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

Theory

No. of Units	Topics	No. of Lectures
1	Introduction, sources of food, scope and benefit of industrial food preservation, perishable, non perishable food, causes of food spoilage	2
2	Preservation by salt and sugar – Principle, method, equipment and effect on food quality	1
3	Thermal processing methods of preservation – Principle and equipments : Canning, blanching, pasteurization, sterilization, evaporation	3
4	Use of low temperature – Principal, equipment and effect on quality Chilling, cold storage, freezing	3
5	Preservation by drying dehydration and concentration – Principle, Methods, equipment and effect on quality : Difference, importance of drying and dehydration over other methods of drying and dehydration, equipments and machineries, physical and chemical changes in food during drying and dehydration Need and principle of concentration, methods of concentration – Thermal concentration, freeze concentration, membrane concentration, changes in food quality by concentration	5
6	Preservation by radiation, chemicals and preservatives Definition, methods of irradiation, direct and indirect effect, measurement of radiation dose, dose distribution, effect on microorganisms. Deterioration of irradiated foods- physical, chemical and biological; effects on quality of foods Preservation of foods by chemicals, antioxidants, mould inhibitors, antibodies, acidulants etc. Preservation by fermentation- Definition, advantages, disadvantages, types, equipments	5
7	Recent methods in preservation : Pulsed electric field processing, High pressure processing, Processing using ultrasound, dielectric, ohmic and infrared heating. Theory, equipments and effect on food quality	5
	Total	**24**

Practicals

No. of Units	Topics	No. of Experiments
1	Demonstration of various machineries used in processing	1
2	Demonstration of effect of blanching on quality of foods	1
3	Preservation of food by heat treatment- canning Canning of fruits and vegetables	1
4	Preservation of food by high concentration of sugar i.e. preparation of jam	1
5	Preservation of food by using salt- Pickle	1
6	Preservation of food by using acidulants i.e. pickling by acid, vinegar or acetic acid	1
7	Preservation of food by using chemicals	1
8	Preservation of bread, cake using mold inhibitors	1
9	Preservation of coconut shreds using humectants	1
10	Drying of pineapple slices, apple slices in cabinet drier	1
11	Demonstration on drying of green leafy vegetables	1
12	Drying of Mango/other pulp	1
13	Drying of semisolid foods using roller dryers	1
14	Drying of foods using freeze-drying process	1
15	Demonstration of preserving foods under cold v/s freezing process	1
16	Processing foods using fermentation technique i.e. preparation of sauerkraut	1
	Total	**16**

REFERENCE BOOKS

1 Technology of Food Preservation — N.W. Desroiser and N.W. Desrosier
2 Introduction to Food Science and Technology — G.P. Stewart and M.A. Amerine.
3 Food Processing Operations Vol. III — M.A. Joslyn and J.J. Heild.
4 Preservation of Fruits and Vegetables — Giridhari Lal, G.S. Siddappa, and G.L. Tondon.

FST-112 FOOD PRODUCTION TRENDS AND PROGRAMMES 2 (2+0)

Theory

No. of Units	Topics	No. of Lectures
1	Food demand and supply – Qualitative and quantitative requirements	2
2	Expected technological advances to meet the needs	2
3	Future priorities in food production needs –status of food industry in India and abroad	2
4	Magnitude and inter dependence of food production and processing agencies.	2
5	Food availability, production trends – factors of production – types of foods like processed semi processed, ready to eat foods, fast foods	3
6	Food characteristics nutritional significance of major food groups	2
7	Present trends of consumption, further requirements	2
8	Consumers change of aptitude in food products consumption	3
9	New food products developed programmes aimed for making more food availability to increasing population and their prospects – merits and drawbacks, prospects for future growth in India	2
10	National and international trends and programmes in food handling, processing and marketing	2
11	Potentials and prospects of developing food industry in India	2
12	Food losses –factors affecting – programmes and strategies to eliminate the looses and meet the required demand	2
13	Global demand for food	2
14	World food day – importance and action plans	2
	Total	**30**

REFERENCE BOOKS

- Food Science III edn. N. N. Potter. AVI Publishing Co Inc West post, USA
- Canoed Foods Thermal Processing and Microbiology AC Herson and A.D. Null and-J A Churchill Ltd. London
- Agricultural Administration in India K. Vijayaraghavan
- Modern Techniques of Raising Chidda Singh, Oxford & IBH Pub.Co.

field crops

- Agriculture Research Systems and Management in the 21st Century — KV Raman, M.M. Anwer and R.B. Gaddagimath, NAARAM Alumini Association National Academy of Agril. Research Management, Rajendranagar, Hyderabad.
- Food Processing Industries — B.M. Desai, V.K. Gupta, N.V. Namboodri. Oxford & IBH Publishing Company, Pvt. Ltd., 66 Janpath, New Delhi.

FST-122 POST HARVEST MANAGEMENT OF FRUITS AND VEGETABLES 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Post harvest technology of fruits and vegetables: An over view concept and science, importance loss reduction, role in export, economy and employment generation	3
2	Morphology, structure and composition of fruit and vegetable - Physical, textural characteristics, structure and composition	3
3	Maturity standards - Importance, methods of maturity determinations maturity indices for selected fruits and vegetables	3
4	Harvesting of important fruits and vegetables	3
5	Fruit ripening- chemical changes, regulations, methods	3
6	Storage practices : Controlled atmospheric, Bead atmosphere, hypobaric storage, cool store, zero energy cool chamber	4
7	Commodity pretreatments - chemicals, wax coating, prepackaging	3
8	Physiological post harvest diseases, chilling injury and disease	2
9	Handling and packaging of fruits and vegetables - Post Harvest handling system for citrus, mango, banana, pomegranate, tomato, papaya and carrot packaging house operations	3
10	Principles of transport and commercial transport operations	2
	Total	**29**

Practicals

No. of Units	Topics	No. of Experiments
1	Studies on morphological features of some selected fruits and vegetables	1
2	Studies on maturity indices	1
3	Studies on harvesting of fruits and vegetables	1
4	Determination of RQ	1
5	Studies on precooling and storage of fruits and vegetables	1
6	Studies on wax coating on apples, papaya, citrus, mango, aonla	2
7	Studies on use of chemicals for ripening and enhancing shelf life of fruits and vegetables	2
8	Studies on regulations of ripening of banana, mango, papaya	1
9	Studies on various storage systems and structures	1
10	Studies on prepackaging of fruits	1
11	Studies on prepackaging of vegetables	1
12	Studies on physiological disorders - chilling injury of banana and custard apple	1
13	Visit to commercial packaging house – grape/mango/ pomegranate/banana	1
14	Visit to commercial storage structures - onion, garlic, potato	1
	Total	**16**

REFERENCE BOOKS

Post Harvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetable	Er. B. Pantastico
Post Harvest: An Introduction to the Physiology and Handling of Fruits and Vegetables.	R.B. Wills, M.B. Mc Glasson, D. Graham, T.L. Lee and E.G. Hall.
Post Harvest Technology of Fruits and Vegetables- Vol. I	L.R. Verma, and V.K. Joshi.
Hi-tech Horticulture	D.K. Singh.
Biochemistry of Foods	Eskin, Henderson and Townsend
Fruit and Vegetable Technology	Duckworth.

FST-123 CEREAL PROCESSING 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Present status and future prospects of cereals (Rice, Wheat, Corn, Sorghum, Rye) Morphology of Rice : Physical properties: Density, Bulk density, Angle of repose, - hardness, asperity, porosity, stack of milling and moisture on physical properties Chemical composition: Distribution of nutrients and Aroma of rice. Drying of paddy : general principles and methods of drying, cracking phenomenon - prevention. Methods of drying, batch type, continuous type driers	4 4
2	Parboiling of rice : Milling of rice : i) Conventional Milling ii) Modern milling iii) Advantages and disadvantages of milling machineries. iv) By products of rice milling Aging of rice : Enrichment: Need of Enrichment, Methods of enrichment, enrichment levels, fortification of amino acids. - Processed Foods from rice: Breakfast cereals, flakes, puffing, canning and instant rice	5 5
	Corn : Morphology, Physico-chemical properties, Corn milling, Milling fractions and modified starches Barley : Morphology, Physico-chemical properties and processing	5

	(Malting)	
4	Sorghum : Morphology, Physico-chemical properties, Milling, Malting, Pearling and industrial utilization	4
5	Millets – Oat / Rye : Importance of Millet, composition, processing of millets for food uses	5
	Total	**32**

Practicals

No. of Units	**Topics**	**No. of Experiments**
1	Morphological characteristics of cereals	1
2	Physical properties of cereals	1
3	Chemical properties of cereals	1
4	Determination of colour of cereals	1
5	Parboiling of paddy	1
6	Cooking quality of rice	1
7	Milling of rice	2
8	Conditioning of wheat	1
9	Production of sorghum flakes	1
10	Production of popcorns	1
11	Preparation of sorghum malt	2
12	Determination of gelatinization temp. by amylograph	1
13	Extraction of oil from rice bran	1
14	Visit to cereal processing unit	1
	Total	**16**

REFERENCE BOOKS

Technology of Cereals — Kent.

Post Harvest Technology of Cereals, Pulses and Oil seeds — A. Chakrawarthy

3 Modern Cereal Sci and Technology — Y. Pomeranz

4 Utilization of Rice — Luh.

5 Post Harvest Bio Technology of Cereals — D.K. Salunkhe

6 Hand Book of Cereal Science and Technology — Editors O.R. Fennema, Markus Karel

FST-235 LEGUME AND OILSEED TECHNOLOGY 3 (2+1)

Theory

No. of Units	**Topics**	**No. of Lectures**
1	Present status and future prospectus of legumes and oil seeds	3

	morphology of legume and oilseeds	
2	Classification and types of legumes and pulses. Chemical composition and nutritional value. Antinutritional factors, their chemistry, methods of removal of antinutritional factors	4
3	Processing of legumes of home scale, cottage scale and commercial methods of dehulling. Modern techniques in dehulling. Processing of red gram,. bengal gram, green gram, black gram.	4
4	Dal milling – principles, methods, equipments and effect on quality. Principle products, dry and wet milling of pulses, fermented products of legumes	2
5	Soaking – principles, methods of soaking - sprouting, puffing, roasting and parboiling of legumes, physical and bio-chemical changes during these processes	4
6	Cooking quality of dhal – methods, factors affecting quality of dhal and cooking of dhal. quick cooking dhal, instant dhal.	2
7	Introduction, present and future prospects of oil seeds, chemical composition and characters of oil seed and oils, antinutritional factors, elimination methods	3
8	Post harvest technology of oil seeds, handling drying, storage, grading, pretreatments, cleaning, dehulling, size reduction and flaking	2
9	Oil extraction: traditional methods, ghani, power ghanis, expellers –principle of expeller, structure design of expeller.	2
10	Solvent extraction process : principle, pretreatment - breaking, cracking, flaking. extraction principle, factors affecting the extraction process. Desolventization	2
11	Refining of oils – degumming, neutralization, bleaching, filtration, deodorization, their principles and process controls.	2
12	New technologies in oil seed processing, utilization of oil seed meals of different food uses. high protein product like protein concentrate and isolates	3
	Total	**33**

Practicals

No. of Units	**Topics**	**No. of Experiments**
1	Physical properties of legumes and oil seeds	1
2	Estimation of protein	1
3	Estimation of fat	1
4	Methods and principles of dehulling application oil application red earth slurry.	1

5	Dal milling process.	2
6	Antinutritional factors, methods of elimination.	2
7	Soaking studies.	2
8	Sprouting of legumes.	1
9	Cooking quality of dal	1
10	Fermented product of legumes- dosa, idli, wada, dhokala, etc.	2
11	Extraction of oil by expeller press	1
12	Production of protein rich product.	1
13	Visit to dal mill and oil extraction plant.	1
	Total	**17**

REFERENCE BOOKS

Post Harvest Biotechnology of Legumes — D.K. Salunkhe *et al.*
Post Harvest Biotechnology of Oil Seed — D.K. Salunkhe *et al.*
Processed Protein Food Stuff — A.M. Alschule
The Chemistry and Technology of Edible Oils and Fat — A.E. Baily
Post Harvest Technology of Cereals, Pulses and Oil seeds — Chakraborthy
Oil Seed Processing Technology — B.D. Shukla

FST-236 MEAT, POULTRY AND FISH TECHNOLOGY 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Sources and developments of meat and poultry industries and importance in national economy	2
2	Muscle structure, chemical composition and physico-chemical properties of meat muscle Abattoir design and layout	3
3	Pre-slaughter transport and care and antimortem inspection	2
4	Slaughtering of animals and poultry, post-mortem inspection and grading of meat	3
5	Factors affecting post-mortem changes, properties and shelf life of meat	3
6	Egg structure: Composition, quality characteristics, processing and preservation of eggs	3

7	Processing and preservation of meat- mechanical deboning, aging or chilling, freezing, pickling, curing, cooking and smoking of meat.	3
8	Meat tenderization –Principles and methods	2
9	Meat emulsions	2
10	Technology of manufacture of meat and poultry products	3
11	Meat plant sanitation and safety	1
12	By-products utilization of abattoir	3
13	Fish-Classification,composition, quality charecteristics and preservation.	2
	Total	32

Practicals

No. of Units	Topics	No. of Experiments
1	Pre-slaughter operations of meat animals and poultry birds	1
2	Slaughtering and dressing of meat animals	2
3	Study of post-mortem changes	1
4	Meat cutting and handling	1
5	Evaluation of meat quality	2
6	Preservation of meat by different methods and preparation of meat and poultry products	3
7	Evaluation of quality and grading of eggs	2
8	Preservation of shell eggs	2
9	Studies on by-products utilization	1
10	Anatomy and preservation of fish	**2**
	Total	**17**

REFERENCE BOOKS

Principles of Meat Science — F. J. Forrest
Meat Hand Book — Albert Levie
Developments in Meat Science Vol. I and II — Ralston Lawrie
Poultry Production — R. A. Singh
Meat Technology — Gerard F.

FST-237 WHEAT MILLING AND BAKING TECHNOLOGY 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Wheat – importance, production varities	1
2	Types of wheat, grading and quality of wheat	2
3	Structure of wheat, chemical constituents, their distribution	3-4
4	Physico-chemical and Rheological properties	4-5
5	Enzymes in wheat, damage wheat	6
6	Conditioning of wheat – principles and methods of conditioning	7-8
7	Milling of wheat – Roller flour milling process Break rolls, reduction rolls, The design and operation Wheat milling process	9-12
8	Products of wheat milling industry Flour grades, Supplementation, Fortification	13-15
9	Flour additives, flour improvers, Bleaching, Oxidizing agents	16-18
10	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, roppynes	19-25
11	Baked Products from soft wheat: cookies, crackers, biscuits, cakes: types, ingredients, process, causes, remedy	26-27
12	Other bakery products: using very hard wheat. pizza, pastry and its types. Macaroni products: Including spaghetti, noodles, vermicelli-process. Nutritional improvement of bakery products	28-29
13	Setting of bakery unit, bakery norms, specifications for raw materials Packaging, marketing of products, project report on bakery	30-32
	Total	**32**

Practical

No. of Units	Topics	No. of Experiments
1	Classification of wheat based on physico-chemical properties	1
2	Conditioning of wheat	1
3	Milling of wheat	1
4	Quality Testing of flour. - Falling number and α- amylase activity. - Sedimentation value. – Pelshenke value. – Rheological Tests. Farinograph. Mixograph Extensiograph.	4-8

	Alveograph.	
5	Manufacture of bread, types, faults, remedies, shelf life bread, quality of bread	9-12
6	Test Baking: biscuits, cookies, crackers, buns: Types and quality	13-14
7	Other baked products- pastry, pizza	15
	Visit to wheat milling industry, visit to bakery	16

REFERENCE BOOKS

Bakery Science and Cereal Technology — Khetarpaul.
Technology of Cereals — Kent.
Bread — Spensor.
Flour Milling Process — Scott.

FST-238 CONFECTIONERY TECHNOLOGY 2 (1+1)

Theory

No. of Units	Topics	No. of Lectures
1	History, traditional confectionery goods, types of confectionary, classification Basic technical considerations, TS, TSS, pH, acidity, ERH, sugar, invert sugar, glucose syrup, RH, crystallization	2
2	Raw materials Sugar, sugar qualities, physical, chemical, optical properties. sugar grinding, dextrose, fructose, lactose, caramel, maltose, honey, sorbitol, xylitol, iso malt, soy maltose, polydextrose, lactitol, maltitol.	2
3	whipping, release agent, thickeners, acidulents, milk and milk products, flavours, for confectionery, emulsifiers and other additives,	2
4	starch derivatives, colours used in confectionary. Production of glucose syrup, acid hydrolysis, enzyme hydrolysis	1
5	Cocoa processing: cocoa bean, processing, roasting, fermentation, production of cocoa butter cocoa powder, its quality	1
6	Chocolate processing : Ingredients, mixing, refining, conching, tempering, molding, cooling, coating, fat bloom	2
9	**Mid term examination**	
10-11	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	2
11-12	Caramel: Definition, composition, factors affecting quality of caramel, caramel manufacture process, batch type, continuous types, checking of faults in caramel	2
13	Toffee: Definition, composition, types of toffee ingredient and their	1

	role. batch and continuous method of toffee	
14-15	Fondant: Fudge/Creamy: ingredients, methods, productivity Lozenges: definition recipe, method of manufacture, compositions, factors affecting quality, industrial production, checklist of faults	2
16-17	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 of nougat	2
18-19	Panning: Process, types of panning, soft and hard panning. quality of confectionery, standards and regulations, packaging requirements of confectionery, economics and marketing of confectionary goods.	1

Practicals

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 decorative cake	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 confectionary	1
12	Preparation of flour confectionary	1
13	Preparation of milk cake	1
14	Preparation of petha	1
15	Preparation of fruit candy	1
16	Preparation of Rasgulla	1
17	Visit to confectionary industry	1
	Total	**17**

REFERENCE BOOKS

Sugar Confectionery and Chocolate Manufacture — R. Less and E.B. Jackson.
Industrial Chocolate Manufactory and Use — S.T. Beekelt
Chocolate, Cocoa & Confectionery Sci and Tech. — Bernared W. Minifie
Basic Baking — S.C. Dubey.

FST-249 FRUIT AND VEGETABLE PROCESSING 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Production and processing scenario of fruits and vegetables in India and World	1
2	Scope of fruit and vegetable preservation industry in India. present status, constraints and prospects	2
3	Overview of principles and preservation methods of fruits and vegetables	3
	Commercial processing technology of following fruits and vegetables	
4	Mango: pulp, RTS, squash, canned pulp. toffee amchur, pickle, powder, bar	2
5	Banana: wafers, puree, powder, banana fig	1
6	Papaya: jam, candy, RTS, nectar, squash, papain.	1
7	Pomegranate: juice, squash, syrup, anardana, dalimb manuka, anargoli.	2
8	Guava; jelly, cheese, juice, canned guava, squash, toffee	1
9	Grape: raisin, juice, wine	1
10	Fig : pulp, dried fig, toffee, powder, bar	1
11	Citrus fruits: jelly, marmalade, RTS, squash, candy	1
12	Aonla ; preserve, jam, candy, juice, squash, powder, dried shreds, chavanprash, pickle, chutney, sauce, sweets.	2
13	Tamarind: pulp, powder, toffee, bar, RTS, slab	2
14	Jamun : jelly, RTS, syrup, wine, flakes, bar, powder	1
15	Wood apple: jelly, marmalade	1
16	Tomato: ketchup, sauce, puree, soup, chutney, pickle	2
17	Ginger: preserve, candy, dried ,ginger pickle, RTS, syrup.	1
18	Onion: dried onion, powder	1
19	Garlic : dried garlic, powder,	1
20	Potato : wafer, starch, papad	1
21	Carrot: preserve, candy, pickle, jam	1
22	Cauliflower and Cabbage: dried cauliflower and cabbage, sauerkraut, pickle	1
23	Leafy vegetables; dried leafy vegetables (spinach, fenugreek, coriander leaves, curry leaves)	1
24	Bitter gourd: pickle, dried bitter gourd	1
	Total	**32**

Practicals

No. of Units	Topics	No. of Experiments
1	Cannning of mango/guava/papaya	1
2	Preparation of fruit jam: apple/mango/guava/ papaya/aonla/strawberry	1
3	Preparation of fruit jelly : wood apple/ sweet orange/mandarin/guava/ tamarind.	1
4	Preparation of fruit marmalade:	1
5	Preparation of fruit preserve and candy	1
6	Preparation of fruit RTS	1
7	Preparation of fruit squash	1
8	Preparation of fruit syrup	1
9	Preparation of grape raisin, dried fig and banana fig.	1
10	Preparation of anardana and dalimb manuka	1
11	Preparation of fruit cheese.	1
12	Preparation of pickle, mixed pickle	1
13	Preparation of dried ginger	1
14	Preparation of amchur	1
15	Preparation of dried onion and garlic	1
16	Preparation of banana and potato wafers	1
17	Preparation of dehydrated leafy vegetable	1
	Total	**17**

REFERENCE BOOKS

Fruit and Vegetable Preservation Principles and Practices — Srivastava R.P. and Sanjeev Kumar

Post Harvest Technology of Fruits and Vegetables : Handling, Processing, Fermentation and Waste Management vol. I and II — Verma L. R. and Joshi V.K.

Hi Tech Horticulture — Singh D.K.

Preservation of Fruits and Vegetables — Khader

Fruit and Vegetable Preservation — Bhutani R.C.

Principles of Fruit Preservation — Morris, Thomas Norman,.

Preservation of fruits and vegetables — Giridharilal, G.S. Siddappa and G.L. Tandon.

FST-2410 FOOD QUALITY 2(1+1)

Theory

No. of Units	Topics	No. of Lectures
1	Food quality, its role in industry definition of quality, quality control, factors affecting quality control	1
2	Quality attributes, dominant attributes, hidden attributes	1
3	Colour-role of colour in quality spectra, different types of colour measuring instruments	1
4	Viscosity- types of fluids, different viscometers to measure viscosity	1
5	Consistency- Methods used to measure consistency of product Difference between viscosity and consistency	1
6	Size and shape- Its role, method to find shape and size of food and food products	1
7	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	2
8	Texture- Classification, definition and 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	2
9	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, interaction of tastes Odour- definition, classification, neutral - mechanisms, olfactory abnormalities, odor testing, techniques, thresholds, odor intensities	2
10	Visual, auditory, other senses, vision, audition, oral perception	2

	other than taste	
11	Factors influencing sensory measurements: Attitudinal factors, motivation psycological errors in Judgment, relation between stimulus and perception adaptation. Correlation of sensory and instrumental analysis.	2
12	Quality Measurements: Laboratory measurement: types of tests, panel selection and testing environment, serving procedures, instruction to judges, different tests, directional difference tests, classification of difference tests, two-sample tests, three sample tests, multisample tests, comparison of procedures, ranking, scoring, hedonic scaling, dilution procedures, descriptive sensory analysis, contour method, other procedures. Consumer measurement: Factors influencing acceptance and preference, objectives of consumer preference studies, information obtained from consumer study, factors influencing results from consumer surveys, methods of approach, development of the questionnaire, types of questionnaires, serving procedures. Comparison of laboratory panels with consumer panels, limitations of consumer survey	2
13	Quality of raw materials: Physical, Chemical and microbial quality. Quality of products during processing & after processing color, taste, texture, flavour, appearance.	1
14	Factors influencing the Food qualities: Soil, field practices, harvesting practices, procedures, packaging, transportation, storage, conditions, processing conditions, packaging and storage conditions of finished products.	2
15	Recording and reporting of quality.	1
	Total	**22**

Practicals

No. of Units	**Topics**	**No. of Experiments**
1	Sensory evaluation of product	1
2	Quality evaluation of raw materials.	1
3	Quality evaluation of product for size, shape.	1
4	Determination of viscosity of food products.	1
5	Determination of texture	2
6	Sensory evaluation of product for taste	1
7	Market testing of products.	2
8	Evaluation of food standards.	1
9	Determination of color by using lovibond tintometer	2
10	Visit to food factory to know sensory evaluation problems.	2

11	Consumer study for food quality.	1
12	Visit to fruit and Vegetable market for quality assessment.	1
	Total	**16**

REFERENCE BOOKS

Principles of Sensory Evaluation of Food	Maynard A –Amerine, Rose Marie Pangborn, Edward B. Roessler.
Quality Control for Food Industry	Krammer & Twigg.
Quality Control in Food Industry	S.N. Herschdogrfer.
Advances in Food Research	Academic Press. Vol I.

FST-2411 PROCESSING OF MILK AND MILK PRODUCTS 2 (1+1)

Theory

No. of Units	Topics	No. of Lectures
1	Milk – Definition, composition of milk from different species, colostrum.	2
2	Physico – Chemical properties of milk.	2
3	Nutritive value of milk and milk products.	2
4	Effect of heat on milk.	2
5	Processing of milk- pasteurization by L T H T and HTST and UHT – filtration, UF and RO, clarification, cream separation, homogenization and heat processing.	2
6	Classification of milk products.	2
7	Manufacture of butter and butter oil (Ghee)	2
8	Fermented milks	2
9	Preparation of yoghurt and cheese.	2
10	Ice-cream – Method of manufacture.	2
11	Manufacture of indigenous milk products – ghee, khoa, chhanna, paneer, dahi and shrikand.	2
12	Indian milk confectionary – Khoa and Chhanna based sweets.	2
13	By products of dairy Industry and their utilization.	2
14	Packaging and storage of milk and milk products – Defects – Standards.	2
	Total	**28**

Practicals

No. of Units	Topics	No. of Experiments
1	Sampling and analysis of milk – physico chemical properties and composition, DMC and DYC reduction tests, presence of adulterants and preservatives.	2
2	Standardization of milk for markets	1
3	Clarification and separation of milk	1
4	Heat processing of milk – Pasteurization	1
5	Preparation of butter and ghee	2
6	Ice-cream preparation	2
7	Preparation of dahi, shrikhand, lassi etc	2
8	Preparation of khoa and khoa based sweets	2
9	Preparation of channa, paneer and chana based sweets	2
10	Visit to Dairy plant	1
	Total	**16**

REFERENCE BOOKS

Outlines of dairy Technology — Sukumar- De , Oxford University Press, New Delhi.

The Fluid Milk Industry — J.L.Henderson. 3rd edition AVI Publishing Co. West port, Conn. USA.

Principles of Dairy Processing — J.N.Warner, Wiley Eastern Ltd, New Delhi.

Indian Dairy Products — K.S.Rangappa and K L Acharya Asia Publishing house, Bombay.

Judging of Dairy Products — J.A.Nelson and Trout, The Olsen publishing Co. Milwankee, Wisconsin, USA.

Milk processing and Dairy Products Industries, — EIRI Board of consultants & Engineers Engineers India Research Institute, Delhi.

Technology of Milk Processing — Q. A. Khan & Padmanabhan

FST-2412 SPICE AND FLAVOR TECHNOLOGY 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Production and processing scenario of spice, flavour & plantation crops and its scope	2
2	Major Spices: (1) Post Harvest Technology composition, processed products of following spices (2) Ginger (3) Chill (4) Turmeric (5) Onion and garlic (6) Pepper (7) Cardamom (8) Cashew nut, coco nut.	2
3-8	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	5

9	**Mid term examination**	
10-11	Savory, Thyme, Ajowan, Curry leaves, Asafoctida	3
12	Tea, Coffee, Cocoa: Processing quality control	2
13	Vanilla and annatto-processing	2
14	Spice oil and oleoresins	2
15	Chemistry and physiology of taste, flavouring compounds in foods	3
16	Separation, purification and identification of natural flavouring materials	3
17	Synthetic flavouring agents and their stability	2
18	Flavours of soft drinks, Baking and confectionery industry	2
19	Standards specification of spices and flavours	2
20	Packaging of spices and spice products	2
	Total	**32**

Practical

No. of Units	Topics	No. of Experiments
1	Identification and characterization of flavouring compounds of spices	1
2	Oil determination	1
3	Extraction of oil from clove, pepper, cardamom-chili	1
4	Extraction of oleoresins-Turmeric, ginger, pepper, clove	2
5	Piperine estimation in pepper oleoresin	1
6	Steam distillation of spices	2
7	Determination of curcumin content in turmeric	1
8	Chemical analysis of spices moisture, Volatile oil, specific gravity, refractive index, acid value	1
9	**Mid term examination**	
10	Study of standard specification of spices	1
11	Packaging study of spices	1
12	Preparation of curry powder	1
13	Preparation of Indian Masala for different foods	2
14	Visit to spice industry	1
	Total	**16**

REFERENCE BOOKS

Spices – vol. II - Parry J.W.
Spice and condiments - Pruthi J.S.
Herbs and spices - Rosemery Hemphill

The book of spices - Rosen garten, F. and Livington Jr.
Spices and herbs for the Food Inudstry - Lewies, Y.S.
Spices Vol. I and II; Tropical Agril. Series - Purseglove, J.W. Brown E.G., Green C.L. And Robbins SRJ.
7. Food Flavourings - P.R. Ashust
8. Food Flavouring composition, manafacture and uses. - J.Merrory

FST-3513 FOOD INDUSTRIAL BYPRODUCT AND WASTE UTILIZATION 2 (1+1)

Theory

No. of Units	Topics	No. of Lectures
1	Industrial byproducts and waste.	2
2	Potentials and prospects of developing by-products industry in India.	2
3	Agricultural waste and agro based industrial waste management.	2
4	By products of cereals.	2
5	By products of legumes.	2
6	By products of oil seeds.	2
7	By products of dairy.	2
8	By products of fruit and vegetables processing industries.	3
9	By products of meat, poultry and eggs.	2
10	By products of fish processing units.	2
11	By products of plantation crops and spices.	3
12	Uses of byproducts of agro based industries in various sector.	2
13	Byproducts of fermentation industries.	2
14	By products of sugar and bakery industries.	2
	Total	**30**

Practical

No. of Units	Topics	No. of Experiments
1	Extraction of banana fiber.	1
2	Extraction of leaf proteins.	2
3	Alcohol production from molasses.	3

4	Utilization of crop residues for the production of cellulose.	2
5	Use of mango kernels for starch manufacture.	3
6	Isolation and purification of pectin from organic waste.	2
7	Extraction of volatile oils from organic waste.	2
	Total	**15**

REFERENCE BOOKS

1 Food from Waste Warvan
2 Food Protein Sources Pirie
3 Technology of Fish Utilization Ed. Kreuyer

FST-3514 CARBONATED BEVERAGE TECHNOLOGY 2(1+1)

Theory

No. of Units	Topics	No. of Lectures
1	History and types of soft drinks	1
2	Water treatment and quality	1
3	Specification for beverage water	1
4	Alkalinity reduction ,filteration of water,water softening.	1
5	Sweeteners used in soft drink and their properties ,non nutritive sweetners	1
6	Natural colorants used in soft drinks	1
7	Synthetic colorants used in soft drink	1
8	Acidulants used in soft drink	1
9	Mid term examination	
10	Clouding agents for soft drink	1
11	Flavouring agents used in soft drink	1
12	Carbon dioxide and carbonation for sift drink	1
13	Equipments and machineries used in soft drink	1

14	Packaging aspects in soft drink	1
15	Quality control in soft drink –Chemical snd sensory	1
16	Quality control in soft drink –Microbiological quality	1

Practical

No. of Units	Topics	No. of Experiments
1	Physical properties of water	1
2	Determination of Hardness of water	1
3	Determination of density of caramel	1
4	Determination of viscosity of caramel	1
5	Determination of colours in soft drinks by wool technique	1
6	Determination of saccharine in beverages	1
7	Determination of benzoic acid in beverages	1
8	Determination of sulphurdioxide in beverages	1
9	Mid term	
10	Determination of caffeine in cola type of beverages	1
11	Determination of brix value, gas content, PH and acidity of beverages	1
12	Microbial total plate count of water and beverages	1
13	Microbial analysis of water for E – coli	1
14	Visit to carbonation Unit	1
15	Visit to water treatment plant	1
16	Visit to the drinking water/mineral water plant+-	

REFERENCE BOOKS

1 Preservation of Fruit and Vegetable Products - Giridharilal, Siddappa G.S. and Tondon G.D.

2 Fruit and Vegetable Juices - Tressler D.K., Joslyn M.A. and Marsh G.C. AVI publishing company New York.

3 Food Engineering Operations - Brennan, Buttler, Crowell and Lilly

FST-3615 PRODUCT DEVELOPMENT AND FORMULATION 2 (1+1)

Theory

No. of Units	Topics	No. of Lectures

1	Need, importance and objectives of formulation for new product development.	1
2	Ideas, business philosophy and strategy of new product	1
3	Formulation based on sources availability and cost competitiveness for concept developments of new products	2
4	Standardization of various formulation and product design	2
5	Adaptable technology and sustainable technology for standardized formulation for process development	1
6	Process control parameters and scale-up, production trials for new product development at lab and pilot scale	2
7	Quality assessment of new developed products	2
8	Market testing and marketing plan	1
9	Costing and economic evaluation of developed products	2
10	Commercialization / product launch for marketing	2
	Total	**16**

Practical

No. of Units	**Topics**	**No. of Experiments**
1	Market survey of existing various products	1
2	Formulation of new products based on corporate decision /needbased	
	Protein-energy rich	1
	Low calorie (fat replacer)	1
	Low sodium content	1
	Glycemic index based	1
	Cholestrolemic index based	1
	Phyto-chemical based	1
3	Product development based on above formulation depending on local sources/ technology	2
4	Quality assessment	2
5	New product development for	
	Infant / weaning foods	1

	Geriatric	1
	Physiological status	1
	Athletes	1
	Total	**15**

REFERENCE BOOKS

1 New Food Product Design and Development Beckley, Blackwell Publishing

Oxford UK

Sensory and Consumer Research in Food Product Design and Development Moskowitz, Blackwell Publishing Oxford UK

FST-3616 SPECIALITY FOOD 3 (2+1)

Theory

No. of Units	Topics	No. of Lectures
1	Need and scope of specialty foods	3
2	Speciality food based on ease in preparation for cost health benefits Functional foods Convenience food Health care and medical benefits Nutritional status Low cost foods	3
3	Speciality foods based on sources • Cereals and millets • Legumes and pulses • Fruits and vegetables • Animal food sources • By product based • Non conventional foods	4
4	Speciality foods based on process • Innovative process technology • Food additives basis • Bioactive components • Novel neutraceuticals products • Packaging techniques • Adaptable technology basis • Fast and PET foods 3	3
5	Speciality food based on genetics	3

	Genetically modified foods Transgenic foods Biotechnological aspects of detoxification	
6	Proprietary foods	3
7	Supplementary foods	3
8	Therapeutic foods Modification of diets in disorders, feeding purposes Disease oriented of different organs ex: digestive trac, liver, cardiovascular system, kidney , metabolic disorders, allergy, endocrine disorders	3
9	Specific consumer oriented foods • Defence persons • Space / astronought • High altitude mountain climbers • Disaster situation – crises, care, maintenance	4
10	Speciality foods based on growing condition - organic , inorganic farming	3
	Total	**32**

Practical

No. of Units	**Topics**	**No. of Experiments**
1	Preparation of speciality foods based on	
	i) Functionality	1
	ii) Convenience	1
	iii) Low cost	1
	iv) Nutritional purpose	1
2	Preparation of speciality food using locally available foods crops, fruit and vegetables few products	2
3	Assessment of byproduct for preparation of value added speciality food	2
4	Isolation of phytochemical/ bioreactive agent of plant sources and their utilisation in proprietory foods	2
5	Preparation of speciality food as per requirement of	
	i) Location	1
	ii) Nature of work	1
	iii) Status of worker	1
6	Evolution of food cultivated under organic farming conditions	2
	Total	**15**

REFERENCE BOOKS

1 Food Science Potter
2 Processed Protein Food Stuffs Alchule
3 Food and Nutrition M Swaminathan
4 Therapeutic Diets NIN
5 Supplementary Foods NIN

FST- 3617 EXTRUSION TECHNOLOGY 2 (1+1)

Theory

No. of Units	Topics	No. of Lectures
1	Food proteins Types, sources, availability, need, properties etc. food problems, role, means for increasing food supply	4
2	Amino acid fortification of foods i.e. break fast cereals, infant foods, bread, baked products.	4
3	Legumes and oilseed foods Isolate, concentrate, and substitute to milk, variation in composition and nutritive value.	4
4	Meat Analogue, commercial development, nutritional aspect, marketing aspect	4
5	New protein foods, tofu, miso, texturized vegetable protein, hydrolyzed vegetable protein, formulation and quality control	4
6	Extrusion Technology Importance, principles of extrusion cooking, methods of extrusion cooking	4
7	Extruders- Types of extruders, single screw, twin screw, their applications, effects of dependent and independent variables on the product quality.	4
8	Extruded products- Raw materials, process of manufacture, properties, quality, evaluation, packaging requirement, marketing	4
	Total	**32**

Practicals

No. of Units	Topics	No. of Experiments
1	Physicochemical properties of proteins, protein rich products, weaning foods, beverages	4
2	Texturized products, protein rich bakery products	4
3	Type of food extruders, preparation of extruded products	4
4	Factors affecting extrusion cooking, moisture content, diameter, temperature, pressure, screw speed, time, quality evaluation of these products	4
	Total	**16**

REFERENCE BOOKS

1. New protein foods, vol.I,II, A.L. Altschul.
2. Extruded foods Matza.

FST-3618 QUALITY ASSURANCE AND CERTIFICATION (1+1)

Theory

No. of Units	Topics	No. of Lectures
1	Quality inspection, quality control, quality management and quality assurance	1
2	Total quality management • Good manufacturing practices • Good agricultural practices • Good laboratory practices Quality management systems (QMS)	4
3	Quality Circles, SQC., ISO System	2
4	HACCP, principles, implementation	3
5	Plan documentation, types of records	2
6	Auditing, surveillance Audit, mock audit, third party quality certifying audit, Auditors and Lead auditors.	2
7	Certification, certification procedures, certifying bodies, accrediting bodies, international bodies.	2
	Total	**16**

Practicals

No. of Units	Topics	No. of Experiments
1	Quality assurance procedures	1
2	TQM, GMP, GAP documentation.	2
3	Preparation of quality policy & documentation (quality Manuals)	1
4	Preparation of laboratory manuals.	1
5	Application of HACCP to products.	2
6	Preparation of documentation and records.	1
7	Auditing- surveillance, mock audit.	2
8	Visit to units implementing GMP, GAP	2
9	Visit to units with ISO systems	2
10	Visit to units with HACCP certification.	2
	Total	**16**

REFERENCE BOOKS

1 Preharvest and Post Harvest Food Safety Beier, Blackwell Publishing Oxford UK
2 Guide to Food Laws and Regulations Curties, Blackwell Publishing Oxford UK
3 Technology of Food Preservation Desrosier and Desrosier
4 HACCP Mortimore, Blackwell Publishing Oxford UK

Other courses of 7 credits approved by IVth Dean Committee are as follows

Sr. No.	Course title	Course credits
1	Principles of Economics	2 (2+0)
2	IT Application in Food Industry	2 (1+1)
3	Processing of Spices and Plantation Crops	3 (2+1)

1. Physical education : 01credit (Non credit course)
2. Mathematics (Deficiency courses) : 04 credit (Non credit courses