3rd SEMESTER

Code	Course Name	Credits			Total
		L	T	P	-
"JFT17"	CEREAL, LEGUME AND OIL SEED TECHNOLOGY	4	. 0	0	4
FT173024	FRUIT AND VEGETABLE TECHNOLOGY	4	0	0	4
FT17303U	PROCESSING OF FOODS OF PLANT ORIGIN (PRACTICAL)	0	0	4	4
FT17304 DC	NUTRACEUTICALS AND FUNCTIONAL FOODS	3	1	0	4
FT17 305 0C	FLAVOUR TECHNOLOGY	2	0	. 0	2
FT1730504	NOVEL TECHNIQUES OF FOOD PROCESSING	2	0	0	2
FT173070	INDUSTRIAL TRAINING AND CREDIT SEMINAR	0	1	1	2
JFT17	POSTHARVEST MANGEMENT OF TREE NUTS	2	0	0	2
FT17006GE	MEAT SCIENCE	2	0	0	2
FT170076	PHYTOCHEMICALS AND FOODS	2	0	0	2
FT1700360	ELEMENTARY ANIMAL PRODUCTS TECHNOLOGY	0	1	1	2
Credits= Hours					

3

FT17301CR

CEREAL, LEGUME AND OIL SEED TECHNOLOGY (4+0+0)

Unit - I (Wheat Chemistry and Technology)

- Current status and future scenario of world wheat production and uses.
- Structure and chemical composition of wheat grain and its relation to processing qualities.
- Criteria of wheat quality physical and chemical. Molecular basis of wheat grain hardness/softness.

Wheat milling – principle, conditioning and milling systems. Flour streams, extraction rates and their composition.

Structure and functionality of wheat proteins, carbohydrates and lipids in bread making.

Enzymes of wheat and their technological significance.

Vital wheat gluten - manufacturing techniques, uses and functionality.

Dough rheology and dough testing apparatus such as recording dough mixers, load extension meter.

Unit - II (Minor Cereal Grains and Bakery products)

Composition and structure of corn.

- Wet and dry milling of corn. Corn products and their uses.
- Composition and structure of barley and oat. Milling of oat and barley. Clasification of malt products, nutritive value and food applications of malt.
- Chemical, technological and nutritional aspects of sorghum and millets.
- Bread making processes, development in bread making methods, functions of ingredients/ additives such as fat, emulsifiers, oxidants, reducing agents, conditioners. Bread faults and remedies.
- Technology of biscuit, cake, cookies and cracker manufacture.
- Durum wheat chemistry, quality and technology of pasta products.

Unit - III (Rice Chemistry and Technology)

- Rice grain structure and chemical composition.
- Milling of rice types of rice mill: huller mill, sheller-cum-huller mill, shellercum-cone polisher mill, small capacity rice mill. Modern rice milling. Factors affecting rice yield during milling. By-products of rice milling and their utilization.
- Cooking quality of rice.

- Parboiling of rice traditional method and their drawbacks. CFTRI process of parboiling. Properties of parboiled rice. Changes during parboiling. Advantages and disadvantages of parboiling.
- Rice convenience foods precooked rice, canned rice, expanded rice, rice based infant food formulas, rice puddings and breads, rice cakes, rice noodles and fermented foods.

Unit IV (Oil seed and Legume processing)

- Types of oil seeds and their chemical composition.
 - Oil extraction Mechanical and solvent extraction.
 - Refining of crude oils.
- Processing of oil seeds for protein concentrates and isolates.
- Margarine manufacturing processing and its uses.
- Structure and composition of pulses, their importance in Indian diet.
- Dhal milling and processing of pulses.
- Fermented and traditional products.

- 1. Pomeranz, Y. (1998). *Wheat: Chemistry and Technology*, Vol. I 3rd Ed., American Association of Cereal Chemists, St. Paul, MN, USA.
- 2. Juliano, B. O. (1985). *Rice Chemistry and Technology*, American Association of Cereal Chemists, St. Paul, MN, USA.
- Samuel, A.M. (1996). The Chemistry and Technology of Cereal as Food and Feed. CBS Publishers & Distribution, New Delhi.
- 4. Dandy, D. A. V & Dobraszczyk, B. J. (2001) Cereal and Cereal Products: Chemistry abd Technology, Aspen Publishers.
- Kent, N. L. & Evers, A. D. (1994) Kent's Technology of cereals 4th Ed. Elsevier science Ltd. Oxford, U. K.



FRUIT AND VEGETABLE TECHNOLOGY (4+0+0) UNIT-I

Fruit maturity and ripening indices.
Postharvest changes in fruits and vegetables.
Ethylene biosynthesis, mode of action, inhibition of ethylene synthesis.
Composition & related quality factors for processing.
Handling of horticultural produce.
Precooling and transport of horticultural commodities.

UNIT-II

Cold chain management. Storage: Definition & functions Types of storage: low cost and high cost storage systems Controlled atmospheric storage: Its construction and control of gases. Hypobaric storage Zero energy cool chamber: Its construction and advantages.

UNIT-III

Principles of preservation, Preservation by heat, chemicals, sugar, salt, fermentation, drying, freezing Chemistry of pectin, theories of gel formation Role of enzymes in processing Quality standards of fruits & vegetable products. Canning: spoilage of canned products

UNIT-IV

Fruit & vegetable Juices: Preparation & preservation of juices syrups, cordials, Squash, concentrate pickles, tomato products Dehydration of fruits & vegetables Freezing of fruits & vegetables Jams, Jellies, Marmalades and preserves Waste utilization

- 1. Postharvest Technology of Fruit & Vegetables by A.K. Thompson.
- 2. Postharvest Technology of Fruits & Vegetables by verma & joshi 2000. Indus publications, New Delhi
- 3. An introduction to Postharvest Technology by RBH Wills. 2003
- 4. Preservation of fruits & Vegetables by Siddappa etal 1999. ICAR, New Delhi
- 5. Preservation of Fruits & Vegetables by Srivastava & Kumar, 1996. Intl. Book publishing Co. Lucknow
- 6. Handbook of Vegetables and Vegetable Processing by Y. H. Hui 2011. Wiley Blackwell
- 7. Handbook of Fruits and Fruit Processing by Y. H. Hui 2006. Wiley Blackwell



PROCESSING OF FOODS OF PLANT ORIGIN (PRACTICAL) (0+0+4)

Part I (Cereals)

- 1. Physico-chemical testing of wheat and rice.
- 2. Experimental milling of wheat and rice. Assessment of per cent of head rice,
 - broken, immature kernels and degree of polish in rice.
- 3. Determination of quality characteristics of flours.
- 4. Experimental parboiling and evaluation of quality of parboiled rice.
- 5. Evaluation of cooking quality of rice.
- 6. Rheological properties of dough using Farinograph/ Extensograph/Mixograph.
- 7. Pasting properties of starches using Visco-amylograph/RVA.
- 8. Experimental baking of bread, cake and biscuit and their evaluation,
- 9. Experimental extrusion cooking and quality evaluation of extrudates.
- 10. Solvent extraction of oil seeds.
- 11. Quality evaluation of oils.
- 12. Visit to wheat and rice processing plants.
- 13. Determination of yeast activity
- Preperaion of protein isolates from legumes and evaluation of cooking quality of legumes.
- Part 11 (Fruits and Vegetables)
 - 1. Quality Evaluation of Fruits & Vegetables (TSS, Color, Acidity, Texture etc.)
 - 2. Canning of fruits & vegetables.
 - 3. Testing of can, cut out analysis
 - 4. Preparation and analysis of syrups and Brines.
 - Experimental dehydration of fruits and vegetables (Dehydration and rehydration ratio)
 - 6. Preparation and preservation of juices.
 - 7. Preparation and preservation of squashes and RTS.
 - 8. Preparation and preservation of Jam, Jellies and marmalades.
 - 9. Preparation and preservation of pickle and vinegar.
 - 10. Preparation of tomato ketchup and sauce.
 - 11. Visit to a fruit and vegetable processing industry.

- Handbook of Analysis and Quality Control of Fruit and Vegetable Products S. Ranganna
- 2. Preservation of fruits & Vegetables by Siddappa etal 1999. ICAR, New Delhi
- Pomeranz, Y. (1998). Wheat: Chemistry and Technology, Vol. I 3rd Ed., American Association of Cereal Chemists, St. Paul, MN, USA.
- Juliano, B. O. (1985). Rice Chemistry and Technology, American Association of Cereal Chemists, St. Paul, MN, USA.
- 5. Stanley P.Cauvain & Lindas S. Young. Baked Products. Blackwill Publishing.
- Stanley P.Cauvain & Lindas S. Young. The Chorleywood Bread Process. CRC Publications.
- 7. Bakery Technology & Engineering by Samueal A. Matz.
- 8. Manual of American Assocation of Cereal Chemists
- 9. Manual of AOAC, 1990

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NEUTRACEUTICALS AND FUNCTIONAL FOOD\$ (3+1+0)

Unit – I

- Introduction Definition, Classification of nutraceutical factors. Food and non food sources. Mechanism of action.
- Nutraceutical factors in specific foods.
- Introduction to diseases of developed world- diabetes, obesity, hypertension
- Dietary fibre Types, Effects of fibre deficient diets
- · Physical and physiological properties of dietary fiber
- Hypocholesterolemic, hypolilpidemic and hypoglycemic effects. Role in prevention of CHD and cancer.
- · Beta- glucan- Chemical features and health benefits

Unit – II

- Probiotics- definition, criteria for selection of probiotic microorganisms.
- · Common probiotic products, yoghurt, kefir and ice-cream.
- Health benefits of probiotics-immune modulation and cancer prevention
- Prebiotics Importantant prebiotic molecules and their beneficial effects.
- Concept of synbiotics.
- · Fatty acid as functional food- Mono and poly-unsaturated fatty acids
- Omega 3 fatty acids- introduction, nomenclature & sources.
- · Eicosanoid metabolism of fatty acids and its implications in human health
- Biological and functional effects. Omega 3 fatty acids and insulin resistance.
- Olive oil and its health benefits.

Unit – III

- Phytochemicals and Antioxidants Introduction, therapeutic properties of some common plants.
- Free radicals and oxidative stress
- Biosynthesis of common phytochemicals-Shikmic acid and mavalonic acid pathway
- Role of ascorbic acid, flavonoids, Tocopherols, Carotenoids, capsaicinoids, lycopeneb as disease prevention agents.
- Garlic-composition and its therapeutic effects

Tea and its health benefits

Soybean as a functional food.

Unit – IV (Tutorials)

Proteins as functional foods

Vitamins and minerals as functional ingredients

Extraction of neutraceuticals

Stability of nutraceuticals factors during processing and digestion

Testing efficacy of functional foods

Marketing of functional foods.

Legislative aspects of functional foods.

References:

1.

2.

5.

- Functional Foods by Goldberg.
- Handbook of Neutraceuticals and Functional Foods by Wildman.
- 3. Functional Foods: principles and technology by Mingruo Guo.
- Chemical and Functional Properties of Food Components by Zdzislaw E. Sikorski.

Technology of Functional Cereal Products by Bruce R. Hamaker

6. Functional Foods: Biochemical and Processing Aspects by John Shi, G. Mazza, Marc Le Maguer, CRC Press



FLAVOR TECHNOLOGY (2+0+0)

Unit-1

- Introduction: Definition & classification of food flavors. Factors affecting food flavors.
- Flavor compounds of foods: Terpenoids, flavonoids and sulfur compounds
- Taste substances & Nonspecific saporous sensations: Sweet, bitter, sour, salty, astringency, pungency and cooling.
- Flavor precursors in food stuffs

Unit-11

- Spice flavors: Essential oils and oleoresins.
- Flavor composition of foods: beer, honey, wine & fermented dairy products, Vanilla, garlic, onion & cruciferae.
- Off flavor development in foods: Thermally produced, enzymatic reactions & microbial by-products.
- Flavor encapsulation & stabilization: Principles, types & techniques of flavor encapsulation & their applications in food industry.

- Food Flavor Technology. Andrew J. Taylor.
- Food Flavors: Formation, Analysis, & packaging influences. E. T. Contis, C. T. Ho, C. J. Mussinan, T. H. Parliament, F. Shahidi & Spanier.
- Encapsulation Technology for active food ingredients & food Products. Nicolass Jan Zuidam, Viktor A. Nedovic.
- · Food flavours. I. D. Morton & A. J. Macleod.
- Food Chemistry. Owen R. Fennema.
- Bitterness in foods and beverages. Russel L. Rouseff.
- Chemistry of Foods & Beverages: Recent Developments. George Charalambous & Ira Katz. Phenolic, George Charalambous & George Inglet.
- Food Additives. S. N. Mahindru.

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NOVEL TECHNIQUES IN FOOD PROCESSING (2+0-0)

Unit – I

Emerging Techniques in Food Processing: Application of technologies of high intensity light, pulse electric field, ohmic heating, micronization in food processing and preservation, Applications of Magnetic Field in Food Preservation

High Pressure Processing of Foods: Concept of high pressure processing, quality changes, effects of pressure on microorganisms and its application in food processing.

Unit – II

Ultrasonic in Food Processing: Properties and generation of ultrasonic, ultrasonic imaging, application of ultrasonics as an analytical tool and processing techniques

Supercritical Fluid Extraction: Property of near critical fluids (NCF), solubility and efficiency of NCF extraction, equipment and experimental techniques used in NCF extraction and industrial application.

Encapsulation, Stabilization, and Controlled Release of Food Ingredients and Bioactives Nanotechnology: Principles, mechanism and applications in foods

- 1. New Methods of Food Preservation by G. W Gould, 2012; Springer
- 2. Introduction to Food Engineering by R. P Singh and Dennis R Heldman, 1983; Academic press Elsevier
- 3 Food processing technology: *Principles and practice* by P.J Fellows, 2009; *CRC Press*
- 4 Handbook of Food Preservation by M. Shafiur Rahman, 1999 : CRC Press
- Engineering Properties of Foods. Third Edition (Food Science and Technology) by M. A. Rao, Syed S.H. Rizvi, Ashim K. Datta ,2010 ; CRC Press
- 6. Food Physics: Physical properties- Measurement and applications by L.O.Figura and A.A.Teixeira 2007; *Springer*

SFT17 COSGE

POST HARVEST MANAGEMENT OF TREE NUTS (2+0+0)

Unit I

• Horticulture maturity indices of tree nuts (Almonds, Pistachios, Pecans, Hazelnuts, Walnuts, Chestnuts)

• Harvesting & Post harvest handling operations of the tree nuts (Almonds,

- Pistachios, Pecans, Hazelnuts, Walnuts, Chestnuts)
- Packaging and Storage of tree nuts
- Chemical composition of tree nuts
- Quarantine issues in tree nuts

Unit II

- Quality standards of in shell and shelled tree nuts
- Nutritional and Neutraceutical factors in tree nuts and their importance in human health.
- Aflatoxins in tree nuts and their health hazards and control
- Flavors and volatile components of tree nut

- 1. Tree nuts; Production, Processing, Products Vol.1 & 2 by J.G. Woodroof.
- 2. The book of edible nuts by Frederic Rosengarten, Jr.
- 3. Tree nuts; Composition, phytochemicals and health effects edited by Cesarettin Alasalvar & Fereidoon Shahidi

FT17300 GE MEAT SCIENCE (2 +0)

UNIT-I

- Sources of meat, Ante-mortem handling and inspection of meat animals.
- Meat and human nutrition
- Slaughtering and processing equipment: Plant location and facilities; stunning methods; sticking/bleeding; dressing methods; offal inspection and processing.
- Structure and functions of living muscle: Microstructure, contraction mechanism, muscle metabolism.
- Postmortem changes in muscle: Biochemical alterations, physical alterations-rigor mortis; shortening; unusual patterns of postmortem metabolism. Factors affecting post mortem changes in meat.

UNIT-II

- Meat quality parameters: Colour, WHC, flavour, tenderness and texture.
- Microbial deteriotation of meat: sources of microbial contamination, deteriorative changes, identification of meat spoilage.
- Principles of various preservation techniques: Refrigeration, freezing, curing, smoking, canning, dehydration and irradiation of meat.
- Traditional meat products of J&K.

- Lawre. R. A. & Ledward, D. A. (2006). Lawres Meat Science 7th Ed. Woodhead Publishing Company, Cambridge, England (U.K.)
- Pearson, A. M., & Gillet, T. A., (1996). Processed Meats. Springer Publishing (3rd Ed.).
- J. F. Gracey, David S. Collins & Robert J. Huey (2009). Meat Hygiene. Elsevier Publishing (10th Ed.).
- 4. Hui, Y. H., & Nip, W-Q. (2001). Meat Science and Applications, CRC Press (Taylor and Francis Group).
- Forest, J. C., Abesle, E.D., Hedrele, H.B., Judge, M.D., Merkle, R.A. (2006).
 Principles of Meat Science. Academic Press, New York.
- 6. Thornton, H. (). Textbook of Meat Hygiene. Harcourt Publishers 6th Ed.

CEFTI COTCE

PHYTOCHEMICALS AND FOODS (2+0+0)

Unit – I

- Phytochemicals and Antioxidants Introduction
- Free radicals and oxidative stress
- Biosynthesis of common phytochemicals-Shikmic acid and mavalonic acid pathway
- Chemistry, sources and health benefits of:
 - Flavonoids, Carotenoids, Ascorbic acid, Lycopene, Capsaicinoids

Unit – II

- Phytochemicals and cancer
- Role of Phytochemicals in prevention of cardio-vascular diseases
- Phytochemicals in bone health
- Phytoestrogens
 - Stability of Phytochemicals during food processing and storage

- 1. Phytochemical Functional Foods by Ian Johnson and Gary Williamson
- 2. Handbook of Neutraceuticals and Functional Foods by Wildman.
- 3. Functional Foods: principles and technology by Mingruo Guo.
- 4. Chemical and Functional Properties of Food Components by Zdzislaw E. Sikorski.

FT170000

ELEMENTARY ANIMAL PRODUCTS TECHNOLOGY (0+1+1)

Unit-I (Tutorial)

- Processing of market milk- standardization, toning of milk, homogenization,
- Storage, transportation and distribution of milk. Pasteurization and sterilization.
- Milk products- Processing of cream, butter, cheese, ice cream.
- Sources of meat, composition and nutritive value of meat.
- Conversion of muscle to meat. Factors affecting post mortem changes in meat.
- Properties and shelf life of meat.
- Eating quality of meat colour, flavor, tenderness, juiciness and water holding capacity.
- Meat quality evaluation
- Preservation of meat by freezing, curing, pickling and smoking of meat.

Unit-II (Practical)

- Quantative estimation of milk constituents such as moisture, %TS, fat.
- Determination of acidity and specific gravity of milk
- Platform tests on given sample of milk.
- Standardization of milk.
- Detection of adulterants in milk- water, starch, urea.
- Preparation of common milk products like flavoured milk, yoghurt, ice cream.
- To study slaughtering and dressing of meat animals.
- Evaluation of meat quality.
- Preparation of various meat products such as: Meat pickle
- Preparation and evaluation of traditional meat products.
- Determination of meat to bone ratio in Chicken
- Visit to local milk processing plant.

- **References:**
 - 1. Outlines of Dairy Technology by S. K. De
 - 2. Chemistry and Testing of Dairy products by H.V. Atherton & J.A. Newlander
 - 3. Milk and dairy Product Technology by Edger Spreer.
 - 4. Dairy Chemistry by H.H. Sommer
 - 5. Lawre. R. A. & Ledward, D. A. (2006). Lawres Meat Science 7th Ed. Woodhead Publishing Company, Cambridge, England.
 - 6. Throntons Meat Hygiene.
 - 7. Principles of Meat Science by Forest.
 - 8. Developments in Meat Science by Lawrie,
 - 9. Processed Meats by Pearsons.