry, nutrition and additives is designed in such a manner that the students develop a basic understanding of the sources, importance, stability, and transformations of food components during handling and processing.

Learning Outcomes:

By the end of this course, students will be able to:

- Build a strong understanding of basic fundamentals of food chemistry • understand how alterations /transformations during processing and handling affect the quality and stability of food
- Learn about the nature and importance of additives in food chemistry

Unit 1: Introduction

Introduction of food chemistry; An overview of the following: alterations during handling or processing (texture, flavour and colour), chemical and biochemical reactions leading to alteration in food quality (browning, oxidation, hydrolysis, protein denaturation), cause and effect relationship pertaining to food handling; Factors governing stability of food (chemical and environmental factors) and role of food chemists.

(Lectures: 03)

Unit 2: Water:

Definition of water in food, Structure of water and ice, Types of water, Sorption phenomenon, Water activity and packaging, Water activity and shelf-life.

(Lectures: 04)

Unit 3: Carbohydrates

Introduction, Sources, Functions, Deficiencies, Structure and importance of Polysaccharides in food chemistry (Agar and Agarose, Pectin, Hemicellulose, Cyclodextrins, Gums, Alginate, Starches, Modified starches), Non Enzymic Browning and its prevention, Caramelisation, Formation of acrylamide in food, Role of carbohydrates as sweeteners in food.

(Lectures: 05)

Unit 3: Vitamins and Minerals

Vitamins: Introduction, Sources, Classification: Water Soluble and Water insoluble Vitamins, Essential Vitamins, Physiological function, deficiencies, Causes of variation and loss in foods, Vitamin like compounds, Effect of food processing. Minerals: Introduction, Sources, Classification: Major minerals and trace elements, Physiological function, Deficiencies, Factors affecting mineral content of food, Fortification and enrichment of foods with minerals, Effect of food processing.

(Lectures: 06)

Unit 4: Food additives:

Additives: Introduction, Importance, Classification, Antioxidants, Emulsifiers, Stabilizers, Gelling agents, Gums, Thickeners, Sweeteners, Acidulants, Preservatives, Humectants, Food toxins.

Colouring Agents and Pigments: Introduction, Natural food colourants: Anthocyanins, Carotenoids, Chlorophyll, Caramel, Betalains; Examples of Pigments in common food; Nature-identical colourants: β -Carotene, Canthaxanthin and Riboflavin. Artificial colouring agents; Artificial/synthetic colourants: Azo dyes (e.g. amaranth dye, tatzazine, citrous red, Allura red); Quinoline (e.g. quinoline yellow); Phthalein (e.g. erythrosine); Triarylmethanes

and indigoid (e.g. indigo carmine), FD&C Dyes and Lakes; Properties of certified dyes, Colours exempt from certification.

Food Flavours: Sensation of taste and odour, Chemical Dimension of basic types of taste (Salty, Sweet, Bitter, Sour, Umami taste), other sensations like astringency, coolness, pungency/pungency); Non-Nutritive Sweeteners (aspartame, saccharin, sucralose, Cyclamate) and Nutritive Sweeteners, Molecular mechanism of flavour perception, Biogenesis of fruits and vegetable flavours, Taste Inhibition, Modification and Enhancement, Common Vegetable and Spice Flavours. (Lectures: 12)

PRACTICALS (Credits: 02, Laboratory Periods-60)

1. Determination of Moisture in different Food Products by hot air oven-drying method.
2. Paper chromatography of synthetic food dyes (*ascending and circular both*).
3. Quantitative determination of Food dyes in Powdered drink mixes by Spectrophotometric method.
4. Colorimetric determination of Iron in vitamin / dietary tablets.
5. Determination of rancidity of edible oils by Kriess Test.
6. Estimation of Vitamin C in a given solution/ Lemon Juice/ Chilies by 2, 6-dichlorophenol Indophenol Method.
7. Isolation of Casein from milk.
8. Qualitative test for Amino acids and proteins (Biuret Test, Xanthoproteic Test, Ninhydrin Test, Millon's Test, Nitroprusside Test, etc).
9. Determination of total fat by acid hydrolysis method.

REFERENCES:

Theory:

- DeMan, J.M., Finley, J.W., Hurst, W.J., Lee, C.Y. (2018), Principles of Food Chemistry, 4th Edition, Springer.
- Msagati, T.A.M. (2013), Chemistry of Food Additives and Preservatives, WileyBlackwell.
- Fennema, O.R. (2017), Food Chemistry, 5th Edition, CRC Press.
- Attokaran, M. (2017), Natural Food Flavors and Colorants, 2nd Ed., Wiley-Blackwell.
- Potter, N.N., Hotchkiss, J.H, (1995) Food Science, 5 th Ed., Chapman & Hall.
- Brannen, D., Davidsin, P.M., Salminen, T. Thorngate III, J.H. (2002), Food Additives, 2 nd Edition, CRC Press.
- Coultate, T. (2016), Food: The Chemistry of its Components, 6th Edn., Royal Society of Chemistry. 8. Belitz, H. D.; Grosch, W. (2009), Food Chemistry, Springer.

Practicals:

1. Ranganna, S. (2017). Handbook of analysis and quality control for fruits and vegetable products, 2nd Edn., McGraw Hill Education.
2. Sawhney, S.K., Singh, R. (2001), Introductory Practical Biochemistry, Narosa Publishing House.