

19FT201 FOOD CHEMISTRY AND TOXICOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HS	CS	SA	S	BS
45	-	30	25	50	-	-	5	5

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the chemical composition and properties of food nutrients and their physical, chemical, nutritional and functional changes during handling, processing, storage and utilization. The objective of this course is to impart knowledge on innate properties of food molecules and their interactions with other food constituents and to empower the students with analytical techniques for identification and quantification of various biomolecules present in food.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes	POs
1	Analyse the role of biomolecules and water for various deteriorative reactions.	2
2	Analyse the chemistry and processing aspects of protein and fats in food.	2
3	Identify various colour based compounds responsible for food colour and development of food colorant from biological sources.	2, 3
4	Development of nutrient rich food while ensuring lower anti-nutritional factors.	3
5	Identify and analyse various toxins in food and formulate strategies to overcome food intoxication.	2, 4

SKILLS:

- ✓ Perform analytical techniques associated with food using basic analytical instrumentation.
- ✓ Critically analyze the chemical information, synthesize the information and validate it.
- ✓ Select appropriate analytical technique when presented with a practical problem.



Source:

<http://bsp.iitd.ac.in/Wordpress/wp-content/uploads/2018/10/chemical.jpg>

ACTIVITIES:

- o *Checking different physico-chemical properties of water*
- o *Estimation of total carbohydrate and their importance in food industry*
- o *Checking efficacy of various solvents for edible oil extraction.*
- o *Protein and evaluation of their functional properties in industry*
- o *Absorption kinetics of vitamins and minerals*

UNIT - I**L-9**

SCOPE AND DEVELOPMENT OF FOOD CHEMISTRY : Water in foods - role and types of water in foods, functional properties of water, water activity and sorption isotherm; Carbohydrates-changes of carbohydrates on cooking, dietary fibre, browning reactions, enzymatic and non-enzymatic browning.

UNIT - II**L-9**

PROTEINS IN FOODS : Protein-structure and function, physical and chemical properties, nutritional changes in protein; Determination methods-physical, chemical; Lipids in foods-role and use of lipids/fat, chemical aspects of lipids, lipolysis, auto-oxidation, thermal decomposition, chemistry of frying technology of fat and oil; oil processing-refining, hydrogenation, inter esterification.

UNIT - III**L-9**

PIGMENTS IN ANIMAL AND PLANT KINGDOMS : Heme pigments - chlorophyll, carotenoids, phenolic and flavonoids, betalains, effect of processing on pigment behavior; Technology for retention of natural colors of food stuffs.

UNIT - IV**L-9**

VITAMINS AND MINERALS : Requirements; Allowances; Enrichment; Restorations; Fortifications; Loss of vitamins and minerals; Optimization and retention of vitamins and minerals; Chemistry of anti-nutritional factors.

UNIT - V**L-9**

PRINCIPLES OF FOOD TOXICOLOGY : Classification of food toxicants; Exposure; The dose-response curve; Absorption; Distribution and elimination of toxicants; Natural toxins in foods of plant origin; Marine toxins; Mycotoxins; Toxicants resulting from food processing; Biotransformation reactions (Phase I & Phase II); Risk assessment; Food, law and safety.

LABORATORY EXPERIMENTS**LIST OF EXPERIMENTS****TOTAL HOURS: 30**

1. Qualitative test for all carbohydrates - Solubility, Molisch, Anthrone, Iodine test.
2. Qualitative test for pentoses, reducing sugars, (Bial's, Fehling's, Benedict's, Barfoed's test)
3. Qualitative test for Glucose, Fructose, Sucrose (Osazone, Acid hydrolysis, Selewanooffs.)
4. Quantitative test for all amino acids, aromatic amino acids, sulphur containing amino acids. (Ninhydrin, Xanthoproteic, Nitro Prusside test).
5. Quantitative tests for peptide bonds and proteins (Biuret test & Folin - Lowry test).
6. Separation of amino acids by paper chromatography.
7. Separation of lipids by thin layer chromatography.
8. Estimation of viscosity and refractive index of foods.
9. Determination of free fatty acid content in fats and oils.
10. Estimation of chlorophyll and carotenoids in foods.
11. Enzymatic browning: Kinetics of polyphenol oxidase.
12. Functional properties of proteins.
13. Meat pigments extraction and characterization.
14. Study of chemical leavening agents.
15. Properties of sugars/nonenzymatic browning.

TEXTBOOKS:

1. H. D. Belitz, W. Grosch and P. Schieberle, "Food Chemistry", 4th edition, Springer, 2009.
2. O. R. Fennema, S. Damodaran and K. L. Parkin "Fennema's Food Chemistry", 4th edition, CRC press, 2007.

REFERENCE BOOKS:

1. M. Swaminathan, "Essentials of Food and Nutrition", 1st edition, Ganesh & Co, 1974.
2. L. H. Meyer, "Food Chemistry", 3rd edition, Reinhold Pub. Corp, 1960.
3. S. Ranganna, "Handbook of Analysis and Quality Control for Fruit and Vegetable Product", 2nd edition, Tata McGraw-Hill Education, 1986.