I. DEPARTMENT OF FOOD PROCESS TECHNOLOGY

Sr. No.	Course No.	Course title	Credits	Semester
1	FPT-111	Principles of Food Processing	3 (2+1)	I
2	FPT-112	Postharvest Management of Fruits and Vegetables	3 (2+1)	I
3	FPT-123	Cereal Processing	3 (2+1)	II
4	FPT-124	Food Packaging Technology	2 (1+1)	II
5	FPT-235	Legumes and Oilseeds Technology	3 (2+1)	III
6	FPT-236	Meat, Poultry and Fish Technology	3 (2+1)	III
7	FPT-237	Processing Technology of Beverages	2 (1+1)	III
8	FPT-238	Processing of Milk and Milk Products	3 (2+1)	III
9	FPT-249	Wheat Milling and Baking Technology	3 (2+1)	IV
10	FPT-2410	Fruits and Vegetables Processing	3 (2+1)	IV
11	FPT-2411	Processing of Spices and Plantation Crops	3 (2+1)	IV
12	FPT-3512	Confectionary and Snacks Technology	3 (2+1)	V
13	FPT-3513	Food Extrusion Technology	2 (1+1)	V
14	FPT-3614	Food Quality and Sensory Evaluation	3 (2+1)	VI
		Total Credits	**39 (25+14)**	

FPT-111 PRINCIPLES OF FOOD PROCESSING 3(2+1)

Theory

Introduction: Defining food; Classification of food; Constituents of foods; Food processing; Food preservation; Food Spoilage – Introduction, Causes of food spoilage, Food poisoning, Food-borne intoxication, Food-borne infection, Food Preservation and Processing: Introduction; necessary; Methodology; Principles and Methods of food preservation, High Temperature Preservation: Introduction; Blanching; Pasteurization; Sterilization; Canning, Drying, Dehydration and Concentration: Introduction; Purpose; Water activity and relative humidity; Factors affecting rate of drying and dehydration; Drying methods; Changes during drying and dehydration; different Driers; Concentration-Methods of concentration, Changes; Effect of drying, dehydration and concentration on quality of foods, Food Irradiation: Introduction; Radiation sources; Measurement of radiation dose; Mechanism of Action; Type of irradiation; Factors affecting food irradiation; Effect of irradiation, Preservation using Sugar, Salt and Acids: Sugar – Introduction, Factors affecting osmotic pressure of sugar solution, Foods preserved using sugar; Salt: Introduction, Antimicrobial activity of salt, Estimation of salt, Food products preserved using salt; Acid – Introduction, Mechanism, Common foods preserved using acids, Preservation by Use of Chemical preservatives: Introduction; Objectives; Factors affecting antimicrobial activity of preservatives; Type of chemical preservatives; Sulphur dioxide, Benzoic acid, etc; Use of other chemicals like acidulants, antioxidants, mold inhibitors, antibodies, etc. Food Fermentation: Introduction, methods, common fermented foods Recent methods in Processing: Introduction; PEF, HPP, Ultrasound, Dielectric heating; Microwave heating, Ohmic heating; Infrared heating; UV light, X-rays, Membrane processing, Ozonization; High intensity electric field in pulses; New hybrid drying technologies; Monitoring by NMR and MRI Technology, etc Effect of processing on nutritional value of food: Introduction; Consuming raw foods; Changes during meat grilling; Effect of processing on vitamins; Effect of processing on minerals; Effect of processing on carbohydrates; Effect of processing on lipids.

Practicals

Demonstration of various machineries used in processing; Demonstration of effect of blanching on quality of foods; Preservation using heat; Preservation by low temperature; Preservation by high concentration of sugar; Preservation by using salt; Preservation by using chemicals.; Drying and dehydration of fruits; Drying and dehydration of vegetables; Fermentation of food.

Teaching Schedule-Theory With Weightages(%)

Lecture No.	Topics	% Syllabus Covered
1 – 3	Introduction: Defining food; classification of food; constituents of foods; food processing; food preservation; food spoilage – introduction, causes of food spoilage, food poisoning, food-borne intoxication, food-borne infection	9
4 – 5	Food preservation and processing: Introduction; necessary; methodology; principles and methods of food preservation	6
6 – 8	High Temperature Preservation: Introduction; blanching; pasteurization; sterilization; canning	9
9 – 11	Low temperature preservation: Introduction; methods of low temperature preservation; chilling; refrigeration and cold storage; factors affecting refrigerated & frozen storage of foods; effect of freezing on constituents of foods	9
12 – 16	Drying, dehydration and concentration: Introduction; purpose; water activity and relative humidity; factors affecting rate of drying and dehydration; drying methods; changes during drying and dehydration; different driers; concentration- methods of concentration, changes; effect of drying, dehydration and concentration on quality of foods	16
17 – 18	Food irradiation: Introduction; radiation sources; measurement of radiation dose; mechanism of action; type of irradiation; factors affecting food irradiation; effect of irradiation	7
19 – 21	Preservation using sugar, salt and acids: Sugar – Introduction, factors affecting osmotic pressure of sugar solution, foods preserved using sugar; salt: introduction, antimicrobial activity of salt, estimation of salt, food products preserved using salt; acid – Introduction, mechanism, common foods preserved using acids	9
22 – 24	Preservation by use of chemicals: Introduction; objectives; factors affecting antimicrobial activity of preservatives; type of chemical preservatives; sulphur dioxide, benzoic acid, etc; use of other chemicals like acidulants, antioxidants, mold inhibitors, antibodies, etc.	9
25	Food fermentation: Introduction, methods, common fermented foods.	3
26 – 30	Recent methods in processing: Introduction; PEF, HPP, ultrasound, dielectric heating; microwave heating, ohmic heating; infrared heating; UV light, X-rays, membrane processing, ozonization; high intensity electric field in pulses; new hybrid drying technologies; monitoring by NMR and MRI Technology, etc	16
31 – 32	Effect of processing on nutritional value of food: Introduction; consuming raw foods; changes during meat grilling; effect of processing on vitamins; effect of processing on minerals; effect of processing on carbohydrates; effect of processing on lipids	7
	Total	**100**

Practical Exercises

No. of Units	Topics	No. of experiments
1	Demonstration of various machineries used in processing	1
2	Demonstration of effect of blanching on food quality characteristics	1
3	Preservation using heat	1
4	Preservation by low temperature	1
5	Preservation by high concentration of sugar(Jam/Jelly/Marmalade /syrup /squash)	3
6	Preservation by using salt (pickling)	1
7	Preservation by using chemical preservatives (sodium benzoate, calcium propionate)	2
8	Drying and dehydration of fruit	1
9	Drying and dehydration of vegetables	1
10	Reconstitution test for fruits and vegetables	1
11	Preservation of coconut shreds using humectants	1
12	Spray drying of milk	1
13	Preparation of fermented product	1
	Total	**16**

TEXTBOOKS

Sr. No.	Name of Book	Author	Publisher
1	Preservation of Fruits & Vegetables	Girdhari Lal, G. S. Siddappa, G. L. Tandon,	Indian Council of Agricultural Research, Publications 1986
2	Food Processing Technology: Principles and Practice	P. Fellows	CRC Press, 2000 ISBN: 9780849308871
3	Handbook of Food Preservation	Shafiur Rahman M.	CRC Press, 2007 ISBN: 9781420017373
4	Emerging Technologies for Food Processing	Da-Wen Sun	Academic Press, 2005 ISBN: 9780080455648
5	Introduction to Food Processing	Jelen P.	Prentice Hall , 1985
6	Handbook of Analysis and Quality Control for Fruit and Vegetable Products.	Ranganna S.	2nd Ed. Tata-McGraw-Hill. 2001.

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Technology of Food Preservation	Desroiser N.W.	AVI Pub. Co., 1997
2	Introduction to Food Science and Technology	Stewart GP and Amerine MA	Elsevier, 2012 ISBN: 0323156649,
3	Food Processing Handbook	Brennan JG	John Wiley & Sons, 2012 ISBN: 9783527634378
	Food Science	Potter NN and Hotchkiss JH	Springer Science & Business Media, 2013ISBN: 9401572623
4	Essentials of Food Science	Vickie AV	Springer Science & Business Media, 2013ISBN: 9781461491385
5	Food Processing and Preservation	B. Sivasankar	PHI Learning Pvt. Ltd., 2002 ISBN: 9788120320864

FPT-112 POSTHARVEST MANAGEMENT OF FRUITS AND VEGETABLES 3(2+1)

Theory

Introduction: Importance; Present status; export potential; employment generation Introduction to Post Harvest Management: Definition of PHM, PHT, Scope, Responsibilities, Post-harvest losses, Possible measures, Morphology of Fruits and Vegetables: Introduction; Parts of fruit; Botanical classification of fruit; Consumer classification of fruit; Classification of fruits on the basis of origin; Vegetables; Fruits vs. vegetables Nutritional value: Introduction; Water; Carbohydrates; Protein; Lipid; Organic acids; Vitamin and minerals, Volatiles; Physiology and Biochemistry: Introduction; Physiological development stages; Respiration; Respiration drift; Climacteric fruit; Non-climacteric fruit; Biochemistry of respiration; Aerobic and Anaerobic respiration; RQ; Factors affecting rate of respiration; Transpiration; Maturity of Fruits and Vegetables: Introduction; Methods of identification of maturity, Fruit Ripening: Introduction; Changes during Ripening; Deterioration of Fruits & Vegetables: Introduction; Primary and Secondary causes of losses; Pre-harvest Factors affecting Quality: Introduction; Preharvest factors related to plant; Preharvest factors related to Environment; Preharvest factors related to chemicals; Harvesting of Fruits & Vegetables: Introduction,definition, methods of harvesting,factors during harvest affecting harvesting of fruits &vegetables: Introduction; Post-harvest handling; Post-harvest Commodity Treatments: Precooling; Waxing; Sprout inhibition; Disinfestation; Fungicide application; Hot water treatment; Vapour heat treatment; Irradiation; Ripening and Degreening; Delaying ripening; Curing of roots and tubers; Dryings of root crops; Commodity treatments for apple Pre-cooling: Introduction; Effect of precooling on product quality; Factors affecting precooling; Cooling methods; Packinghouse operations: Introduction; Dumping (loading and unloading); Washing; Drying; Sorting & Grading; Commodity treatments; Packaging; Transportation Storage Structures: Introduction; Goal of Storage systems; Storage considerations; Storage Systems; Low cost and High Cost Technology, MA, CA and Hypobaric storage Chemical Preservation of Fruits and Vegetables: General rules for chemical preservation; Factors affecting action of chemical preservatives, Hurdle technologies for preservation; Biotechnology of fruits and vegetables

Practicals

Morphological features of some selected fruits and vegetables; Studies on maturity indices;Wax coating of selected fruits; Use of chemicals for ripening of fruits; Effect of maturity on acidity of lemon; Effect of storage of respiration and transpiration of fruit; Packaging of fruits and vegetables with scavengers; Determination of firmness of fruits and vegetables ; Degreening of fruits

Teaching Schedule-Theory With Weightages(%)

Lecture No.	Topics	% Syllabus Covered
1	Introduction: Importance; present status; export potential; employment generation	3
2 – 3	Introduction to post harvest management: Definition of PHM, PHT, scope, responsibilities, post-harvest losses, possible measures, to reduce the PHL	6
4 – 6	Morphology of fruits and vegetables: Introduction; parts of fruit; botanical classification of fruit; consumer classification of fruit; classification of fruits on the basis of origin; vegetables; fruits vs. vegetables	10
7 – 8	Nutritional value: Introduction; water; carbohydrates; protein; lipid; organic acids; vitamin and minerals; volatiles	6
9 – 11	Physiology and biochemistry: Introduction; physiological development stages; respiration; respiration drift; climacteric fruit; non-climacteric fruit; biochemistry of respiration; aerobic and anaerobic respiration; RQ; factors affecting rate of respiration; transpiration	10
12 – 13	Maturity of fruits and vegetables: Introduction; methods of identification of maturity, fruit ripening: introduction; changes during ripening	6
14	Deterioration of fruits & vegetables: Introduction; primary and secondary causes of losses	3
15	Pre-harvest factors affecting quality: Introduction; preharvest factors related to plant; preharvest factors related to environment; preharvest factors related to chemicals;	3
16 – 18	Harvesting of fruits & vegetables: Introduction; definition; different methods of harvesting; factors during harvest affecting quality of produce; post-harvest handling: Iintroduction; postharvest handling	10
19 – 21	Post-harvest commodity treatments: Introduction; precooling; waxing; sprout inhibition; disinfestation; fungicide application; hot water treatment; vapour heat treatment; irradiation; ripening and degreening; delaying ripening; curing of roots and tubers; dryings of root crops; commodity treatments for apple	10
22	Pre-cooling: Introduction; effect of precooling on product quality; factors affecting precooling; cooling methods	3
23 – 24	Packinghouse operations: Introduction; dumping (loading and unloading); washing; drying; sorting & grading; commodity treatments; packaging; transportation	6
25 – 28	Storage structures: Introduction; goal of storage systems; storage considerations; storage systems; low cost and high cost technology, MA, CA and hypobaric storage	12
29 – 31	Chemical preservation of fruits and vegetables: General rules for chemical preservation; factors affecting action of chemical preservatives	9
32	Hurdle technologies for Preservation and biotechnology of fruits and vegetables	3
	Total	**100**

Practical Exercises

No. of Units	Topics	No. of experiments
1	Morphological features of some selected fruits and vegetables	1
2	Determination of angularity of banana and its correlation with maturity	1
3	Study on inactivation of enzyme by blanching	1
4	Determination of total soluble solids of fruits	1
5	Determination of juice content of fruits	1
6	Determination of titrable acidity of fruit and its correlation with ripening	1
7	Studies on starch content and its correlation ripening of fruit	1
8	Determination of fruit firmness and its correlation with ripening	1
9	Wax coating of selected fruits	2
10	Ripening of banana using ethrel	1
11	Studies on effect of different storage temperatures on quality of fruits	1
12	Effect of storage transpiration rate of fruit	1
13	Packaging of fruits and vegetables	2
14	Effect of blanching of polyphenol oxidase activity	1
	Total	**16**

TEXT BOOKS

Sr. No.	Name of Book	Author	Publisher
1	A Handbook on Post harvest Management of Fruits and Vegetables	P. Jacob John	Daya Publishing House, Delhi ISBN: 9788170355328
2	Postharvest: An introduction to the physiology and handling of fruit and vegetables, 6th edition	Wills R. and Golding J.	UNSW Press ISBN: 9781742247854
3	Post harvest Technology of Fruits and Vegetables – Vol. 1	Verma L. R. and Joshi V. K.	Indus Publishing Company, Delhi ISBN: 8173871086
4	Handbook of Analysis and Quality Control for Fruits and Vegetable Products	Ranganna S.	2nd Edition, Tata-McGraw Hill, 2001

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Handbook of Postharvest Technology	Chakraverty A. Mujumdar A. S. Ramaswamy H.	Marcel Dekker Inc. , New York ISBN: 0824705149
2	Handbook of Vegetable Science and Technology:	Salunke D. K. Kadam S. S.	Marcel Dekker Inc. , New York ISBN: 0824705149
3	Handling and Preservation of Fruits and Vegetables by Combined Methods for Rural Areas- Technical Manual	FAO	FAO Agr. Ser. Bull., 149. 2007

FPT-123 CEREAL PROCESSING 3(2+1)

Theory

Present status and future prospects of cereals and millets; Morphology: physico-chemical properties; chemical composition and nutritive value Rice: Paddy processing and rice milling: conventional milling, modern milling, milling operations, milling machines, milling efficiency, byproducts of rice milling. Quality characteristics influencing final milled products. Parboiling: rice bran stabilization and its methods; Aging of rice; Enrichment – need, methods; processed foods from rice – breakfast cereals, flakes, puffing, canning and instant rice. Wheat: break system, purification system and reduction system; extraction rate and its effect on flour composition; Quality characteristics of flour and their suitability for baking. Corn: Corn milling – dry and wet milling, starch and gluten separation, milling fractions and modified starches. Barley: Malting and milling Sorghum: milling, Malting, Pearling and industrial utilization Millets: Importance of Millet, composition, processing of millets for food uses, major and minor millets Products and Byproduct of cereal and millets: infant foods from cereals and millets, breakfast cereal foods – flaked, puffed, expanded, extruded and shredded products, etc.

Practicals

Determination of physical properties of cereal grains;Determination of chemical properties of cereal grains Studies on cooking quality of cereals; Preparation of malt; Value added products from cereals and millets; Production of modified starch; Visit to milling industry

Teaching Schedule - Theory with Weightages (%)

No. Units	Topics	% Syllabus Covered
1-4	Present status and future prospects of cereals and millets; Morphology: physico-chemical properties; chemical composition and nutritive value	13
5-11	Rice: Paddy processing and rice milling: conventional milling, modern milling operations, milling machines, milling efficiency, byproducts of rice milling. Quality characteristics influencing final milled products. Parboiling: rice bran stabilization and its methods; Aging of rice; Enrichment – need, methods; processed foods from rice – breakfast cereals, flakes, puffing, canning and instant rice.	21
12-15	Wheat: break system, purification system and reduction system; extraction rate and its effect on flour composition; Quality characteristics of flour and their suitability for baking.	13
16-20	Corn: Corn milling – dry and wet milling, starch and gluten separation, milling fractions ad modified starches.	15
21	Barley: Malting and milling	3
22-24	Sorghum: Milling, Malting, Pearling and industrial utilization.	9
25-28	Millets: Importance of Millet, composition, processing of millets for food uses, major and minor millets	13
29-32	Products and Byproduct of cereal and millets: infant foods from cereals and millets, cereal based fermented products, breakfast cereal foods – flaked, puffed, expanded, extruded and shredded products, etc.	13
	Total	**100**

Practical Exercises

No. of Units	Topics	No. of experiments
1	Determination of physical properties of cereal grains	2
2	Determination of chemical properties of cereal grains	2
3	Germination of grains	1
4	Studies on cooking quality of cereals (cooking time, grain elongation, etc)	1
5	Functional properties of different cereal flour	1
6	Determination of starch content of cereal	1
7	Study on gelatinization of starch	1
8	Determination of amylase content of rice	1
9	Determination of fat acidity of cereals	1
10	Phenol test for cereals	1
11	Determination of sedimentation value	1
12	Milling of cereal grains	2
13	Visit to milling industry	1
	Total	**16**

TEXT BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Technology of Cereals	Kent NL	Woodhead Publishing1983 ISBN: 9780080408347
2	Post Harvest Technology of Cereals, Pulses and Oil seeds	A. Chakravarthy	Oxford and IBH Publishing Company, 2014
3	Modern Cereal Science & Technology	Y. Pomeranz	VCH Publishing, 1987 ISBN: 9780895733269
4	Hand Book of Cereal Science and Technology	Keral Kulp	CRC Press, ISBN: 9780824782948
5	Principles of Cereal Science and Technology	Hoseney RS	2nd Ed. AACC., 1994

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Rice – Utilization	Luh b.s.	Springer, 1991 ISBN: 9780442004859
2	Post Harvest Biotechnology of Cereals	Salunkhe D.K.	CRC Press, 1985 ISBN: 9780849362880
3	Handbook of Post Harvest and Technology; Cereals, Fruit and Vegetables tea and spices.	Chakraverty A., Mujumdar A.S. Hosahalli S.R.	CRC Press 1990 ISBN: 9780203911310
4	Rice – Chemistry and Technology	Champagne E.T.	American Association of Cereal Chemists, 2004 ISBN: 97818911273425
5	Cereal and Cereal Products	Dendy DAV & Dobraszczyk BJ	Aspen Publication, 2001
6	Cereal Science	Matz SA	AVI Publication, 1969

FPT-124 FOOD PACKAGING TECHNOLOGY 3(2+1)

Theory

Introduction to subject, Packaging situations in World and India Need of packaging, plastic consumption/use in World, India etc. Package requirements, package functions Hazards acting on package during transportation, Storage and atmospheric package, labeling laws Package Materials: classification packages, paper as package material its manufacture, types, advantages corrugated and paper board boxes etc. Glass as package material, Manufacture, Advantages, disadvantages. Metal as package material-manufacture, Advantages, disadvantages Aluminum as package material, its advantages and disadvantages, plastic as package material classification of polymers, Properties of each plastics, uses of each plastics, chemistry of each plastic such as polyethylene, Polypropylene, polystyrene, polycarbonate, PVC, PVDC, Cellulose acetate, Nylon etc. Lamination, Coating and Aseptic packaging, Lamination, need of lamination, types, properties, advantages & disadvantages of each type. Coating on paper & films, types of coatings. Need of coating, methods of coatings. Biodegradable and edible packaging, Aseptic packaging-Need, Advantages, process, comparison of conventional & aseptic packaging. System of aseptic packaging and materials used in aseptic packaging, Machineries used in Packing foods. Permeability – theoretical consideration, permeability of gases and vapours. Permeability of multilayer packages, permeability in relation to products. Packaging of Specific Foods with its properties like bread, biscuits coffee, milk powder, egg powder, carbonated beverages Snack foods etc, Mechanical and functional tests on package, Various mechanical functional testes perform in laboratories on package boxes and package materials.

Practicals

Identification of Packaging Materials; Measurement of Thickness of Packaging Films, papers and boards; Measurement of water absorption of paper, paper boards; Measurement of bursting strength of paper and paperboard; Measurement Tear resistance of papers; Measurement of puncture resistance ofpaper and paperboard; Measurement of tensile strength of paper of paper boards;Determination of gas transmission rate of package films; Determination of WVTR of films; Determination of coating on package materials; Identification of plastic films; Prepackaging practices followed for packing fruits and vegetables.

Teaching Schedule - Theory with Weightages (%)

No. Units	Topics	% Syllabus Covered
1-5	Introduction to subject, Packaging situations in world and India, need of packaging, plastic consumption/use in world, India etc. package requirements, package functions, hazards acting on package during transportation, storage and atmospheric package, labeling laws	16
6-15	Package materials: classification packages, paper as package material its manufacture, types, advantages, corrugated and paper board boxes etc. Glass as package material, manufacture, advantages, disadvantages, metal as package material-manufacture, advantages, disadvantages, aluminum as package material,. Its advantages and disadvantages, plastic as package material, classification of polymers, properties, uses and chemistry of each plastic such as polyethylene, polypropylene, polystyrene, polycarbonate, PVC, PVDC, cellulose acetate, nylon etc.	30
16-21	Lamination, Coating and Aseptic packaging: Lamination, need of lamination, types, properties, advantages & disadvantages of each type. coating on paper & films, types of coatings, need of coating, methods of coatings, Biodegradable and edible packaging, aseptic packaging-need, advantages, process, comparison of conventional & aseptic packaging. system of aseptic packaging and materials used in aseptic packaging machineries used in packing foods. Permeability – theoretical consideration permeability of gases and vapours, permeability of multilayer packages, permeability in relation to products.	19
22-27	Packaging of specific foods with its propertieslike bread, biscuits coffee, milk powder, carbonated beverages snack foods etc	19
28-32	Mechanical and functional tests on package Various mechanical functional testes perform in laboratories on package boxes and package materials	16
	Total	**100**

Practical Exercises

No. of Units	Topics	No. of experiments
1	Identification of packaging materials	1
2	Measurement of thickness of packaging films, papers and boards	1
3	Measurement of water absorption of paper, paper boards	1
4	Measurement of bursting strength of paper of paper boards	1
5	Measurement tear resistance of papers	2
6	Measurement of puncture resistance of paper and paperboard	1
7	Measurement of tensile strength of paper of paper boards	1
8	Determination of gas transmission rate of package films	1
9	Determination of WVTR of films	2
10	Determination of coating on package materials	1
11	Tests for identification of plastic films	2
12	Prepackaging practices followed for packing of fruits and vegetables	1
13	Visit to packaging industry	1
	Total	**16**

TEXT BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Handbook of Package Engineering	Joseph F. Hanlon	CRC Press ISBN: 9781566763066
2	Food Packaging: Principles and Practice, Third Edition	Robertson G.L.	CRC Press, 2012 ISBN: 9781439862414
3	Food Packaging	Sacharow and Griffin	AVI Publishing Company, 1980 ISBN: 9780870553479
4	Principles of Food Packaging	R. Heiss	Keppler, 1970
5	Food Packaging	Kadoya T.	Academic Press, 1990

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Fundamentals of Packaging	F.A. Paine	Institute of Packaging, 1981 ISBN: 9780950756707
2	Plastic Packaging: Properties, Processing and Applciations	Culter JD and Hernandez RJ	Hanser, 2004 ISBN: 9783446229082
3	Food Packaging Technology	Richard C, Derek M, Mark J.K.	CRC Press, 2003 ISBN: 9780849397882
4	Principles of Food Packaging	Sacharwo S and Griffin RC	AVI Publication, 1980
5	A Handbook of Food Packaging	Painy FA	Blackie Academics, 1992

FPT-235 LEGUMES AND OILSEEDS TECHNOLOGY 3(2+1)

Theory

Present status and future prospects of legumes and oilseeds; Morphology of legumes and oilseeds; Classification and types of legumes and oilseeds, Anti-nutritional compounds in legumes and oilseeds; Methods of removal of anti-nutritional compounds, Milling of legumes: home scale, cottage scale and modern milling methods, milling quality, efficiency and factors affecting milling; problems in dhal milling industry, Soaking and germination of pulses, Cooking quality of legumes – factors affecting cooking quality, Oilseeds: composition, methods of extraction, Desolventization and refining of oils: degumming, neutralization bleaching, filtration, deodorization, etc. New technologies in oilseed processing, Utilization of oil seed meals for food uses i.e. high protein products like concentrate, isolates Byproduct of pulses and oil milling and their value addition.

Practicals

Determination of physical properties of legumes and oil seeds; Determination of proximate composition of selected pulses and oilseeds; Determination of nutritional quality of selected pulses and oilseeds; Study of mini dhal mill; Study of mini oil mill; Preconditioning of pulses before milling Preconditioning of oilseeds before milling; Removal of anti-nutritional compounds from selected pulses and oilseeds; Laboratory milling of selected pulses and its quality evaluation; Laboratory milling of selected oilseeds and its quality evaluation; Laboratory refining of selected oils; Laboratory hydrogenation of selected oils; Study of cooking quality of dhal; Processing of composite legume mix and preparation of value added products; Visit to commercial dhal mills and oil mills.

Teaching Schedule - Theory with Weightages (%)

No. Units	Topics	% Syllabus Covered
1-4	Present status and future prospects of legumes and oilseeds; Morphology of legumes and oilseeds; Classification and types of legumes and oilseeds	13
5-7	Anti-nutritional compounds in legumes and oilseeds; Methods of removal of anti-nutritional compounds	9
8-12	Milling of legumes: home scale, cottage scale and modern milling methods, milling quality, efficiency and factors affecting milling; problems in dhal milling industry	13
13-15	Soaking and germination of pulses	10
16-18	Cooking quality of legumes – factors affecting cooking quality	9
19-21	Oilseeds: composition, methods of extraction	9
22-24	Desolventization and refining of oils: degumming, neutralization bleaching, filtration, deodorization, etc.	9
25-26	New technologies in oilseed processing	10
27-30	Utilization of oil seed meals for food uses i.e. high protein products like concentrate, isolates	12
31-32	Byproduct of pulses and oil milling and their value addition.	6
	Total	**100**

Practical Exercises

No. of Units	Topics	No. of experiments
1.	Determination of physical properties of legumes/oilseeds	2
2.	Determination of antinutritional factors in legumes	2
3.	Cooking quality of dhal	1
4.	Puffing of legumes	1
5.	Milling of legumes	1
6.	Preparation of composite legume flour	1
7.	Preparation of soy milk and soy paneer	1
8.	Preparation of protein isolate	1
9.	Preparation of quick cooking dhal	1
10.	Measurement of physico-chemical properties of oils	1
11.	Hydrogenation of oil	1
12.	Measurement of melting point of fats	1
13.	Preparation of peanut butter	1
14.	Visit to dhal mill and oil mill	1
	Total	**16**

TEXT BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Pulses	Harbhajan Singh	Agrotech Pub. Academy, 2005 ISBN: 9788183210140
2	Legumes Chemistry, Technology and Human Nutrition	Mathews RH	Marcel Dekker, 1989
3	Post harvest technology of cereals: pulses and oilseeds	Chakraverty A.	Oxford & ibh publishing company, 1988 isbn: 9788120402898
4	Bailey's Industrial Oil & Fat Products	Bailey A.E. and Shahidi F.	Wiley Publciation, 2005 ISBN: 9780471385462
5	Food Legumes	Kay DE	Tropical Products Institute, 1979

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Food and Feed from Legumes and Oilseeds	Smartt J and Nwokolo E.	Springer, 2012 ISBN: 9781461304333
2	Legumes and Oilseed Crops	Bajaj YPS	Springer, 2012 ISBN: 9783642744488
3	Handbook of Seed Science and Technology	Basra A.	CRC Press, 2006 ISBN: 9781560223153

FPT-236 MEAT, POULRY AND FISH TECHNOLOGY 3(2+1)

Theory

Sources and developments of meat and poultry industries in India and importance in national economy, Muscle structure, chemical composition and physico-chemical properties of meat muscle, Abattoir design and layout, Pre-slaughter transport and care and antemortem inspection. Slaughtering of animals and poultry, post-mortem inspection and grading of meat, Factors affecting post-mortem changes, properties and shelf life of meat. Egg structure: Composition, quality characteristics, processing and preservation of eggs, Processing and preservation of meat- mechanical deboning, aging or chilling, freezing, pickling, curing, cooking and smoking of meat, Meat tenderization. – principles and methods, Meat emulsions, Technology of manufacture of meat and poultry products Meat plant sanitation and safety By-products utilization of abattoir.

Practicals

Pre-slaughter operations of meat animals and poultry birds;Slaughtering and dressing of meat animals;Study of post-mortem changes;Meat cutting and handling;Evaluation of meat quality;Preservation of meat by different methods and preparation of meat and poultry products;Evaluation of quality and grading of eggs;Preservation of shell eggs;Experiments in by-products utilization.Classification of fish (fresh water and marine), composition of fish, characteristics of fresh fish. Fish products: surimi; Fish protein concentrates (FPC); Fish protein extracts (FPE), fish protein hydrolysates (FPH);

Teaching Schedule - Theory with Weightages (%)

Unit No.	Topics	% Syllabus Covered
1-2	Sources and developments of meat and poultry industries in India and importance in national economy	6
3-5	Muscle structure, chemical composition and physico-chemical properties of meat muscle. Abattoir design and layout	10
6-8	Pre-slaughter transport and care and antimortem inspection	9
9-11	Slaughtering of animals and poultry, post-mortem inspection and grading of meat	9
12-14	Factors affecting post-mortem changes, properties and shelf life of meat	9
15-17	Egg structure: Composition, quality characteristics, processing and preservation of eggs	10
18-20	Processing and preservation of meat- mechanical deboning, aging or chilling, freezing, pickling, curing, cooking and smoking of meat	10
21-23	Meat tenderization. – principles an methods	10
24-25	Meat emulsions	6
26-28	Technology of manufacture of meat and poultry products	9
29-30	Meat plant sanitation and safety; By-products utilization of abattoir	6
31-32	Classification of fish (fresh water and marine), composition of fish, characteristics of fresh fish. Fish products: surimi; Fish protein concentrates (FPC); Fish protein extracts (FPE), fish protein hydrolysates (FPH)	6
	Total	**100**

Practical Exercises

Unit No.	Topics	Number of Experiments
1	Slaughtering and dressing of poultry bird	1
2	Slaughtering and dressing of goat	1
3	Determination of water holding capacity of meat	1
4	Determination of extract release volume	1
5	Determination of meat pH	1
6	Estimation of total meat pigments	1
7	Determination of metmyoglobin content of meat	1
8	Preparation of meat products	1
9	Preparation of blood meal	1
10	Tenderization of meat	1
11	Composition and structure of egg	1
12	Determination of egg quality by Haugh unit	1
13	Preservation of shell egg	1
14	Study of anatomy and dressing of fish	1
15	Preparation of fish protein concentrate (FPC)	1
16	Visit to slaughter house	1
	Total	**16**

TEXT BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Principles of Meat Science	Aberle E.D.	Kendall Hunt Publication ISBN: 9780787247201
2	Principles of Meat Technology	Singh V. P.	New India Publishing Agency, Delhi ISBN: 9789380235554
3	Handbook of Heat and Meat Processing	Hue Y.H.	CRC Press, New York ISBN: 9781439836835
4	Poultry Production	Singh R. A.	Khyani Publishers, Delhi
5	Fish Processing Technology	Hall G.M.	Springer Publication ISBN: 9781461311133
6	Handbook of Meat, Poultry and Seafood Quality	Kerth	Wiley Backwell, 2012 SBN: 9780470958322

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Meat Science	Lawrie R. A.	Pergamon Press, New York ISBN: 080307906
2	Handbook of Meat Processing	Fidel Toldra	Wiley-Blackwell, Iowa, USA ISBN: 9780813821825
3	Meat Products Handbook – Practical Science and Technology	Gerhard Feiner	CRC Press, Boca Raton ISBN: 9780849380105
4	Outlines of Meat Science and Technology	Sharma B.D.	Jaypee Brother Medical Publishers, ISBN: 9789350254813

FPT-237 PROCESSING TECHNOLOGY OF BEVERAGES 2(1+1)

Theory

History, importance of beverages and status of beverage industry, Processing of beverages, Packaged drinking water, juice based beverages, Synthetic, still, carbonated, low-calorie and dry beverages, isotonic and sports drinks, dairy based , alcoholic beverages fruit beverages, speciality beverages, tea, coffee, cocoa, spices, plant extracts, etc.; FSSAI specifications for beverages, Ingredients, manufacturing and packaging processes and equipment for different beverages; Water treatment and quality of process water Sweeteners, colorants, acidulants, clouding and clarifying and flavouring agents for beverages Carbon dioxide and carbonation Quality tests and control in beverages; Miscellaneous beverages Coconut water, sweet toddy, sugar cane juice, coconut milk, flavoured syrups

Practicals

Quality analysis of raw water; Determination of density and viscosity of caramel; Determination of colours in soft drinks by wool technique; Preparation of iced and flavoured tea; Preparation of carbonated and non-carbonated beverages; Determination of caffeine in beverages; Determination of brix value, gas content, pH and acidity of beverages; Quality analysis of tea and coffee, Preparation of miscellaneous beverages; Visit to carbonation unit; Visit to mineral water plant.

Teaching Schedule - Theory with Weightages (%)

No. of Units	Topics	No. of Lectures	% Syllabus Covered
1	History, importance of beverages and status of beverage industry	**1**	**6**
2	Processing of beverages	**1**	**6**
3	Packaged drinking water, juice based beverages	**1**	**6**
4-5	Synthetic, still, carbonated, low-calorie and dry beverages, isotonic and sports drinks, dairy based and alcoholic beverages,	**2**	**13**
6-7	Fruit beverages, speciality beverages, tea, coffee, cocoa, spices, plant extracts, etc.;	**2**	**13**
8-9	FSSAI specifications for beverages	**2**	**13**
10	Ingredients, manufacturing and packaging processes and equipment for different beverages;	**1**	**6**
11	Water treatment and quality of water	**1**	**6**
12	Sweeteners, colorants, acidulants, clouding, clarifying and flavouring agents for beverages	**1**	**6**
13-14	Carbon dioxide and carbonation	**2**	**13**
15	Quality tests and control in beverages;	**1**	**6**
16	Miscellaneous beverages: coconut water, sweet toddy, sugar cane juice, coconut milk, flavoured syrups	**1**	**6**
	Total	**16**	**100**

Practical Exercises

No. of Unit	Topics	Number of Experiments
1.	Quality analysis of water from different sources and treatments	1
2.	Determination of aqueous extraction of tea/coffee	1
3.	Test for chicory in coffee	1
4.	Detection of sodium benzoate in beverage	1
5.	Measurement of pH and acidity of beverage	1
6.	Detection of *E. coli* in beverage	1
7.	Measurement of CO_2 content of carbonated beverage	1
8.	Determination of caffeine in beverages	1
9.	Determination of tannins in wine	1
10.	Preparation of Instant Tea/coffee	1
11.	Preparation of RTS beverage	1
12.	Preparation of carbonated beverage	1
13.	Specifications for different fruit beverages and preparation of fruits squash	1
14.	Preparation of artificial lemon juice	1
15.	Preparation of beverage using artificial sweetener	1
16.	Visit to carbonation unit	1
17.	Visit to mineral water plant	1
	Total	**16**

TEXT BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Fruit and Vegetable Juices	Tressler D.K., Joslyn M.A. and Marsh G.C.	AVI publishing company New York 1971
2	Food and Beverage Technology International USA	Bernard and Alan	Sterling Publication, 1989
3	Beverages: Technology, Chemistry and Mcirobiology	Varnam and Sutherland	Springer, 1994
4	Manufacturing of Food and Beverages	NIIR Board	NIIR Publication, New Delhi

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Food Flavourings	P.R. Ashust	Springer, 2012
2	Handbook of Alcoholic Beverages	Alan Buglass	John Wiley and Sons, 2011
3	Beverages	Pare Jean	Company's Coming Publishing Limited, 1997
4	Preservation of Fruit and Vegetable Products	Girdharilal, Siddappa, Tondon	Indian Council of Agricultural Research, Publications 1986

FPT-238 PROCESSING OF MILK AND MILK PRODUCTS 3(2+1)

Theory

Milk and milk products in India. Importance of milk processing plant in the country Handling and maintenance of dairy plant equipment. Dairy plant operations viz. receiving, separation, clarification, pasteurization, standardization, homogenization, sterilization, storage, transport and distribution of milk. Problems of milk supply in India, UHT, toned, humanized, fortified, reconstituted and flavoured milks. Technology of fermented milks (starter culture, dahi, yoghurt, shrikhand). Milk products processing viz. cream, butter, *ghee*, cheese, condensed milk, evaporated milk, whole and skimmed milk powder ice-cream, butter oil, *khoa*, *channa, paneer* and similar products. Judging and grading of milk products Cheese spreads by spray and roller drying techniques, EMC (Enzyme modified cheese), Enzymes in dairy processing Insanitization *viz*. selection and use of dairy cleaner and sanitizer. Inplant cleaning system Scope and functioning of milk supply schemes and various national and international organizations, Specifications and standards in milk processing industry, Dairy plant sanitation and waste disposal.

Practicals

Sampling and analysis of milk – Sp.gravity physico chemical properties and composition, DMC and DYC reduction tests, presence of adulterants and preservatives;Standardization of milk for markets;Clarification and separation of milk;Heat processing of milk – Pasteurization;Preparation of ;utter and Ghee;Ice-cream preparation;Preparation of dahi, shrikhand, lassi etc;Preparation of khoa;khoa based sweets;Preparation of channa, paneer and chana based sweets;Visit to Dairy plant;

Teaching Schedule - Theory with Weightages (%)

No. unit	**Topics**	**% Syllabus Covered**
1-2	Milk and milk products in India; Importance of milk processing plant in the country	7
3-6	Handling and maintenance of dairy plant equipment. Dairy plant operations viz. receiving, separation, clarification, pasteurization, standardization, homogenization, sterilization, storage, transport and distribution of milk	12
7-8	Problems of milk supply in India. UHT, toned, humanized,fortified, reconstituted and flavoured milks	7
9-11	Technology of fermented milks (starter culture, dahi, yoghurt, shrikhand); Milk products processing viz. cream, butter, *ghee*, cheese, condensed milk, evaporated milk, whole and skimmed milk powder	9
12-13	Ice-cream, butter oil, *khoa*, *channa, paneer* and similar products	6
14-15	Judging and grading of milk products	6
16-17	Cheese spreads by spray and roller drying techniques	6
18-19	EMC (Enzyme modified cheese); Enzymes in dairy processing	6
20-21	Insanitization *viz*. selection and use of dairy cleaner and sanitizer	6
22-23	Inplant cleaning system	7
24-26	Scope and functioning of milk supply schemes and various national and international organizations	10
27-29	Specifications and standards in milk processing industry	9
30-32	Dairy plant sanitation and waste disposal	9
	Total	**100**

Practical Exercises

No. of units	**Topics**	Number of experiments
1.	Sampling of milk and milk production	1
2.	Milk testing	1
3.	Determination of fat content of milk	1
4.	Detection of adulterants in milk and milk products	1
5.	Standardization of milk	1
6.	Heat processing of milk – Pasteurization	1
7.	Preparation of butter	1
8.	Preparation of ghee	1
9.	Preparation of ice-cream	1
10.	Preparation of coagulated milk product (paneer)	1
11.	Preparation of indigenous fermented milk products (dahi, Shrikhand, etc)	1
12.	Preparation of khoa	1
13.	Preparation of khoa based sweet	1
14.	Prepaartion of channa	1
15.	Preparation of channa based sweet (*Rasogulla*)	1
16.	Visit to dairy plant	1
	Total	**16**

TEXT BOOKS

Sr. No.	**Name of Book**	**Author**	**Publisher**
1	Outline of Dairy Technology	Sukumar De	Oxford University Press, 2008
2	The Fluid Milk Industry	Henderson JL	AVI Publishing Co, USA
3	Indian Dairy Industry	K.S.Rangappa and K L Acharya	Asia publishing house, Mumbai
4	Technology of Milk Processing	Khan QA and Padmanabhan	ICAR, New Delhi

REFERENCE BOOKS

Sr. No.	**Name of Book**	**Author**	**Publisher**
1	Principles of Dairy Processing	J.N.Warner,	Wiley Eastern Ltd, New Delhi
2	Judging of Dairy Products	J.A.Nelson and Trout	The Olsen publishing Co. Milwankee, Wisconsin, USA
3	Dairy Technology: Principles of milk properties and processes	Walstra P.	CRC Press, 1999
4	Technology of Dairy Products	Early R.	Springer, 1998

FPT-249 WHEAT MILLING AND BAKING TECHNOLOGY 3(2+1)

Theory

Wheat – importance, production verities used for cultivation, Types of wheat, grading and quality of wheat Structure of wheat chemical constituents, their distribution, Physico-chemical and Rheological properties, Enzymes in wheat, damage wheat, Conditioning of wheat – principles and methods of conditioning, Milling of wheat – Roller flour milling process Break rolls, reduction rolls, The design and operation, Wheat milling process, Products of wheat milling industry,flour, atta, etc. flour grades, supplementation, Fortification, Flour additives, flour improvers, Bleaching, Oxidizing agents Bakery products, role of bakery ingredients (major and minor), from hard wheat: bread processes of bread making using straight and sponge, dough methods role of each ingredient, quality control Testing of raw material testing of final product Bread faults, staleness, roppiness, Baked Products from soft wheat:cookies, crackers, biscuits, cakes: types, ingredients, process, fault causes and remedy Other bakery products: using very hard wheat. pizza, pastry and its types. Macaroni products: Including spaghetti, noodles, vermicelli-process. Nutritional improvement of bakery products Setting of bakery unit, bakery norms, specifications for raw materials, Packaging, marketing of products, project report preparation

Practicals

Classification of wheat based on physico-chemical properties;Conditioning of wheat; Milling of wheat;Quality Testing of flour: Falling number and α- amylase activity; Sedimentation value, Pelshenke value, Rheological Tests (Farinograph, Mixograph, Extensiograph, Alveograph);Manufacture loaf bread, types, faults, remedies, shelf life bread, quality of bread;Test Baking: biscuits, cookies;rackers, buns: ;Types and quality;Other baked products- pastry, pizza;Visit to wheat milling industry, visit to bakery.

Teaching Schedule - Theory with Weightages (%)

No. of Units	Topics	% Syllabus Covered
1	Wheat – importance, production verities used for cultivation	6
2	Types of wheat, grading and quality of wheat	4
3-4	Structure of wheat, chemical constituents and their distribution	6
5-6	Physico-chemical and Rheological properties	6
7	Enzymes in wheat, damage of wheat	3
8-9	Conditioning of wheat – principles and methods of conditioning	6
10-12	Milling of wheat: Rolling flour milling process; break rolls; reduction rolls; Design and operation, wheat milling process	10
13-14	Products of wheat milling industry: Flour, atta, etc. flour grades, supplementation, Fortification	7
15	Flour additives, flour improvers, Bleaching, Oxidizing agents	3
16-21	Bakery products, role of bakery ingredients (major and minor),from hard wheat: bread processes of bread making using straightand sponge, dough methods role of each ingredient, quality controlTesting of raw material testing of final productDefects in bread; staleness, roppines.	16
22-25	Baked product from soft wheat; cookies, crackers, biscuits, cakes – ingredients, process, fault causes and remedy	12
26-28	Other bakery products: using very hard wheat. pizza, pastry and its types. Macaroni products: Including spaghetti, noodles, vermicelli-process.	9

	Nutritional improvement of bakery products	
29-32	Setting of bakery unit, bakery norms, specifications for raw materials Packaging, marketing of products, preparation of project report.	12
	Total	**100**

Practical Exercises

No. of Units	**Topics**	**No. of Experiments**
1.	Classification of wheat based on physico-chemical properties	1
2.	Determination of gluten content of wheat	1
3.	Determination of dough rising capacity	1
4.	Determination of Pelshanke Value	1
5.	Determination of sedimentation value	1
6.	Determination of falling number	1
7.	Determination of alcoholic acidity of flour	1
8.	Preparation of bread	1
9.	Evaluation of quality parameters of bread	1
10.	Preparation of biscuit	1
11.	Evaluation of physical properties of cookies	1
12.	Preparation of sponge cake	1
13.	Rheological Testing (farinograph, mixograph, extensiograph, alveograph, amylograph)	2
14.	Visit to wheat milling industry, visit to bakery unit	1
	Total	**16**

TEXT BOOKS

Sr. No.	**Name of Book**	**Author**	**Publisher**
1	Bakery Science and Cereal Technology	Khetarpaul. And	Daya Books, New Delhi 2005
2	Technology of Cereals	Kent.	Woodhead Publishing, 1994
3	Flour Milling Process	Scott JH	Chapman & Hall, 1951
4	Bakery Products Science and Technology	Zhou and Hui	John Wiley and Sons, 2014

REFERENCE BOOKS

Sr. No.	**Name of Book**	**Author**	**Publisher**
1	Modern Bakery Products	EIRI	EIRI Publication, New Delhi
2	Dough Wheat and Baked Products	Faridi and Faubin	Springer, 2012
3	Baked Products	Stanley PC and Linda SY	Asia publishing house, Mumbai

FPT-2410 FRUITS AND VEGETABLES PROCESSING 3(2+1)

Theory

Production and processing scenario of fruits and vegetables in India and World, Scope of fruit and vegetable preservation industry in India. present status, constraints and prospects, Overview of principles and preservation methods of fruits and vegetables, Commercial processing technology of fruits and vegetables, Primary processing and pack house handling of fruits and vegetables; Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables, Minimal processing of fruits and vegetables Blanching operations and equipment, Canning: Definition, processing steps, and equipment, cans and containers, quality assurance and defects in canned products, Preparation and preservation of juices, squashes, syrups, sherbets, nectars, cordials, etc; Problems on squash and RTS; Processing and equipment for above products and FSSAI specification Preparation, preservation and machines for manufacture of crystallized fruits and preserves, jam, jelly and marmalades, problems, candies, Preparation, preservation and machines for manufacture of preserve, concentrate, fruit wine, sauerkraut, chutney, pickles, sauce, puree, paste, ketchup; toffee, cheese, lather, dehydrated, wafers and papads, soup powders; FSSAI specification, Production of pectin and vinegar; Commercial processing technology of selected fruits and vegetables for production of various value added processed products.

Practicals

Primary processing of selected fruits and vegetables;Canning of Mango/Guava/ Papaya;Preparation of Jam from selected fruit;Preparation of jelly from selected fruits;Preparation of fruit marmalade;Preparation of RTS;Preparation of squash;Preparation of syrup;Preparation of raisins; dried fig and dried banana; Preparation of anardana;Preparation of papain;Preparation of Pickles;Preparation of dried onion and garlic and ginger;Preparation of banana and potato wafers;Preparation of dehydrated leafy vegetables and Visit to fruits and vegetables pack house; Canning plant, vegetable dehydration plant.

Teaching Schedule - Theory with Weightages (%)

No. of Units	Topics	% Syllabus Covered
1-2	Production and processing scenario of fruits and vegetables in India and World	6
3-5	Scope of fruit and vegetable preservation industry in India. present status, constraints and prospects	9
6-8	Overview of principles and preservation methods of fruits and vegetables	9
9-12	Commercial processing technology of fruits and vegetables	12
13-15	Primary processing and pack house handling of fruits and vegetables; Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables	10
16-17	Minimal processing of fruits and vegetables	6
18-19	Blanching operations and equipment	6
20-22	Canning: Definition, processing steps, and equipment, cans and containers, quality assurance and defects in canned products	9
23-25	Preparation and preservation of juices, squashes, syrups, sherbets, nectars, cordials, etc; problems in squash and RTS; processing and equipment for above products and FSSAI specification	9
26-29	Preparation, preservation and machines for manufacture of crystallized fruits and preserves, jam, jelly and marmalades, problems, candies; Preparation, preservation and machines for manufacture of preserve, concentrate, fruit wine, sauerkraut, chutney, pickles, sauce, puree, paste, ketchup; toffee, cheese, lather, dehydrated, wafers and papads, soup powders; FSSAI specification	12
30-32	Production of pectin and vinegar; Commercial processing technology of selected fruits and vegetables for production of various value added processed products.	12
	Total	**100**

Practical Exercises

No. of Units	Topics	No. of Experiments
1	Primary processing of selected fruits and vegetables	1
2	Canning of mango/guava/ papaya	1
3	Preparation of jam/ jelly/ marmalade from selected fruit	1
4	Preparation of RTS beverage	1
5	Preparation of squash	1
6	Preparation of grape raisins	1
7	Preparation of dried fig / banana fig	1
8	Preparation of fruit candy	1
9	Osmotic dehydration of fruit slices	1
10	Preparation of fruit leather	1
11	Preparation of fruit toffee	1
12	Preparation of pickle	1
13	Preparation of dried onion/garlic/ginger	1
14	Preparation of banana/ potato wafers	1
15	Preparation of dehydrated tomato powder	1
16	Visit to fruits and vegetables processing unit	1
	Total	**16**

TEXT BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Fruit and Vegetable Preservation Principles and Practices	Srivastava R.P. and Sanjeev Kumar	International Book Distributing Company, New Delhi 2005
2	Post Harvest Technology of Fruits and Vegetables : Handling, Processing, Fermentation and Waste Management vol. I & II	Varma L. R. and Joshi V.K.	Indus Publishing, 2000
3	Preservation of Fruits and Vegetables	Khader	ICAR, New Delhi 2010
4	Preservation of Fruits and Vegetable	G. Lal, G.S. Siddappa, G.L. Tandan	ICAR Publication, New Delhi 1996

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Fruit and Vegetable Processing	M.G. Danthy	FAO, Rome
2	Post harvest Handling and Processing of Fruit and Vegetable	I.S. Singh	Text book
3	Fruit Processing	David Arthey,	Reference book
4	Handbook of Fruit and Vegetable Processing	Sinha and Hui	John Wiley and Sons, 2010
5	Fruit and Vegetable Preservation -Principles and Practices	Srivastava RP & Kumar S	International Book Distributors, 2003
6	Handbook of Fruit Science &Technology: Production, Composition and Processing.	Salunkhe DK & Kadam SS.	Marcel Dekker 1995

FPT-2411 PROCESSING OF SPICES AND PLANTATION CROPS 3(2+1)

Theory

Production and processing scenario of spice, flavour & plantation crops and its scope, Major Spices:(1) Post Harvest Technology composition, processed products of following spices – ginger, chilli, turmeric, onion, garlic, pepper, cardamom, cashew nut and coconut, Minor spices - herbs and leafy vegetables: processing and utilization, all spice, annie seed, sweet Basil, caraway seed, cassia, cinnamon, clove, coriander, cumin, dill seed,fern seed, nutmeg, mint, marjoram, rose merry, saffron, sage,savory, thyme, ajowan, curry leaves, asafoctida,Tea, coffee, cocoa: Processing and quality control, Vanilla and annatto; Processing spice oil and oleoresins; Chemistry and physiology of taste, flavouring compounds in foods separation, purification and identification of natural flavouringmaterials; Synthetic flavouring agents and their stability;flavours of soft drinks, baking and confectionery industry; Standards specification of spices and flavours; Packaging of spices and spice products; Processing of arecanut and its quality control; Processing of cashewnut and its quality control; Flavours of major and minor spices; By products from plantation crops and spices

Practicals

Identification and characterization of flavouring compounds of spices; Estimation of oil contents indifferent spices; Extraction of oil from clove, pepper, cardamom-chili; Extraction of oleoresins:Turmeric, ginger, pepper, clove; Piperine estimation in pepper oleoresin; Steam distillation of spices; Determination of curcumin content in turmeric; Chemical analysis of spices moisture, Volatile oil; Specific; gravity, refractive index, acid value; Study of standard specification of spices; Packaging study of spices;Preparation of curry powder; Preparation of Indian Masala for different foods; Visit to spice industry

Teaching Schedule - Theory with Weightages (%)

No. of Units	Topics	% Syllabus Covered
1-2	Production and processing scenario of spice, flavour & plantation crops and its scope	7
3-5	Major spices: Post harvest technology, composition, processed products of spices – ginger, chilli, turmeric, onion, garlic, pepper, cardamom, cashew nut and coconut	9
6-8	Minor spices, herbs and leafy vegetables: processing and utilization, All spice, annie seed, sweet basil, caraway seed, cassia, cinnamon, clove, coriander, cumin, dill seed, Fern seed nutmeg, mint, marjoram, Rose merry, saffron, sage, etc	9
9-11	savory, thyme, ajowan, curry leaves, asafetida	10
12-14	Tea, Coffee, Cocoa: Processing quality control	9
15-16	Vanilla and annatto-processing	7
17	Spice oil and oleoresins	4
18-19	Chemistry and physiological of taste, flavouring compounds in foods	6
20-21	Separation, purification and identification of natural flavouring materials	6
22-23	Synthetic flavouring agents and their stability	6
24-25	Flavours of soft drinks, Baking and confectionery industry	6

26-27	Standards specification of spices and flavours	6
28	Packaging of spices and spice products	3
29	Processing of arecanut and its quality control	3
30	Processing of cashewnut and its quality control	3
31	Flavours of major and minor spices	3
32	By products from plantation crops and spices	3
	Total	**100**

Practical Exercises

Number of units	Topics	Number of experiments
1.	Physicochemical properties of different spices	2
2.	Study of standard specification of spices	1
3.	Study on Curing of ginger	1
4.	Detection of adulteration in spices	2
5.	Determination of piperine content of black pepper	1
6.	Picrocrocine, safranal and crocine content	1
7.	Test for presence of chromate	1
8.	Extraction of oil/ oleoresins from spices	1
9.	Steam distillation of spices for essential oil	1
10.	Determination of curcumin content in turmeric	1
11.	Preparation of curry powder	1
12.	Preparation of Indian *Masala* for different foods	2
13.	Visit to spice industry	1
	Total	**16**

TEXT BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Spices and Plantation Crops	K.G. Shanmugavelu	Agrotech Publication, Delhi
2	Spice and Condiments	Pruthi J.S.	National Book Trus, 1996
3	Handbook on Spices and Condiments (cultivation, processing and extraction)	Panda H.	Asia Pacific Business Press Inc. 2010
4	The Complete Book on Spices &Condiments (with cultivation, processing & uses)	NIIR BOARD	Asia Pacific Business Press Inc. 2010
5	Spices and Seasonings: A Food Technology Handbook	Tainter DR and Grenis AT	John Wiley and Sons, 2001

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Handbook of Herbs and spices	Peter VK	Woodhead Publishing 2012
2	The Book of Spices	Rosengarten F.	Pyramid Books, 1973
3	Spices and Herbs for the Food Industry	Lewis YS	Food Trade Press, 1984
5	Food Flavourings	P.R. Ashust	Springer, 2012

FPT-3512 CONFECTIONARY AND SNACKS TECHNOLOGY 3(2+1)

Theory

History, Traditional confectionary goods, Types of confectionary, classification of confectionery products Raw Materials/ ingredients-Sugar, Sugar qualities, Physical, Chemical, Optical properties. Sugar grinding, Dextrose, Fructose, Lactose, caramel, maltose, Honey, sorbitol, xylitol, Iso malt, soy maltose, Polydextrose, Mannitol. Whipping, Release agent, thickeners, Acidulents, Milk and Milk Products, Flavours for confectionery, emulsifiers and other additives, Starch derivatives, colours used in confectionary. Production of glucose syrup, Acid hydrolysis, enzyme hydrolysis, Cocoa Processing: Cocoa bean, processing, roasting, Fermentation, Production of Cocoa butter Cocoa powder, its quality. Chocolate Processing : Ingredients, Mixing, Refining, Conching, Tempering, Molding, Cooling, Coating, Fat bloom. High Boiled Sweets: Introduction, Composition, Properties of high boiled sweets, preparation of high boiled sweets, Traditional, batch and continuous Method of preparation, Different types of higher boiled sweets, Recipes. Caramel: Definition, Composition, Factors affecting quality of caramel, caramel Manufacture process, batch type, continuous types, checking of faults in caramel, Toffee: Definition, Composition, types of toffee Ingredient and their role. Batch and Continuous method of toffee Fondant: Fudge/Creamy: ingredients, Methods, Productivity Lozenges: Definition recipe, Method of Manufacture, Compositions, factors affecting quality, Industrial production, checklist of faults and remedy Tablets: Definitions, recipe, composition, wet granulation, Slugging, Manufacture of Tablet, and Checklist of tablet faults. Marshmallow and. Nougat: Definition, composition, recipe, and method of manufacture. Nougat Panning: Process, types of Panning, soft and hard panning. Quality of confectionery, Standards and regulations, Packaging requirements of confectionary, economics and marketing of confectionary goods.

Practicals

Production of invert sugar ;Preparation of High boiled sweets; Preparation of Toffee; Preparation of ; Groundnut Chikki; Preparation of decorative cake; Preparation of Chocolate; Preparation of Traditional ; Indian Confection; Preparation of shrikhand wadi; Preparation of milk chocolate ;Preparation ;f fruit toffee ;Preparation of flour based confectionery ;Preparation of milk cake; Preparation of petha ;Preparation of fruit candy ;Preparation of rasgulla ;Visit to Confectionary Industry

Sr. No.	Topics	No. of Lectures	% Syllabus Covered
1-2	History; Traditional confectionary goods; Types of confectionary; Classification of confectionery products.	2	6
3-6	Raw Materials/ ingredients- sugar, sugar qualities, physical, chemical, optical properties,sugar grinding, dextrose, fructose, lactose, caramel, maltose, honey, sorbitol, xylitol, iso-malt, soy maltose, polydextrose, mannitol	4	13
7-8	Whipping, release agent, thickeners, acidulents, milk and milk products, flavours, for confectionery, emulsifiers and other additives,	2	6
9-10	Starch derivatives, colours used in confectionary. Production of glucose syrup, Acid hydrolysis, enzyme hydrolysis	2	6
11-14	Cocoa processing: cocoa bean, processing, roasting, fermentation, Production of cocoa butter,cocoa powder, its quality.	4	14
15-18	Chocolate processing: ingredients, mixing, refining, conching, tempering, molding, cooling, coating, fat bloom.	4	13
19-22	High Boiled Sweets: introduction, composition, properties of high boiled sweets, preparation of high boiled sweets, traditional, batch and continuous method of preparation. different types of higher boiled sweets, recipes.	4	12
23-24	Caramel: definition, composition, factors affecting quality of caramel, caramel manufacture process, batch type, continuous types, checking of faults in caramel.	2	6
25-26	Toffee: definition, composition, types of toffee ingredient and their role. Batch and continuous method of toffee.	2	6
27-28	Fondant: fudge/creamy: ingredients, methods, Productivity lozenges: Definition recipe, Method of Manufacture, Compositions, factors affecting quality, Industrial production, checklist of faults and remedy	2	6
29-30	Tablets: Definitions, recipe, composition, wet granulation, Slugging, Manufacture of Tablet, and Checklist of tablet faults. Marshmallow and. Nougat: Definition, composition, recipe, and method of manufacture. Nougat	2	6
31-32	Panning: Process, types of Panning, soft and hard panning. Quality of confectionery, Standards and regulations, Packaging requirements of confectionary, economics and marketing of confectionary goods.	2	6
	Total	**32**	**100**

Practical Exercises

No. of Unit	Topics	No. of experiments
1	Production of invert sugar	1
2	Preparation of high boiled sweets	1
3	Preparation of toffee	1
4	Preparation of groundnut *chikki*	1
5	Preparation of caramel	1
6	Preparation of chocolate	1
7	Preparation of traditional Indian confection	1
8	Preparation of *shrikhand wadi*	1
9.	Preparation of milk chocolate	1
10.	Preparation of fruit toffee	1
11	Preparation of flour based confectionery	1
12	Preparation of milk cake	1
13	Preparation of *petha*	1
14	Preparation of fruit candy	1
15	Preparation of *rasgulla*	1
16	Visit to confectionary industry	1
	Total	**16**

TEXT BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Industrial Chocolate Manufactory and Use	S. T. Beckett	Springer, 2012 ISBN: 9781461521112
2	Sugar Confectionery and Chocolate Manufacture	R. Less and E.B. Jackson	Springer, 2012 ISBN: 9781468414950
3	The Complete Technology Book on Snack Foods	Panda H.	NIIR Project Consultancy Services, 2013 ISBN: 9789381039243
4	Sugar Confectionary Manufacture	Jackson EB	Aspen Publication, 1999

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Snack Food Processing	Lusas EW and Rooney LW	CRC Press, 2001 ISBN: 9781420012545
2	Snack Food	Booth RG	Springer, 2012 ISBN: 9781461314776
3	Chocolate, Cocoa and Confectionery: Science and Technology	Bernard W. Minifie	Springer, 1999 ISBN: 9780834213012
4	Snack Food Technology	Matz S.A.	Springer, 1985 ISBN: 9780870554605

FPT-3513 FOOD EXTRUSION TECHNOLOGY 2(1+1)

Theory

Extrusion: definition, introduction to extruders, principles and types, Uses of extruders in the food industry, Single screw extruder: principle of working, net flow, factors affecting extrusion process, Twin screw extruder: counter rotating and co-rotating twin screw extruder, Process characteristics of the twin screw extruder Pre-conditioning of raw materials used in extrusion process Use of dry extruders in extrusion Chemical and nutritional changes in food during extrusion, Classification of Break fast cereals: Raw materials, process and quality testing of vermicelli, spaghetti: Raw materials, process and quality testing of pasta and macronic products Texturized vegetable protein: Definition, processing techniques, and foods Ready to eat break fast cereals by extrusion cooking.

Practicals

Physicochemical properties of proteins, protein rich products, weaning foods, beverages;Texturized products, protein rich bakery products;Type of food extruders, preparation of extruded products; Factors affecting extrusion cooking, moisture content,; diameter, temperature, pressure, screw speed, time, quality evaluation of these products

Teaching Schedule - Theory with Weightages (%)

Sr. No.	Topics	% Syllabus Covered
1	Extrusion: definition, introduction to extruders, principles and types	6
2	Uses of extruders in the food industry	6
3-4	Single screw extruder: principle of working, net flow, factors affecting extrusion process	13
5-6	Twin screw extruder: counter rotating and co-rotating twin screw extruder	13
7	Process characteristics of the twin screw extruder	6
8	Pre-conditioning of raw materials used in extrusion process	6
9	Use of extruders in extrusion.	6
10	Chemical and nutritional changes in food during extrusion	6
11	Classification of breakfast cereals	6
12	Raw materials, process and quality testing of vermicelli and spaghetti	6
13	Raw materials, process and quality testing of pasta and macronic products	6
14	Texturized vegetable protein: Definition, processing techniques	6
15-16	Ready to eat breakfast cereals by extrusion cooking	14
	Total	**100**

Practical Exercises

Unit No.	Topics	Number of experiments
1	Physical properties of extruded foods (expansion, density, water absorption index, etc)	1
2	Physicochemical properties of proteins	1
3	Preparation of protein isolate and concentrate	2
4	Preparation of noodles/ vermicelli	1
5	Preparation of spaghetti	1
6	Preparation of weaning foods	1
7	Studies on properties of texturized vegetable protein	2
8	Determination of oil absorption capacity of extruded products	1
9	Determination of water absorption capacity of noodles	1
10	Cooking quality of TVP	2
11	Studies on Textural Profile Analysis of extruded products	1
12	Effect of extrusion cooking on antinutritional factor	1
13	Visit to extrusion industry	1
	Total	**16**

TEXT BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Extruded foods	Matza S.	Springer, 2000
2	Technology of Extrusion Cooking	N.D. Frame	Springer, 2012
3	Extruders in Food Application	Riaz M.N.	CRC Press, 2000

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Advances in Food Extrusion Technology	Maskan and Altan	CRC Press, 2000
2	Extrusion of Foods	Harper JM	CRC Press, 1981
3	Food Process Engineering and Technology	Berk Z.	Academic Press, 2013
	New Protein Foods, vol. I, and II	A.L. Altschul.	Academic Press, 1985

FPT-3614 FOOD QUALITY AND SENSORY EVALUATION 3(2+1)

Theory

Food quality and its role in food industry, need of quality control, factors affecting quality control, Quality attributes, dominant and hidden attributes, Color: Role of colors in quality spectra, different types of colour, measuring instruments; Viscosity – types of fluids, different viscometers to measure viscosity; Consistency – methods used to measure consistency or product difference between viscosity and consistency; Size and shape - Method to find shape and size of food and food products,Defects: Classification, genetic- physiological defects- Structural, off color, character, entomological Defects- holes, Scars, lesions, off coloring, curled leaves, pathological defects, Mechanical defects, Extraneous or foreign material defects; Measurement of defects: Improving visibility by dilution, white background, color differences, standardization of conditions, reference standards, counts and measures, isolation of defects by floatation, elution, electronic sorting, Internal defects. Texture: Classification, role of firmness, yielding quality, juiciness, chewiness, fibrousness, grittiness, mealiness, stickiness, measurement of texture/ kinesthetic characteristicsby compression, mechanical thumb, puncture tester, succulometer, shearing by tenderometer, texturometer, maturometer, fibro meter, moisture content, by barbender moisture tester, alcohol insoluble solids, color, consistency & sound measurement for kinesthetics. Flavour: Definition and its role in food quality; Taste: Classification, taste qualities, relative intensity, reaction time, effect of disease, temperature, and taste medium on taste, basic tastes and interaction of tastes; Odour: Definition, classification, mechanisms, olfactory abnormalities, odor testing, techniques, thresholds, odor intensities; Factors influencing the Food qualities: Soil, field practices, harvesting practices, procedures, packaging, transportation, storage, conditions, processing conditions, packaging and storage conditions of finished products. Recording and reporting of quality. Sensory evaluation: Definition, classification and methods, sensory evaluation of different products.

Practicals

Quality attributes measurement of various food products;Quality evaluation of product for colours Quality evaluation of product for size, shape;Determination of viscosity of Food roducts;Determination of exture;Sensory evaluation of product for taste and flavor;Market testing of products.; Evaluation of food standards;Determination of color by using lovibond tintometerl; Measurement of texture using pressure tester; Consumer study for food quality; Visit to fruit & Vegetable market for quality assessment.

Teaching Schedule - Theory with Weightages (%)

Unit No.	Topics	% Syllabus Covered
1-2	Food quality and its role in food industry need of quality control, factors affecting quality control	6
3-4	Quality attributes: dominant and hidden attributes	6
5-6	Color-role of colors in quality spectra, different types of colour measuring instruments	6
7-8	Viscosity:- types of fluids, different viscometers to measure viscosity.	6
9-12	Consistency:- methods used to measure consistency or product difference between viscosity and consistency	12
13-14	Size and shape: - Method to find shape and size of food and food products	6
15-18	Defects: Classification, Genetic, physiological defects, structural, off-color, Entomological Defects: holes, Scars, lesions, offcoloring, curled leaves,	9

	pathological defects. Mechanical defects, Extraneous or foreign material defects. Measurement of defects: Improving visibility by dilution, white background, color differences, standardization of conditions, reference standards, counts and measures, isolation of defects by floatation, elution, electronic sorting, Internal defects.	
19-22	Texture: classification, role of firmness, yielding quality, juiciness, chewiness, fibrousness, grittiness, mealiness, stickiness,, measurement of texture/ kinesthetic characteristics.- by compression, mechanical thumb, puncture tester, succulometer, shearing by tenderometer, texturometer, maturometer, fibro meter, moisture content, by barbender moisture tester, alcohol insoluble solids, color, consistency & sound measurement for kinesthetics.	11
23-26	Flavour: Definition and its role in food quality, Taste, classification, taste qualities, relative intensity, reaction time, effect of disease, temperature, and taste medium on taste, basic tastes and interaction of tastes. Odour : definition, Classification, neutral - mechanisms, Olfactory abnormalities, odor testing, techniques, thresholds, odor intensities	9
27-30	Factors influencing the food qualities: Soil, field practices, harvesting practices, procedures, packaging, transportation, storage, conditions, processing conditions, packaging and storage conditions of finished products.	13
31-32	Recording and reporting of quality.	16
	Total	**100**

Practical Exercises

Unit No.	**Topics**	**Number of experiments**
1	Quality attributes of various food products	1
2	Quality evaluation of product for colours	1
3	Quality evaluation of product for size, shape	1
4	Determination of viscosity of food products	1
5	Determination of textural quality profile	2
6	Determination of color by using lovibond tintometer	1
7	Testing of supertaster for sensory evaluation	1
8	Simple difference tests for sensorial evaluation	2
9	Directional difference tests for sensorial evaluation	1
10	Measurement of insect damage	1
11	Evaluation of food products as per standards	1
12	Descriptive testing for sensory evaluation of food	1
13	Consumer study for food quality	1
14	Visit to fruit &vegetable market for quality assessment	1
	Total	**16**

TEXT BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Fundamentals of Quality Control for Food Industry	Krammer and Twigg	Avi Publishing Company, 1966
2	Quality Control in Food Industry	Krammer and Twigg	Avi Publishing Company, 1966
3	Quality Control in Food Industry	Herschdoerfer	Elsevier, 2012
4	Sensory Evaluation Techniques	Civillie and Carr	CRC Press, 2015
5	Handbook of Analysis and Quality Control for Fruit and Vegetable Products.	Ranganna S.	2nd Ed. Tata-McGraw-Hill. 2001.

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Food Industry Quality Control Systesm	Clute M.	CRC Press, 2008
2	Sensory Evaluation Practices	Stone, Bleibaum and Thomas	Academic Press, 2012
3	Sensory Evaluation Practices	Taylor	Academic Press, 2012
4	Measurement and Control in Food Processing	Bhuyan	CRC Press, 2006
5	Principles of Sensory Evaluation of Food	Amerine MA, Pangborn RM & Rosslos EB	Academic Press 1965