



PSG College of Arts & Science
An Epitome of Quality Learning

Since 1947

B.Voc
FOOD PROCESSING TECHNOLOGY

2017 - 2020

B. Voc Degree Programme
Food Processing Technology
Scheme of Examinations
(for first & second semester subjects)
(for students admitted from 2014-15 & onwards)

CODE NO.	SUBJECT	Exam Duration (Hrs)	Max. Marks			Credit points
			CA	CE	Total	
FIRST SEMESTER						
	Part - I					
14LAU01	Tamil – I OR	3	25	75	100	3 (G)
12LAU01	Hindi – I OR					
14LAU01	French-I					
	Part - II					
14EU01	Communicative English - I-Interpersonal Communication	3	25	75	100	3 (G)
	Part - III					
14FPB01	Principles of Food Processing	3	25	75	100	6 (S)
14FPB02	Fruit and Vegetable Processing Technology	3	25	75	100	6 (S)
14FPB03	Food Service Management (Allied)	3	25	75	100	4 (G)
14FPB04	Basics of Human Nutrition	3	25	75	100	2 (G)
14FPB05	Equipment Operation and Techniques in Food Processing Practical	--	100	--	100	6 (S)
SECOND SEMESTER						
	Part - I					
14LAU02	Tamil – II OR	3	25	75	100	3 (G)
12LAU02	Hindi – II OR					
14LAU02	French-II					
	Part - II					
14EU02	Communicative English II– Academic Communication	3	25	75	100	3 (G)
	Part - III					
14FPB06	Grain Technology	3	25	75	100	4 (S)
14FPB07	Food Chemistry	3	25	75	100	4 (S)
14FPB08	Marketing Management (Allied)	3	25	75	100	4 (G)
14FPB09	Food Processing and Preservation Techniques Practical	3	40	60	100	4 (S)
14FPB10	Basic Quality Control Practical	3	40	60	100	4 (G)
	Industrial training*					2 (S)
	Part - IV					
14VEU01	Value Education**	--	100	--	100	2 (G)
Evaluation will be carried out in III semester.						

CODE NO.	SUBJECT	EXAM DURATION (Hrs)	Max. Marks			Credit Points
			CA	CE	Total	
Third Semester						
	Part –III					
15FPB12	Bakery and Confectionary	3	25	75	100	6 (G)
15FPB13	Food Engineering	3	25	75	100	4 (S)
15FPB14	Extruded and Convenience Foods	3	25	75	100	4 (S)
15FPB15	Data Analytics (Allied)	3	25	75	100	4 (G)
15FPB16	Extruded and Convenience Foods Practical	3	100	-	100	5 (S)
15FPB17	Bakery and Confectionary Practical	3	40	60	100	5 (S)
	Part –IV					
14ESU01	Environmental Studies	-	100	---	100	2 (G)
	Industrial / Institutional training	-	-	-	-	2 (Optional)
Fourth Semester						
	Part –III					
15FPB18	Dairy Processing	3	25	75	100	4 (S)
15FPB19	Flesh Food Processing	3	25	75	100	4 (S)
15FPB20	Food Microbiology	3	25	75	100	3 (S)
15FPB21	Visual Merchandising and Social Media (Allied)	3	25	75	100	4 (G)
15FPB22	Dairy Processing Practical	3	40	60	100	3 (S)
15FPB23	Microbial Techniques Practical	3	100	-	100	4 (G)
	Part –IV					
14SBU01	<u>Skill Based Subject</u> : Internet Security	-	100	-	100	2 (G)
15FPB24	Food Safety and Quality Certification & HACCP Training*	-	100	-	100	2(G)
15FPB25	Industrial Training [#]	-	40	60	100	4 (S)

Code no.	Subject	Exam Duration (hrs)	Max. Marks			Credit points
			CA	CE	Total	
Fifth Semester						
Part –III						
16FPB26	Food Packaging	3	25	75	100	3 (S)
16FPB27	Food Fermentation Technology	3	25	75	100	3 (S)
16FPB28	Plantation Crop Processing	3	25	75	100	3 (S)
16FPB29	Food Product Development	3	25	75	100	2 (G)
Elective I						
16FPB30A	Industrial Auditing (or)	3	25	75	100	4 (G)
16FPB30B	Waste Utilization and Management					
16FPB31	Food Fermentation Techniques Practical	-	100	-	100	2 (S)
16FPB32	Plant layout Design & Management Practical	-	100	-	100	2 (G)
16FPB33	Prototype Product Development -Mini project	-	40	60	100	5 (S)
16FPB34	Industrial training	-	40	60	100	2 (S)
Part –IV						
14NME01	Non-Major Elective (1) : EDC	-	100	-	100	2 (G)
14NME02	Non-Major Elective (2) : General Awareness (On-line Test)	1½	-	100	100	2 (G)
Sixth Semester						
Part –III						
16FPB35	Food Safety and Quality Control	3	25	75	100	4 (S)
16FPB36	Food Business Management	3	25	75	100	2 (G)
16FPB37	Entrepreneur Skill Development	3	25	75	100	2 (G)
16FPB38	Applied Nutrition	3	25	75	100	4 (G)
Elective – II						
16FPB39A	Basic Accounting (or)	3	25	75	100	4 (G)
16FPB39B	Food Standards and Regulations					
16FPB40	Advanced Quality Control Practical	3	40	60	100	4 (S)
16FPB41	Major Project	-	40	60	100	6 (S)
16FPB42	Industrial Training		40	60	100	4 (S)
Total Credits						180

PART-V			Credits
1.	<u>Extension Activity</u> : NSS / NCC / Sports / Department Activity	I – VI semesters	2
2.	<u>Competence Enhancement</u> : Add-on Course / Women's Studies / Extra paper/ Certificate or Diploma in Yoga for Youth Empowerment (offered by World Community Service Centre)	I – VI semesters	2
Grand Total			184

S – Skilled, G – General – EDC – Cluster IV



Since - 1947

Objectives

- To understand the basic concepts of food processing and preservation
- To learn about various types of preservation methods

Unit – I Food Science**(10 hours)**

Constituents of food, classification of foods, functions of food – physiological, social and psychological, Basic V Food Groups, food guide (pyramid), nutrients as food, food in relation to health

Unit – II Principles of food preservation**(20 hours)**

Post harvest food conservation – problems of farm level storage in India, reasons for post harvest losses, importance of post harvest technology, categories of food processing – primary, secondary and tertiary, treatments in post harvest technology (pre-cooling, waxing)

Major processes of food deterioration – FATTOM, biochemical factors causing spoilage, changes caused by microorganisms and enzymes, changes in carbohydrate, protein and fat

Food preservation – importance, principles, different methods of food preservation

Food additives – functions of direct food additives, government regulations, trends and issues, utilization of food additives in industry

Unit – III Food preservation by heat treatment**(20 hours)**

Water activity of foods and its significance in food preservation, factors affecting water activity, reducing water activity of foods, preferred water activity range by microorganisms

Drying and dehydration – principles, merits and demerits, factors affecting drying rate, form of moisture in food, hygroscopic nature of food, pre-treatment in drying (blanching, sulphating, dipping), Classification and types of dryers

Osmotic dehydration – principle, osmotic process, factors affecting osmotic dehydration, problems associated with osmotic dehydration process, freeze drying, quality attributes of dehydrated foods, potential advantages for industry.

Preservation using high temperature – general principle, blanching, pasteurization, sterilization – principles, types, equipment and application, Ultra High Temperature (UHT) – application of UHT in different food products, canning – basic concepts and equipment

Unit – IV Preservation by low temperature and irradiation**(20 hours)**

Cellar storage, refrigeration – principles and techniques, behaviour of foods stored at chilling temperature, cold storage defects

Freezing – principles, mode of freezing (air, solid and liquid as medium) and methods of freezing (air freezing, plate freezing, immersion freezing, cryogenic freezing), preparation of foods for freezing, quality of frozen foods (physical and chemical), effect of freezing on micro organisms, storage stability of frozen foods

Irradiation – sources, doses, effect of irradiation on microorganisms and food components, scope and application of irradiation in foods, technical problem and limitations, legal aspects and safety issues

Unit – V Potential food preservation methods (20 hours)

Preserving foods with electricity – ohmic heating process, effects of ohmic heating on food components, advantages and disadvantages

High pressure processing – hydrostatic pressure treatment of foods, effect of HPP on biological materials (microorganisms, enzymes, physical, chemical, functional and sensory properties), potential applications, merits and limitations

Surface treatments and edible coatings – rationale for using surfactants and edible coatings, mechanism of action, materials used (proteins, lipids and carbohydrates), additives as coating agents – plasticizers, surfactants, preservatives and antioxidants, legal aspects

Encapsulation – basics of encapsulation, encapsulation matrix, techniques and application
Ultraviolet radiation and ultrasound in food preservation

Textbooks

1. Desrosier and Norman (1987), Technology of Food Preservation, 3rd Edition, Shadara: CBS.
2. Shafiur Rahman (2006), Handbook of Food Preservation, Marcel Dekker Inc, New York

Reference

1. Fellows P J (2005), Food Processing Technology – Principles and Practices, Woodhead publishing limited, England
2. Sandeep Sareen (1999), Food preservation, Sarup and Sons, New Delhi
3. Satish Kumar Sharma (2010), Postharvest Management and processing of fruits and vegetables – Instant notes, New India Publishing Agency, New Delhi
4. Subbulakshmi G and Shobha A Udupi (2007), Food Processing and Preservation
5. Sivasankar.B (2002) Food Processing and Preservation, Prentice Hall of India Pvt. Ltd., New Delhi.
6. Technology of Food Preservation and Processing, Engineers India Research Institute, Delhi

14FPB02

Fruit and Vegetable Processing Technology

(6 hours/week)

Objectives

- To know about the importance preserving fruits and vegetables
- To impart technical know-how technology of fruit and vegetable processing
- To learn product specific preserving techniques of the fruit and vegetable products

Unit – I Importance of Fruits and vegetables preservation

(10 hours)

Global and Indian scenario of fruits and vegetables- post harvest losses-different stages

Classification of fruit and vegetables, post harvest field operations, physical and chemical changes of fruits and vegetables during ripening, general methods of fruit and vegetable preservation

Unit – II Canning and bottling

(20 hours)

Canning – principle and operation of equipment for preliminary processing and canning, steps in canning of fruits and vegetables, advantages and disadvantages, problems in canned food

Principle and methods of preparation of jams, jellies, pickles, purees, ketchup, sauce, squash

Bottling operations - filling, closing, sterilization, capping and labelling

Unit – III Dehydration

(20 hours)

Dehydration – principles, pre-preparation, drying techniques, types of drier – tray, cabinet, rotary drum, roller, freeze drying, spray drying and vacuum shelf driers, dehydrated fruit and vegetables products, factors affecting dehydrated products, application of osmotic dehydration in fruits and vegetables – Preparation of fruit preserves and candies, fruit leather and bars, Intermediate moisture foods – characteristics and importance

Unit – IV Minimal processing and hurdle technology

(20 hours)

Minimally processing – principle and techniques, physiology and biochemistry of fresh cut fruit and vegetables, factors affecting shelf life and quality of minimally processed fruit and vegetables, enzymes catalyzed reactions, browning reactions, development of bitter principle, discolouration during processing and storage.

Hurdle technology - potential hurdles, concept of hurdle technology as applied to fruit and vegetable preservation

Fermentation – basic concepts, fermented fruit and vegetables

Bio-preservatives and its applications

Unit – V Nutraceuticals from fruit and vegetables

(20 hours)

Introduction to nutraceuticals and functional foods, classification of nutraceuticals from fruits and vegetables, major bioactive components (phytochemicals, pigments and flavanoids) in fruits and vegetables and their therapeutic properties, methods to enhance active components in food - combination of foods, fermentation and fortification, extraction, isolation, purification and estimation of carotene, betaline and lycopene, nutraceutical products and its regulations

Textbooks

1. Satish Kumar Sharma (2010), Postharvest Management and Processing of Fruits and Vegetables – Instant notes, New India Publishing Agency, New Delhi
2. Rajarathnam S and Ramkete R S (2011), Advances in Preservation and Processing Technologies of Fruits and Vegetables, New India Publishing Agency, New Delhi

Reference

1. Technology of Food Preservation and Processing, Engineers India Research Institute, Delhi
2. Salunkhe D K and Kadam S S (1998), Handbook of Vegetable Science and Technology, Marcel Dekker Inc, New York
3. Amalendu Chakraverty, Arun S. Mujumdar, Hosahalli S. Ramaswamy (2003) Handbook of Postharvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices, Marcel Dekker Inc, New York
4. Srivastava R. P., Kumar Sanjeev (2006), Fruit and Vegetable Preservation - Principles and Practices, International Book Distributing Company
5. Nirmal K. Sinha, Ph.D, Y. H. Hui, E. Özgül Evranuz, Muhammad Siddiq, Jasim Ahmed (2011), Handbook of Vegetables and Vegetable Processing, Blackwell Publishing Limited, USA

14 FPB03

Food Service Management

(4 hours / week)

Objectives

- To understand the basic principles of management
- To learn the concept and principles of resource management

Unit – I Food service industry

(12 hours)

Types of catering - commercial - Hotel, Motel, Restaurant, Cafeteria and Chain hotels
Welfare - Hospital, School lunch, Residential establishment and Industrial catering.
Transport - Air, Rail, Sea and Space, Miscellaneous - Contract and outdoor

Quantity Food Service: Types - their objectives, styles of service - Waiter or waitress service, counter service - snack bar, buffet service, Banquet and Vending.

Sections of food service management industry

Organisation theory and design, classical theory – Bureaucratic and administrative, Organization chart, leadership qualities, leadership techniques and effective leadership, newer approaches to leadership plan

Unit – II Material and process management

(16 hours)

Definition, Management Process - planning, controlling evaluating goals, values and standards

Decision making: concepts, types of decisions, steps in decision making, methods of resolving conflicts

Resource Management - Classification, characteristics, factors affecting the use of resources

Management of time, energy and money - Time management - Time norms, plans and time management

Energy management - Fatigue - types and causes of fatigue - principles and techniques
Mundel's class of changes - work simplification.

Personal management, recruitment and selection, induction, training - Supervision and Dismissal of employees - Legal controls - Labour policies and welfare measures

Money management - Types of income - management process applicable to money - planning, controlling and evaluating - the use of income - elements of buymanship. Cost control, food cost, labour overheads and projects.

Unit – III Financial management

(12 hours)

Scope of financial management, fixed and current asset, financial accounting, management accounting

Costing and budgeting – cost concept, cost components (material, employee and overhead), fixed, semifixed and variable cost, break even and contribution, cost benefit ratio

Pricing – factors affecting pricing, pricing policy, strategy and tactics, pricing method (formal and informal), price management.

Unit – IV Communication

(10 hours)

Definition, types, communication channels, importance of good communication, johari window, barriers of communication, overcoming of barriers

Management information systems using computers - inventory and purchase control, production and quality control

Unit – V Sanitation and hygiene

(10 hours)

Environmental hygiene and sanitation, cleaning procedure - equipment, furniture, ventilation and lighting, water supply, waste disposal, personal hygiene, safety at work place, causes of accidents (physical, psychological and environmental), accordance and application

Textbooks

1. Sethi.M (2006), Catering Management: An Integrated Approach, New Age International publishers ltd, New Delhi.
2. Sunetra Roday (2011), Food Hygiene & Sanitation, McGraw Hill Education Pvt. Ltd., New Delhi

Reference

1. Catherine F. Sullivan, Courtney Atlas (1998), Health Care Food Service Systems Management, Aspen publishers Inc, Maryland.
2. Sethi. M (2006), Institutional Food Management, New Age International publishers Ltd, New Delhi.

Objectives

- To study the relationship between food, nutrients and health
- To understand the functions and sources of various nutrients
- To learn the concept of meal planning

Unit I Introduction to Human Nutrition**(4 hours)**

Definition - food and nutrient, optimum nutrition and malnutrition, human nutrition as an integrated approach, nutrition milestones, malnutrition - global and Indian scenario, etiology and prevention, common nutritional problems in India

Unit II Energy, water and electrolytes**(6 hours)**

[Energy – Definition, unit of calorie and joule, determination of energy value of foods, measurement of heat produced by the body, energy balance, factors affecting energy requirement, Basal Metabolic Rate – measurement and factors affecting BMR, effects of calorie imbalance.

Water – distribution, functions, requirement, water balance, water depletion and excess.

Electrolyte - functions, electrolyte balance, acid-base regulation.

Unit III Macronutrients**(8 hours)**

Carbohydrate – Sources and classification (self study), functions in the body, digestion, absorption and utilization

Protein - Sources and classification (self study), functions, digestion, absorption and utilization, quality evaluation – Protein Efficiency Ratio and Biological Value

Amino acids – Essential and non-essential, deficiency and toxicity

Lipid – Sources and classification (self study), functions, digestion, absorption and utilization, essential fatty acids – significance.

Unit IV Micronutrients**(8 hours)**

Vitamins – fat soluble- A, D, E and K, water soluble – thiamine, riboflavin, niacin, cyanocobalamin, folic acid and ascorbic acid – Sources (self study), functions, deficiency and toxicity

Minerals - Calcium, Phosphorous, Iron, Zinc, Iodine, Selenium and Magnesium – Sources (self study), functions and deficiency, bioavailability of iron.

Unit V Recommended Dietary Allowance and Meal planning

(4 hours)

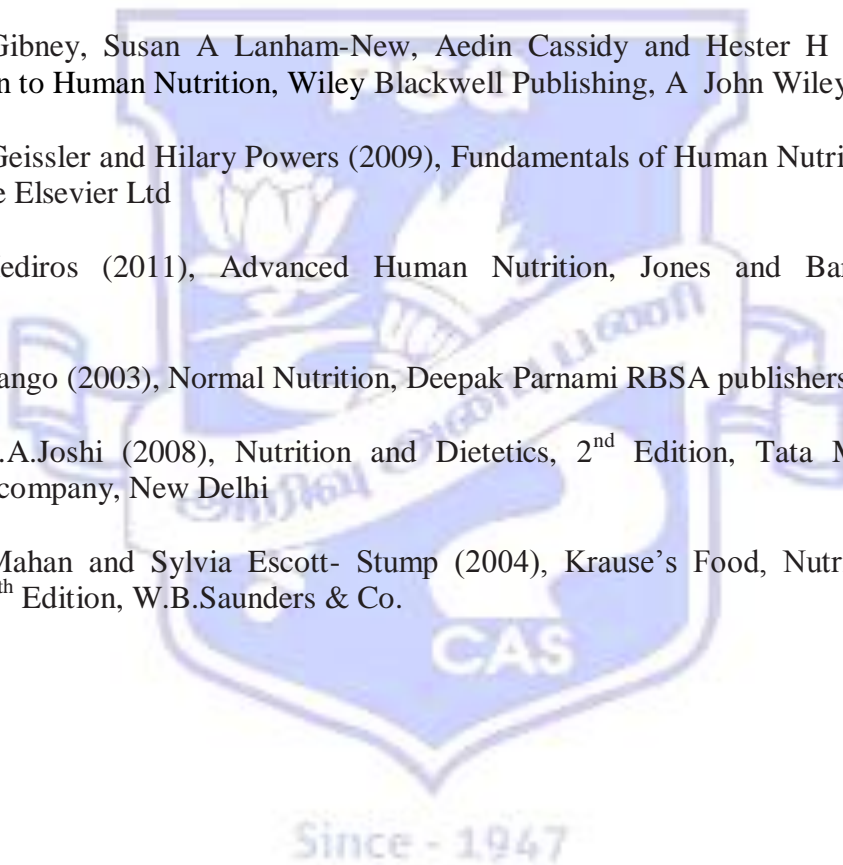
Meal planning – principles and guidance, reference man and reference woman, Indian Recommended Dietary Allowance (RDA) of food and nutrients for different age groups, nutritive value of planned diet

Text book

1.Srilakshmi.B (2012), 4th Edition, Nutrition Science, New Age International Private Limited Publishers

References

- 1.Michael.J.Gibney, Susan A Lanham-New, Aedin Cassidy and Hester H Vorster(2009), Introduction to Human Nutrition, Wiley Blackwell Publishing, A John Wiley & Sons, UK
- 2.Catherine Geissler and Hilary Powers (2009), Fundamentals of Human Nutrition, Churchill Livingstone Elsevier Ltd
- 3.Denis.M.Mediros (2011), Advanced Human Nutrition, Jones and Barlett Learning Company
- 4.Mangala Kango (2003), Normal Nutrition, Deepak Parnami RBSA publishers
- 5.Subhangini.A.Joshi (2008), Nutrition and Dietetics, 2nd Edition, Tata Mc Graw Hill publishing company, New Delhi
- 6.Kathleen Mahan and Sylvia Escott- Stump (2004), Krause's Food, Nutrition and Diet therapy, 11th Edition, W.B.Saunders & Co.



14FPB05 Equipment Operation and Techniques in Food Processing

(6 hours / week)

Objectives

- To understand the principle of operation of various equipment
- To learn and perform pre-operation, operation, monitoring, maintenance/ process control and post operation of the equipment
- To understand the various techniques employed in food processing

Practical exercises

1. Size reduction of cereals and pulses using hammer mill
2. Study of principle and operational mechanism of double jacketed steam kettle
3. Thermal treatment
 - i) Blanching of vegetables using a blancher
 - ii) Sterilization of bottles using an autoclave
4. Pasteurization of milk and fruit juices using plate heat exchanger
5. Canning of fruits/ vegetables
6. Dehydration of vegetables using cabinet drier and fluidized bed drier
7. Spray drying technology for production of milk powder
8. Filling and capping of bottles using a bottle filling and crown capping machine
9. Vacuum packaging of cut fruits and vegetables
10. Study of operational mechanism of form-fill-seal machine and its use in liquid and powder packaging.
11. Study of principle and operational mechanism of cold storage unit
12. Industrial visit – Cereal/ pulse/ oil seed/ fruit and vegetable/ dairy industry

Objectives

- To study the quality characteristics and milling of various cereals, millets, pulses and oil seeds
- To understand the principle, methods of operation and efficiency of various grain processing and milling equipment
- To learn about the various by-products obtained during processing and their utilization

Unit - I Paddy processing (14 hours)

Production trend and consumption pattern, structure and composition of paddy, types of rice, methods of grain drying – LSU dryer, parboiling of rice, physico-chemical changes during parboiling, advantages and disadvantages.

Milling of rice - traditional and modern methods, paddy dehusking, Engelberg huller mills, modern rice mills – their components, rice mill yields and loss due to brokens at different stages of milling, rice grain quality indicators

Processed rice products, effect of ageing of rice, effect of processing on nutritive value, by-products of paddy processing and their utilization, Physical and chemical quality testing of rice

Unit - II Wheat processing (10 hours)

Production trend and consumption pattern, structure, composition, varieties, wheat milling-cleaning, conditioning, equipment used – roller mills, milling fractions and their composition, sieving, purification, flour grades, quality criteria of wheat flour, by-products and their utilization, Physical and chemical quality testing of wheat

Unit - III Maize and millet processing (14 hours)

Production trend and consumption pattern, structure and composition of maize, dry milling - storage and drying, milling equipment - pre-cleaning, degermination and dehusking, roller milling, sifting, purifying, aspiration, pneumatics in a maize mill, wet milling - modern methods of processing, cleaning, steeping, de-germination, bran and fibre separation, gluten and starch separation.

Effect of processing on nutritive value, various products and their utilization– maize flour, starch, dextrose, malto dextrin, high fructose corn syrup and corn oil.

Production trend and consumption pattern, structure and composition (oats, barley, sorghum, ragi and millets), milling process, physical and chemical quality testing of maize and minor millets

Unit- IV Pulse and oil seed processing (12 hours)

Production trend and consumption pattern of different types of pulses, structure and composition of pulses, traditional milling process - pre-cleaning, pitting, oil application,

conditioning, dehusking and splitting, merits and demerits of traditional milling, modern milling process - mechanical hot air drying and conditioning, dehusking in pulse pearler, water conditioning, splitting of pulses in pulse splitter, mini dhal mill, grinding of split pulses, processed pulse products.

Production trend and utilization pattern of different oilseeds, oilseed characteristics, processing of oil seeds - traditional methods of oil expelling - *ghani*, expeller, modern method - solvent extraction of oil - rendering, expression, solvent extraction, degumming, refining, bleaching, deodorization, fractionation, winterization, hydrogenation, inter-esterification, esterification, emulsification, packaging, utilization of by-products of oil seed

Physical and chemical quality testing of pulses and oil seeds

Unit - V General processing, handling and storage methods (10 hours)

Processing techniques - germination, malting, fermentation, roasting, puffing, parching, flaking and extrusion

Grain handling equipment – design and working principle - belt conveyor, bucket elevator, screw conveyor, pneumatic conveyor

Grain storage methods – bag storage, traditional grain storage structures, modern storage structures - bulk storage in silos and bins, cap storage (ceiling and plinth storage), in-silo aeration and drying, problems of dust explosion in grain storage, quality changes of grains during storage and remedial measures to prevent undesirable quality changes, controlled and modified atmospheric storage, list of insects attacking food grains, insect, rodent and pest control measures.

Text books

1. Pingale (1976), Handling and storage of food grains
2. Kent N.L. and Evans A.D (1994) “*Technology of Cereals*” 4th Edition, Elsevier Science (Pergaman), Oxford, UK.
3. Presscot.S.C and Proctor.B.T : Food technology

References

1. Chakraverty, A (1995), Post Harvest Technology of Cereals, Pulses and Oilseeds. Oxford and IBH Publishing Co, Calcutta.
2. Owens.G (2001) *Cereals Processing Technology*, Woodhead Publishing.
3. Alfred.I: Integrated food science and technology for the topics, Maxmillan Publication, Hong Kong.
4. Sahay and Singh (2004), Unit operations in Agricultural Processing, Vikas Publishing House Pvt. Ltd., New Delhi

Objectives

- To study the physical and chemical characteristics of various food constituents
- To study the functional property of food constituents and its role in food processing

Unit - I Introduction food chemistry (10 hours)

Definition of food chemistry, basic characteristics of foods- appearance, taste, odour, flavour, definition – density, freezing point, melting point, boiling point, specific heat, coefficient of expansion, viscosity, fluidity and plasticity, surface tension and interfacial tension, refractive index, conductivity.

Physico-chemical properties of foods – hydrogen ion activity, isoelectric point, titrable acidity, colloidal chemistry of foods.

Physico-chemical operations in food processing (principles only) - emulsification, homogenization, dialysis, adsorption, chromatography, ion exchange, molecular distillation, high frequency heating.

Unit - II Water and Carbohydrates (14 hours)

Water – Moisture in foods, physical properties of water, solute –water interactions, concept of water activity, water binding in foods, water activity requirements of micro organisms, effects of water activity and content on chemical deterioration of foods, controlling water activity in foods, determination of moisture content in foods.

Carbohydrates – Classification, sources, reactions of monosaccharides, polyols, Sucrose and other disaccharides –sources, properties, sucrose as a food ingredient , starch – sources, isolation, gelatinization, thickening and gelling properties of xanthan and other microbial exo-polysaccharides, pectin, alginate, gums and mucilages.

Changes of carbohydrates on cooking- solubility, hydrolysis, retrogradation, dextrinization, flavour and colour production – enzymic browning reactions, caramelization, maillard reaction, strecker degradation, humectancy and plasticizing action of carbohydrates, determination of carbohydrates in foods (Anthrone method).

Unit - III Lipids (12 hours)

Classification, saturated and unsaturated fatty acids, sources, physical properties (definition only)- melting point, softening point, slipping point, specific gravity, refractive index, smoke, flash and fire points and turbidity point, chemical properties- saponification number, acid value, iodine number, acetyl value.

Functionality of fats and oils (definition only) - viscosity, lubricity, plasticity and shortening, emulsifying properties, fat replacers and mimetics, effect of heating , rancidity and reversion of oils, hydrogenation of fats and oils, estimation of fats in foods (Soxhlet's method).

Unit - IV Proteins and enzymes (12 hours)

Proteins - Classification – based on source, shape and solubility, amino acid composition, sources, physical properties (definition only) – electrophoresis, sedimentation, osmotic

pressure and light scattering, chemical properties (definition only) – amphoterism, binding of ions and precipitation.

Stabilization of protein structure – hydrogen bonding, hydrophobic interactions, protein hydration, denaturation, renaturation, gel formation, effect of heat treatment on proteins, proteins from some selected food stuffs (milk, meat, fish, eggs, cereals, seeds), determination of proteins in pulses (Kjeldahl method).

Enzymes – Endogenous enzymes and exogenous enzymes, factors affecting enzyme activity, Endogenous enzymes in foods (phenolase, amylases, lipolytic enzymes, ascorbic acid oxidase), enzymic browning by polyphenol oxidase.

Enzymes as food processing aids – bread making, cheese making, whey processing, meat tenderization, fruit processing, modification of oils and fats and confectionery foods, control of enzyme activity in foods.

Unit - V Vitamins, minerals, pigments and flavour compounds (12 hours)

Vitamins – Fat soluble and water soluble vitamins, sources, stability and degradation of vitamins (A, D, E, B₁ and C), role as antioxidants, determination of vitamin C content.

Minerals – mineral elements in foods, sources and biological role, minerals in food processing, estimation of minerals in foods (calcium and iron).

Colour – Natural and artificial colours, factors affecting stability of colour compounds.

Flavour –Sensory perception of flavour- taste, odour and feel , specific flavours, volatile and non – volatile flavour compounds and their natural sources, synthetic flavours, flavour intensifier, flavour retention during food processing, natural flavour development in foods, flavour development during food processing –thermal breakdown of sugars, amino acids and lipids, thermal reactions of sulphur compounds.

Role of antioxidants in food processing

Organic acids and its application in food industry

Text books

1. Mridula Mirajkar and Sreelata Menon (2002), Food Science and Processing Technology, 2002, Kanishka Publishers, Distributors, New Delhi.
2. Richard Owusu – Apenten (2002), Introduction to food chemistry, 2004, CRC Press.
3. Lillian Hoagland Meyer (1987), Food chemistry, 1st Edition, CBS Publishers and Distributors, New Delhi.

References

1. Sivasankar.B (2006), Food Processing and Preservation, PHI Learning Private Limited.
2. Belitz H.D, Grosch.W and Schieberle.P (2004), Food chemistry, 3rd Edition, Springer-Verlag.
3. Sandeep Sareen (1999), Food preservation, 1st Edition, Sarup & Sons, New Delhi.
4. Seema Yadhav (1997), Food chemistry, 1st Edition, Amol Publications Private Limited, New Delhi.

14FPB08

Marketing Management

(4 hours/ week)

Objectives

- Gain expertise in food marketing, business management and food product design and development.
- Learn how to identify market niches and work with marketing teams and food technologists to develop products that satisfy consumer needs.
- Gain the international version of this qualification by taking a placement overseas or studying international modules.

Unit - I Introduction to marketing

(10 hours)

Concept of marketing- Marketing management changing scenario- marketing food – marketing industry in Industry- challenges in E-marketing- taste & preference – Micro and Macro marketing concepts-professional and academic development through marketing

Unit - II Market Evaluation & Functional marketing

(12 hours)

Market Evaluation and Controls – Types, processes, obstacles to marketing control – Marketing Audit – Marketing Ethics- New Product Decision Process – Types of new products – Test Marketing of a new product, Packaging – Purpose, Types and New Trends in packaging.

Unit - III Process, Products Packaging & Testing - Trends

(12 hours)

New Product Decision Process – Using principles of buyer behaviour - Bloom level Application, synthesis – Types of new products – Test Marketing of a new product, Packaging – Purpose, Types and New Trends in packaging – E building & brand promotion online

Unit - IV Economics of Marketing & Strategic Marketing

(12 hours)

Evaluation of competitors- Pricing methods- pricing Techniques- Employ SWOT & PEST analysis – Translating information into strategies and strategies into Business resources. Building a basic market plan – market signals & market trends- reading the competitors- Legal implications of marketing plans- Demographic marketing- Integrate media, PR and internet communicating channels.

Unit - V Marketing Channel & successful marketing for food Industry

(14 hours)

Marketing Mix – Four P's – Its significance in the competitive environment –Product and Product Line – Product Mix – Product Life Cycle – Managing the product in Product Life Cycle- Physical Distribution – Importance and role of distribution in marketing – Introduction

to the various channels of distribution –Promotion Tools – Sales Promotion, Advertising, Personal Selling, Direct Marketing and Online Marketing as promotion tool.

Marketing survey - practical training of surveying, collecting data and doing a mini research on marketing in real time practices

Text books

1. Marketing Special Indian Edition- Dhruv Grewal, Michael Levy
2. Marketing - Stanton,,Michael Etzel,Walker(Tata)
3. Marketing Management - V.S.Ramaswamy and S.Namakumari
4. Principles of Marketing 9th Edition - Philip Kotler and Gary Armstrong

References

1. Marketing - Bovee and John Thill
2. Marketing Models - Lilien & Kotler & Moorthy
3. Case Studies in Marketing – Indian context - R.Srinivas
4. Marketing Management Text And Cases in Indian Context-Dr.K.Karunakaran
5. Marketing Management Text and Cases-Biplab Bose
6. Marketing Management -S.A. Sherlekar13th Edition
7. Product Management S.A.Chunawala
8. Marketing Management - Philip Kotler



14FPB09 Food Processing and Preservation Techniques Practical

(4 hours / week)

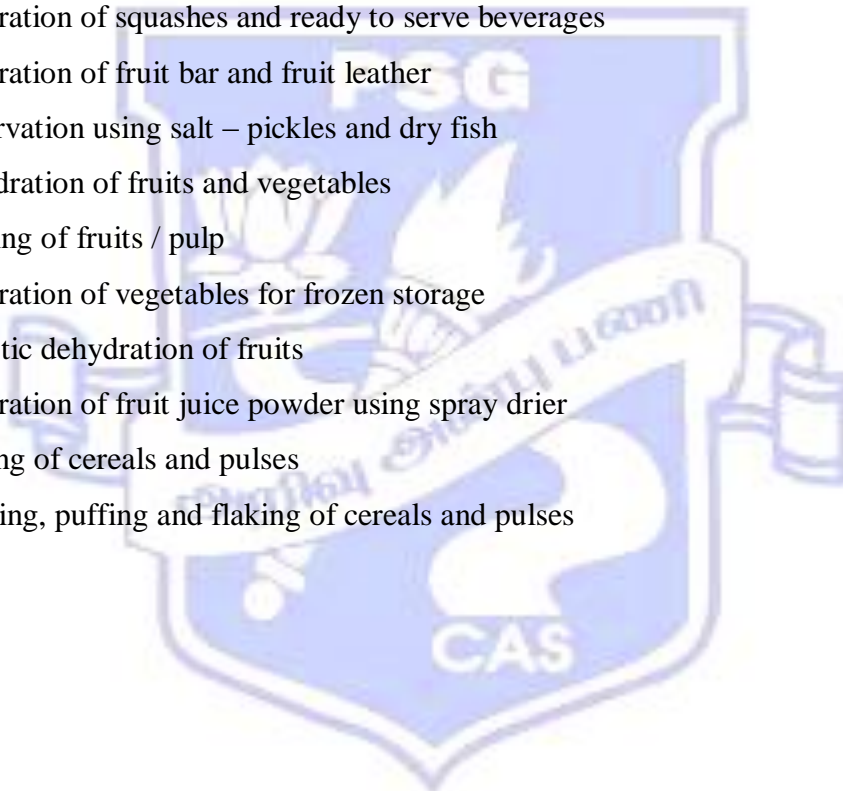
Objective

- To know about the food preservation techniques
- To prepare various food products

1. Determination of edible percentage of different foods

Preservation using sugar

2. Preparation of jams, jellies and marmalades
3. Preparation of squashes and ready to serve beverages
4. Preparation of fruit bar and fruit leather
5. Preservation using salt – pickles and dry fish
6. Dehydration of fruits and vegetables
7. Canning of fruits / pulp
8. Preparation of vegetables for frozen storage
9. Osmotic dehydration of fruits
10. Preparation of fruit juice powder using spray drier
11. Malting of cereals and pulses
12. Roasting, puffing and flaking of cereals and pulses



Since - 1947

Objectives

- To understand the importance of quality control in food industry
 - To identify the quality parameters for different food products
1. Preparation of samples (liquid/semisolid/solid foods) for quality testing
 2. Determination of moisture and total solids
 3. Determination of total soluble sugars and reducing sugar
 4. Determination of acid value
 5. Determination of saponification value
 6. Estimation of pH and Acidity in fruit products, brix : acid ratio
 7. Estimation of Sulphur-dioxide in fruit juices
 8. Determination of water activity
 9. Assessment of non-enzymatic browning
 10. Determination of hydration capacity and hydration index
 11. Estimation of free fatty acids
 12. Estimation of water binding capacity and swelling capacity



Objectives

- To understand basic engineering principles of food processing
- To learn about various unit operations carried out in processing of food products

Unit I Heat Transfer, Refrigeration and Dehydration (12 hours)

Heat transfer-conduction, convection and radiation- heat exchangers –parallel flow, counter flow and cross flow-. Refrigeration- vapor compression system- components and working principle- Water activity - dehydration – types of dryers – tray dryer, vacuum dryer, heat pump dryer, microwave drying and tunnel drying – principles, construction, working and applications - advantages and disadvantages

Unit II Evaporation and Crystallization (12 hours)

Evaporators- mass and energy balance-single and multiple effect evaporators – types of evaporator-falling film, rising film, once through and circulation evaporators – short tube evaporators and long tube evaporators – agitated film evaporator. Crystallization –rate of crystal growth –crystallization equipment -tank, agitated batch, Swenson-Walker vacuum crystallizers – construction and operation.

Unit III Size reduction (12 hours)

Size reduction –energy and power requirements in comminuting – crushing efficiency – Rittinger's, Bond's and Kick's laws for crushing-size reduction equipments – crushers – jaw crusher and gyratory crusher, Crushing rolls – grinders – hammer mills – rolling compression mills-atrition mills – revolving mills – rod mills, ball mills and tube mills, cryogrinding equipment – construction and operation

Unit IV Mixing and Extraction (12 hours)

Mixing of solids, pastes, and liquids – mixing equipment – liquid mixers – mixers for pastes – and high viscous masses -extraction – rate of extraction –equipment for leaching coarse solids – intermediate solids – basket extractor-- Distillation –flash and differential distillation-steam distillation – vacuum distillation-- operation and process – advantages and limitations.

Unit V Mechanical separation (12 hours)

Filtration – definition –filter media – types and requirements-constant rate filtration – constant pressure filtration – filter cake resistance-filtration equipment – rotary vacuum filter –gravitational sedimentation of particles in a fluid – Stoke's law, sedimentation of particles in gas-cyclones – settling under sedimentation and gravitational sedimentation-centrifugal separations.

Textbooks

1. Paul Singh. R and Dennis R. Heldman (2001) (3rd edition), Introduction to Food Engineering , PHI Learning Private Limited.
2. Earle, R.L. (2003), Unit Operations in Food Processing. Pergamon Press, Oxford, U.K.

Reference

1. Geankoplis C.J.(1999), Transport Process and Unit Operations, Prentice-Hall of India Private Limited, New Delhi.
2. Toledo .R.T (2007), Fundamentals of Foods Process Engineering, Springer Science & Business Media.
3. Rao D.G.(2010), Fundamentals of Food Engineering, PHI Learning Private Limited.
4. Chandra Gopala Rao (2006), Essentials of Food Process Engineering, BS Publications
5. Sahay.K.M. and Singh.K.K (2003), Unit Operations in Agricultural Processing, Vikas Publishing House Pvt. Ltd., New Delhi.

15FPB14

Extruded and Convenience Foods

(4 hours / week)

Objective

- To understand the principles and technique of extrusion technology
- To learn about manufacturing process and quality measure of extruded and convenience foods

Unit I Introduction to extrusion (14 hours)

Basic and recent trends of extrusion technology, types of extruders, components of extruder, functions of extruder, uses, advantages and disadvantages of extrusion.

Unit II Types of extruded Products (14 hours)

Long and short pastas, expanded snacks, role of ingredients / raw material selection, manufacturing process of extruder products

Manufacturing process of homemade noodles, instant noodles, vermicelli

Principle and application – expansion, encapsulation and pelletization

Unit III Quality control of extruded foods (8 hours)

Raw material and process parameters optimization, quality control testing for extruded products

Unit IV Convenience foods (12 hours)

Definition, stages, needs, importance, growth drivers, challenges, market size, structure of convenience food in national and international market, advantages and disadvantages of convenience foods.

Unit V Convenience food products (12 hours)

Types, classification, cereal and pulse based, fruit and vegetable based, convenience foods, application of retorts, ready to eat and ready to use products, quality control and standards of selected products.

Text books

1. Medeni Maskan and Aylin Altan (2011), Advances in Food Extrusion Technology, CRC Press.
2. Zeki Berk (2008), Food Process Engineering and Technology, Academic Press
3. Subbulakshmi, G. and Shobha A. Udupi (2001), Food Processing and Preservation, New Age International (P) Limited.

Reference

1. Fellows, P.J. (2008) Food Processing Technology: Principles and Practice, Elsevier
2. Karel Kulp (2000), Handbook of Cereal Science and Technology, Second Edition, CRC Press.

15FPB15

Data Analytics

(4 hours / week)

Objective

- To study the fundamentals and enhancing the application knowledge of Statistics.

Unit I

(8 hours)

Statistics – definition – functions – uses. Data collection - primary and secondary data - methods of collection - census and sampling methods. Classification and tabulation. Diagrammatic and Graphic presentation - bar, pie, histogram, frequency polygon, frequency curve and ogives.

Unit II

(10 hours)

Measures of Central Tendency: mean, median and mode- merits and demerits - Measures of Dispersion – range, quartile deviation, mean deviation and standard deviation- merits and demerits - coefficient of variation – simple problems

Unit III

(10 hours)

Simple Correlation - definitions – uses – Karl Pearson’s coefficient of correlation – properties – Spearman’s rank correlation coefficient. Simple regression – definitions- uses - regression coefficients – regression equations – simple problems.

Unit IV

(12 hours)

Test of significance - meaning - uses – types of errors, large sample tests – testing the significance of mean, two means, single proportion – small sample test – testing the significance of mean and the difference between two means (independent and dependent cases) – simple problems.

Unit V

(8 hours)

Chi-square test -for the independence of attributes - ANOVA- One and two way – simple Problems

NOTE:

Proof and derivation are excluded. Theory carries 30 marks and problems carries 45 marks.

Text book

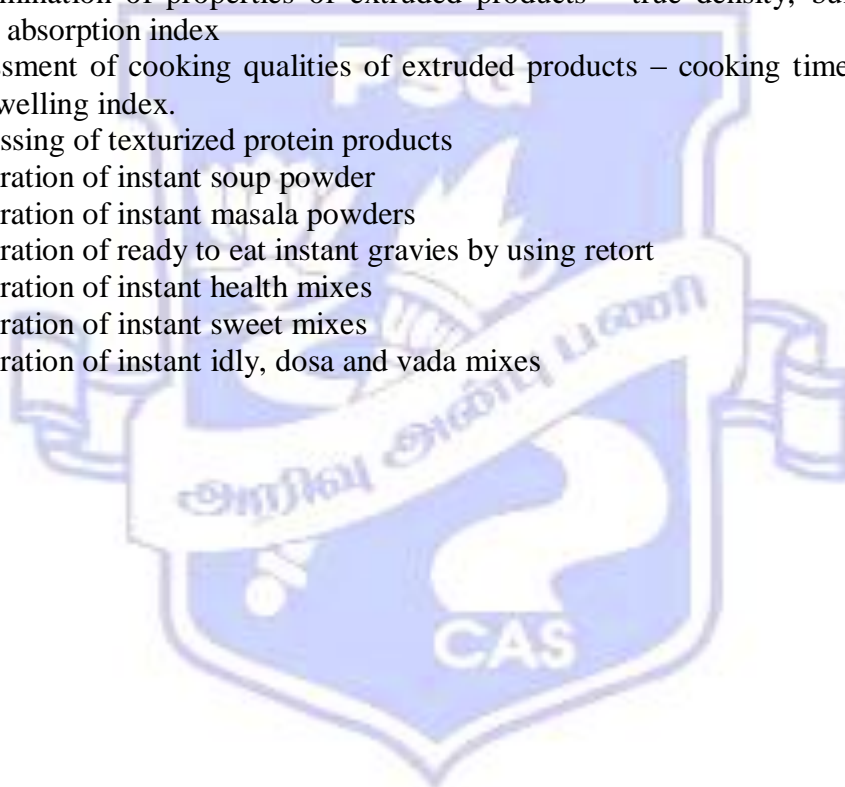
1. Gupta, S.P., Statistical Methods, Sultan Chand & Sons
2. Gupta, S.P. & Gupta, M.P., Business Statistics, SultanChand & Sons, New Delhi for Units I,II & III
3. Pillai, R.S.N. & Bagavathi, Statistics
4. Navneetham, P.A., Business Mathematics and Statistics.

Objective

- To learn about the preparation of extruded and convenience foods

Exercise

1. Preparation of noodles and recipes using prepared noodles
2. Preparation of vermicelli and recipes using prepared vermicelli
3. Preparation of pasta & spaghetti and recipes using prepared pasta & spaghetti
4. Preparation of vadams and papads
5. Preparation of traditional extruded products
6. Determination of properties of extruded products – moisture content, diameter, size, shape
7. Determination of properties of extruded products – true density, bulk density and water absorption index
8. Assessment of cooking qualities of extruded products – cooking time, cooking loss and swelling index.
9. Processing of texturized protein products
10. Preparation of instant soup powder
11. Preparation of instant masala powders
12. Preparation of ready to eat instant gravies by using retort
13. Preparation of instant health mixes
14. Preparation of instant sweet mixes
15. Preparation of instant idly, dosa and vada mixes



Since - 1947

15FPB17

Bakery and Confectionery Practical

(5 hours / week)

Objective

- To learn the preparation of bakery and confectionery products.

Exercise

1. Preparation of bread and rusk
2. Preparation of bread roll, bun, swiss roll
3. Preparation of pizza
4. Preparation of doughnuts
5. Preparation of pastries (pie, tart)
6. Preparation of puffs
7. Preparation of cakes (sponge / chocolate / angel)
8. Preparation of cakes (fruit cake / cup cake / muffins)
9. Preparation of hot puddings
10. Preparation of cold puddings
11. Preparation of cookies (salt / sweet / multigrain)
12. Preparation of fondant / fudge
13. Preparation of marshmallow / jujube / marzipan
14. Preparation of dark / milk chocolate.
15. Preparation of brittles / chikkies.



Since - 1947

15FPB18

Dairy processing

(6 hours / week)

Objectives

- To study processing technology of milk and milk products
- To learn about packaging, testing and quality standards of milk and milk products.

Unit I Milk constituents and preliminary operations (15 hours)

Production trend, role of NDDDB in dairy development, present status of dairy industry, composition and nutritive value of milk, physico - chemical properties of milk constituents, milk reception - buying and collection, cooling & transportation, platform tests, testing and storage of milk, .

Unit II Milk processing operations (20 hours)

Filtration / clarification, standardization, homogenization, pasteurization - objective, principles, methods(LTLT, HTST, UHT), plate heat exchanger (PHE), filling, packaging and storage.

Unit III Milk – different varieties/forms (20 hours)

Composition and manufacturing of sterilized milk, homogenized milk, standardized milk, recombined milk, toned milk, imitation milk, synthetic milk, evaporated milk, (unsweetened condensed milk), sweetened condensed milk, milk powder.

Unit IV Dairy products (20 hours)

Composition, principle and manufacturing of flavoured milk, cream, ice cream, butter, cheese, ghee, khoa, paneer, channa, curd, yoghurt, shrikhand
By-products – Non milk solids, whey protein concentrate, lactose.

Unit V Packaging and quality control of milk and milk products (15 hours)

Packaging - importance, objectives, selection of packaging materials and equipment for milk and milk products. Quality control and standards, sanitation and hygiene in dairy plant.

Textbooks

1. Rajagopal, S. and Roy, S.K. (2014), Milk and Milk Products Technology (1st Edition), , BS Publications
2. Sharma Ramakant (2006), Production, Processing & Quality Of Milk & Milk Products, International Book Distributing Company
3. Hand Book Of Milk Processing Dairy Products And Packaging Technology (2007), EIRI, Engineers India Research In

Reference

1. Ramesh, C. Chandan, Arun Kilara, Nagendra Shah (2009), Dairy Processing and Quality Assurance, John Wiley & Sons.
2. Ramesh, C. Chandan, Arun Kilara (2010), Dairy Ingredients for Food Processing, John Wiley & Sons

Objectives

- To study about the composition, nutritive value and quality characteristics of various types of fleshy foods
- To learn about the processing techniques and quality standards of fleshy foods
- To learn about the sanitation and hygiene procedures carried out in of meat processing plant

Unit I Meat processing (25 hours)

Sources of meat and meat products in India, composition and microscopic structure of meat. Slaughtering of animals, inspection and grading of meat.

Factors affecting post - mortem changes, properties and shelf life of meat. Meat quality evaluation. Mechanical deboning, cuts of meat, aging of meat, meat tenderization, and cooking methods. Processed meat products – cured, smoked, pickled, fermented (sausage), frozen, salted, canned and dehydrated meat.

Unit II Egg processing (15 hours)

Structure, composition, nutritive value and functional properties of eggs. Preservation and processing of egg – whole egg/ shell egg, egg liquid, egg powder. Factors affecting egg quality and measures of egg quality.

Unit III Poultry processing (15 hours)

Classification, composition and nutritive value, pre and post mortem inspection, pre-slaughter care, operations in poultry processing, different cuts of poultry meat, processing and preservation methods - frozen, brined and pickled, value added ready to use products.

Unit III Fish processing (20 hours)

Types of fish, composition and nutritive value, selection of fish, post-mortem changes in fish. Handling of fresh water fish, shell fish etc. Processing methods - canning, smoking, freezing, fermentation (sausage) and dehydration. By-products – production of fish meal, fish protein concentrate and fish liver oil.

Unit V Meat plant sanitation, safety and standard (15 hours)

Meat processing equipment, microbiology and safety of fleshy foods, plant hygiene and sanitation, inspection and quality control – Good Manufacturing Practice and HACCP, Standards and regulations, packaging, handling of products for storage and transportation.

Textbooks

1. Meat Processing & Meat Products Hand Book(2007), Engineers India Research In,
2. Meat Processing and Preservation with Packaging technology, NIIR Board of Consultants and engineers, Asia Pacific Business Press Inc.

Reference

1. Hui, Y.H., Nip, W.K., Rogers, R.W, Meat Science and Application, Marcel Dekkar Inc. New York,
2. Poultry Meat Processing and Quality(2004), G. C. Mead Woodhead Publishing,
3. Kinsman, D.M., Kotula, A.W., and Breidenstein, B.C. (1994), Muscle Foods: Meat, Poultry and Seafood Technology, Chapman & Hall.

Objectives

- To know the important genera of microorganisms associated with food and their characteristics.
- To understand the role of microbes in fermentation, spoilage and food borne diseases.

Unit I Introduction to Microbiology (10 hours)

Classification and morphology of microorganisms involved in food – bacteria, yeast, mold; Industrially important genera of food microbes; Intrinsic and extrinsic factors influencing growth of microorganisms in foods; Bacterial growth kinetics.

Unit II Microbiology of Food products from plant sources (15 hours)

Contamination, spoilage and preservation of fruits, vegetables and products – jam, squash, juice, wine, pickles.

Contamination, spoilage and preservation of cereals and its products – bread, biscuit, beer.

Contamination, spoilage and preservation of sugars, honey, syrups and candy.

Contamination, spoilage and preservation of tea, coffee, cocoa, coconut and canned foods.

Unit III Microbiology of Food products from animal sources (15 hours)

Contamination, spoilage and preservation of dairy products like milk, cheese, butter, condensed milk, milk powder and cream.

Contamination, spoilage and preservation of meat, fish, poultry egg and their products.

Unit IV Food borne pathogens (10 hours)

Food poisoning and intoxication, food borne diseases (symptoms, foods involved and control measures) caused by *Bacillus* spp, *Clostridium botulinum*, *Escherichia coli*, *Staphylococcus* spp, *Salmonella* spp.

Unit V Control of Microorganisms (10 hours)

Disinfection, antimicrobial agents – physical and chemical agents and their mechanism of action; Thermal inactivation of microbes – sterilization equipment, determination and importance of thermal death time.

Microbiology of water – microorganisms in various water sources and purification methods, Drinking water standards; HACCP in food industry.

Textbooks

1. Food Microbiology (4th Ed.), WC Frazier; Tata McGraw Hill, Delhi
2. Modern Food Microbiology(4th Ed.), James M Jay, CBS Publishers, Delhi

Reference

1. Food Microbiology (2008), M. R. Adams, M. O. Moss, Royal Society of Chemistry.
2. Microbiology(1998) , Pelczar, Tata McGraw-Hill Education

15FPB21 Visual Merchandising and Social Media (3 hours / week)

Objectives

- To understand the basic concepts of visual merchandising, advertising and photography
- To learn the about the social media technology and marketing strategy

Unit I Advertising (12 hours)

Introduction to visual merchandising, concepts and principles, types of advertising, advertising and consumer, target audience, structure, message, media planning

Unit II Techniques of writing (10 hours)

Types of writing, readability, writing for print media, television, radio, web. Creative writing, Business writing.

Unit III Photography (Practical) (14 hours)

Lens perspective, different types of shots, different types of lighting, action photography, product photography, use of photo editing software.

Unit IV Promotion through social media (12 hours)

Using social media for promotion of products – Face book, Twitter, Blogs etc.,. Search engine optimization. Web designing, Use of graphics and animation.

Unit V Marketing food products (12 hours)

Branding, brand building, positioning, marketing strategy, competition analysis

Reference

1. Sathish K. Batra (1991), Advertising and sales promotion, Shhkazmi publishers.
2. Sangeetha Sharma and Raghuvir Singh, Advertising, Planning and Implementation.
3. Usha Raman (2010), Writing for the media, New Delhi, Oxford University Press.
4. Robert Gunning (1999), Effective writing, Mc Millan Publishers.
5. Rudolf Flesch (1987), Art of effective writing, Mc Millan Publishers.
6. Choudhary R (2010), Media writing, Centrum press, New Delhi.

Objectives

- To know about different types of dairy products in market
- To prepare various dairy and dairy products

Exercise

1. Test milk for its quality (Adulterant, Acidity, Total solids, Alcohol, COB).
2. Production of pasteurization milk.
3. Production of flavoured milk.
4. Preparation of curd, buttermilk, and lassi.
5. Preparation of rasagulla
6. Preparation of rasamalai and basandhi
7. Preparation of yoghurt and ice cream.
8. Preparation of khoa, condensed milk
9. Preparation of milk powder.
10. Preparation of cream
11. Preparation of butter and ghee.
12. Preparation of paneer and its recipes.
13. Carryout cleaning operation (CIP system)
14. Conduct market survey of different dairy products.
15. Visit and study of a dairy plant, hygiene in dairy unit.



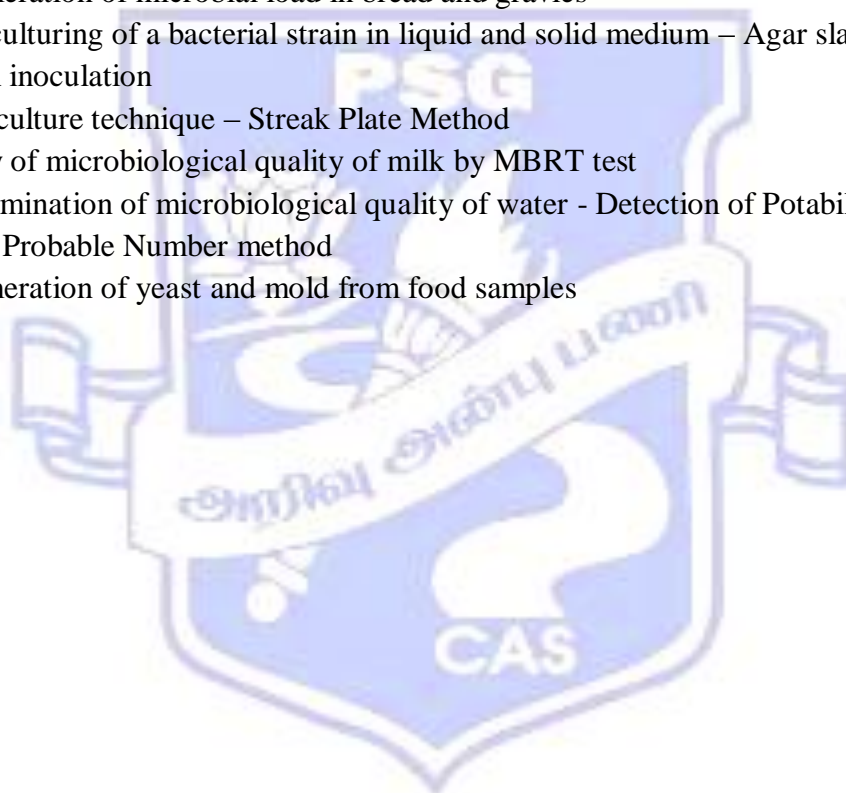
Since - 1947

Objectives

- To learn the preparation of culture media
- To identify the microbes in food

Exercise

1. Study of a bright field microscope
2. Gram staining and study of morphology of bacterial cells
3. Preparation and sterilization of culture media - nutrient broth and agar
4. Serial dilution and plating by spread –plate and pour –plate techniques
5. Enumeration of microbial load in packaged drinking water
6. Enumeration of microbial load in milk, flavoured milk and fruit juice.
7. Enumeration of microbial load in bread and gravies
8. Sub-culturing of a bacterial strain in liquid and solid medium – Agar slant, Agar plate, Broth inoculation
9. Pure culture technique – Streak Plate Method
10. Study of microbiological quality of milk by MBRT test
11. Determination of microbiological quality of water - Detection of Potability of Water – Most Probable Number method
12. Enumeration of yeast and mold from food samples



Since - 1947

Objectives

- To know the functions of packaging and various forms of packaging materials.
- To learn standards and legislations of food packaging materials.
- To understand process involved in aseptic packaging and recent development in food packaging.

Unit I – Introduction, importance and types (9 hours)

Packaging – Importance, functions of packaging materials and their properties (barrier properties, strength properties, optical properties etc). Materials - Paper and paper board – plastics, glass containers, cans, aluminium foils, and Multilayer / Coextruded film, Woven and Non-woven packs. Types - primary, secondary and tertiary packaging, transport packaging - Palletization.

Unit II – Packaging of Ready-to-use foods (8 hours)

Ready-to-use foods - packaging of bakery and confectionery products, packaging of fruit and vegetable products – Fresh, cut, dehydrated and processed form, Intermediate Moisture Foods and instant mixes, Industrial packaging machinery

Unit III –Packaging of processed foods (9 hours)

Packaging of processed food products - packaging of meat, fish and poultry, packaging of dairy products, Industrial packaging machinery

Unit IV- Aseptic packaging, selection and evaluation of packaging materials (10 hours)

Aseptic packaging, Selection of packaging material and design. Evaluation of quality and safety of packaging material – Different testing procedure – Tensile, bursting and tear strength. FSSAI regulations – packaging materials. Labeling and bar coding.

Unit V – Special packaging techniques (9 hours)

Special packaging techniques –vacuum packaging and gas packaging (CAP, MAP), retort pouching – tetra packaging – antimicrobial packaging – bio-degradable packaging, smart packaging, natural packaging, shrink and stretch packaging. Packaging need for export. Industrial training / visit.

Text book

1. Richard Coles, Mark J. Kirwan (2011), Food and Beverage Packaging Technology, (2nd Edition), Wiley-Blackwel
2. Gordon L. Robertson (2012), Food Packaging: Principles and Practice (3rd Edition), CRC Press

Reference books

1. Modern packaging industries, Hand book, 2004, NIIR Board, New Delhi.
2. Food packaging technology, Hand book, 2004, NIIR Board, New Delhi

Objectives

- To understand the concept of fermentation and its importance in food processing
- To acquire knowledge on the design and operation of fermentor and process control
- To learn about the preparation of fermented products from cereals, pulses, fruits, vegetable, dairy and meat.

UNIT I – Introduction to fermentation**(7 hours)**

Fermentation – definition, benefits of fermentation, nutritive value of fermented foods, micro organisms involved in food fermentation, chemical changes in food during fermentation, types of fermentation – ethyl alcoholic, lactic acid, acetic acid and butyric acid fermentation

UNIT II – Production media**(10 hours)**

Nutritional requirement of microbes, media – composition and preparation, culture media – composition, types – liquid and solid/semisolid, natural and synthetic media, production of baker's yeast and single cell protein, scale up and scale down concepts
Sterilization and inoculum preparation – sterilization - principle, sterilization of fermentors and vessels, liquid media and gases - in-batch and continuous process, inoculums preparation, aseptic inoculation

UNIT III - Fermentor**(10 hours)**

Types of fermentor – submerged culture and solid substrate fermentor, batch and continuous stirred tank fermentor, process control, aeration, agitation and oxygen requirement, function and maintenance of various parts of fermentor. Purification of food products, filtration and centrifugation.

UNIT IV - Preparation of fermented Dairy and fruit and vegetable foods**(9 hours)**

Fermented milk products – Probiotic - curd, yoghurt, shrikhand, cheese, butter milk, fermented fruit and vegetable products – wine, vinegar and sauerkraut.

UNIT V - Preparation of fermented cereal and pulse products**(9 hours)**

Fermented cereal and pulse products – bread, dhokla, idly, miso, tempeh, fermented meat products – sausage. Quality testing of fermented packed products.

Text books

1. Srivatsava, M.L.2008. “*Fermentation technology*”. Narosa Publishing house, New Delhi
2. Carl.S.Pederson, 1979. “*Microbiology of food fermentations*”. 2nd Edition, AVI Publishing Co., Inc. Westport, Connecticut

Reference books

1. Stanbury, P.F., Allan Whitaker and S.J. Hall, 2002. “*Principles of Fermentation Technology*”. Aditya books private Ltd., New Delhi
2. B.Mc.Neil and L.M.Harvey, 2007. “*Fermentation – a practical approach*”. 1st Indian Edition. Rajashri Photolithographers, New Delhi.

Objectives

- To study about different types of plantation crops
- To learn the processing techniques of plantation crops
- To update knowledge on equipments used and value addition

Unit – I Coffee and tea processing**(14 hours)**

Coffee – types, structure, processing - roasting, grinding, blending. Chemical composition of green and roasted coffee, decaffeination, additives in coffee. Instant coffee mix, instant coffee powder.

Tea – types of tea (green, green brick, yellow, white, oolong and black tea), Processing of tea – Harvesting, withering, rolling, fermentation, drying, sorting and fiber removal, grading. Chemical composition of tea leaves – polyphenols, caffeine. Value added products of tea. Equipment used in coffee processing – coffee pulping machine, fermentation tanks and dryer. Equipment used in tea processing – withering troughs, leaf sifter and shredder, roller, fermenting drum, drier, fiber separator and grader.

Unit – II Cocoa processing**(10 hours)**

Cocoa - harvesting, fermentation, drying of cocoa beans. Cocoa processing – bean selection, cleaning, preliminary treatment, thermal treatment, breaking of the cocoa beans and shelling, flavor development and alkalizing of cocoa nib, grinding, alkalizing and cocoa liquor treatment. Production of cocoa butter and cocoa powder

Unit – III Sugarcane and Coconut processing**(16 hours)**

Processing of sugar cane – receiving, milling, clarification, evaporation, crystallization, separation, refining, drying and packing, physicochemical properties of sugar, grades and types of sugar, mollasses and other by-products.

Value added products – Manufacturing of jaggery (Gur), sugarcane juice, sugar candy, palm sugar, artificial sweeteners – aspartame, saccharin and sucralase.

Coconut – harvesting, dehusking, deshelling, paring, grinding, milk extraction, grinding, oil extraction. Value added coconut based products – sap, honey, jiggery, sugar, neera, vinegar, milk, cream, desiccated coconut – strips, chip, powder, (full fat, defatted).

Unit – IV Processing of roots and tubers**(10 hours)**

Root and tuber crops production and types (tapioca, potato, cassava), factors affecting storability of roots and tubers, principles of storage, handling and storage methods.

Processing of tapioca – sago and starch production, value added snack foods.

Unit – V Processing of spices**(10 hours)**

Importance of spices, classification of spices, major and minor spices, active components in spices

Processing – harvesting, curing, grading and storage of pepper, cardamom, ginger, turmeric, chilli, value added products – spice mix, extraction of volatile oils and oleoresins.

Visit / Training - spice processing unit

Textbooks

1. L.Jagan Mohan Rao and K.Ramalakshmi (2011), *Recent trends in soft beverages*, Woodhead publishing india PVT Ltd., New Delhi
2. Vijai Bahadur singh and Kirti singh (2015), *Spices*, Today & Tomorrow's printers and publishers, New Delhi
3. I.S.Singh (2011), *Food Processing*, Westville publishing house, New Delhi
4. NIIR borad (2010), *The complete technology book of Cocoa, chocolate, icecream and other milk products*, National Institute of Industrial Research, New Delhi
5. H.Panda (2010), *The complete book on sugarcane processing and By-products of molasses*, Asia Pacific Business Press Inc., New Delhi
6. D.K.Salunke and S.S.Kadam (2005), *Handbook of fruit science and Technology – production, composition, storage and processing*, Marcel Dekker Inc., New York

References

1. Manay. Shakuntala N, Shadaksharaswamy M. (2008), *Food : Facts and Principles*, Asia Pacific pressShanmugavelu K.G (2002). *Spices and Plantation Crops*. Oxford & IBH Publishing Co. New Delhi



Since - 1947

16FPB29

Food product development

(3 hours/ week)

Objectives

- To apply a product development process to generate ideas, design, develop and evaluate new products and their markets.
- To understand the process of optimization, product launch and marketing strategy.

Unit I - Introduction to product development

(9 hours)

Introduction to product development, scientific method in product development, scope in developing new products, need for new products – consumer, commercial and technical.

Unit II – Stages in product development

(9 hours)

Stages in product development - Idea generation, development stage and commercial stage, Open Innovation Stage Gates Processes

Unit III - Product evaluation

(10 hours)

Sensory evaluation – sensory odour, flavour, mouth feel, texture, colour and taste perception, different sensory tests – affective, discrimination and descriptive. Role of sensory evaluation specialist in product development. Shelf life testing – physical, chemical and microbial requirements

Unit IV – Marketing in food product development

(9 hours)

Marketing steps, assess marketing needs and marketing analysis for new product, market Segments, organising, designing and managing new product development process. Product probability (costing and profitability) and lifecycle. IPR and patenting.

Unit V – Product launch

(8 hours)

FSSAI certification – procedures, designing packaging material – brand name, logo, Labelling – design and content, bar coding.
Product launch and evaluation, trends and opportunities in developing innovative food products.

Texts books

1. Brody, A.L. and Lord, J. 2008. Developing New Food Products for a Changing Marketplace, 2nd Edition. CRC Press, Boca Raton
2. FL. Campbell-Platt, G. 2009. Food Science and Technology. Blackwell Publishing Ltd., Oxford, UK.
3. DeMan, J.M. 1999. Principles of Food Chemistry, 3rd Ed. Aspen Publishers

Reference books

1. Gaithersburg, MD. Fuller, G.W. 2011. New Food Product Development, 3rd Edition. CRC Press Boca Raton
2. FL. Moskowitz, H., Saguy, I. S., and Straus, T. 2009. An Integrated Approach to New Food Product Development. CRC Press

Objectives

- To gain an understanding of the importance and the process of Auditing in Industries
- To learn about the various types of industrial audits and their purpose.
- To be equipped with the knowledge about the documentation involved in industrial audits

Unit I - Introduction to industrial auditing (10 hours)

Origins of auditing - auditing in India, introduction to auditing – definition, functions and objectives. Basic principles of auditing, advantages and limitations of audit

Unit II - Classification of audits (12 hours)

Internal and external audit. Classifications as per organizational structure of business. Classification based on the method of audit. ISO 9001:2015, ISO 22000:2005.

Unit III - Planning and procedures of audit (12 hours)

Planning and steps before commencing an audit. Procedures of audit – agreement with client, scope of audit, information gathering about business/ client, professional conduct and ethics.

Unit IV - Documentation related to auditing (12 hours)

Audit programme – its advantages and limitations, audit memorandum, audit notebook and audit working papers

Unit V - Types of industrial audits (14 hours)

Statutory audits, quality and hygiene audits, systems audit, safety audit, energy audit, environmental audit, financial audit – planning, execution, reporting and closing.

Text Books:

1. Auditing -Principles and Practices (2003), VH Kishnadwala, NH Kishnadwala, MV Shetti
2. Auditing - B.S.Raman, United Publishers
3. Auditing - Theory and Practices (2008), Pardeep Kumar, Baldev Sachdeva, Dr.Jagwant Singh, Kalyani Publishers
4. A Handbook of practical Auditing (2015), BN Tandon, S.Sudharsanam, S.Sundharabahu, 14th Edition, S.Chand Publishers.

References:

1. Auditing health and safety management systems: a regulator's view, A. S. Gay and N. H. New, Occupational Medicine, Volume 49, Issue 7, Pp. 471-473, 1999.
2. A Corporate Social Responsibility Audit within a Quality Management

Objectives

- To know the various methods involved in treatment of solid and liquid wastes
- To learn the process of production of value added products from food industry wastes

UNIT I - Utilization of wastes from fruit and vegetable processing industry (14 hours)

Production of pectin, ethanol, natural gas, citric acid, activated carbon, fibre extract from pomace, Production of citrus oil from peels of citrus fruits; Manufacture of candied peel and pectin from albedo of citrus fruits. Waste from Coconuts – uses of coir pith, biogas production, particle board, utilization of coconut waste for industrial applications.

UNIT II – Utilization of wastes from flesh food industry (12 hours)

Utilization of waste from meat industry

Utilization of waste from fish industry - Production of fish meal, fish protein concentrate, glue from seafood processing waste.

Utilization of waste from poultry industry

UNIT III – Utilization of wastes from dairy and cereal processing industry (12 hours)

Utilization of whey – production of whey protein isolate, concentrate and lactose

Utilization of waste from grains

UNIT IV– Solid waste treatment methods (10 hours)

Classification and characterization of food industry wastes, waste disposal methods – physical, chemical and biological

Biological composting, drying and incineration, design of solid waste management system: landfill digester, vermi composting pit.

UNIT V – Liquid waste treatment methods (12 hours)

Design of activated sludge process, rotating biological contactors, trickling filters, UASB, biogas plant, bio-filters and bio-clarifiers. Ion exchange treatment of waste water, recovery of useful materials from effluents by different methods

Text books

1. Food Processing Waste Management; Green JH & Kramer A; 1979, AVI.
2. Environmental Biotechnology: Principles and Applications; Rittmann BE & McCarty PL; 2001, Mc-Grow-Hill International
3. Chakravarthy & De, "Agricultural Waste and By Product Utilisation".

Reference books

1. Food Industry Wastes: Disposal and Recovery; Herzka A & Booth RG; 1981, Applied Science Pub Ltd.
2. Water & Wastewater Engineering; Fair GM, Geyer JC & Okun DA; 1986, John Wiley & Sons, Inc.

16FPB31

Food fermentation techniques practical

(3 hours/ week)

1. Principle and operation of fermentor.
2. Optimization of process parameter in production of tempeh.
3. Production of baker's yeast.
4. Production of citric acid from orange peel.
5. Production of yeast leavened products.
6. Optimization of process parameter in traditional fermented product (idly / dhokla batter).
7. Preparation of wine from grapes.
8. Quality analysis of prepared yogurt.
9. Preparation of apple cider vinegar.
10. Preparation of pickled cucumber / green pepper.
11. Preparation of probiotic food.
12. Preparation of cereal malting and quality testing.
13. Visit to Bio-gas plant.



Since - 1947

Objectives

- To impart knowledge on physical food plant layout.
- To enable the students to understand the statutory requirements, safety and standards while designing food product and processing plant layout

Plant layout design and includes the following

- a. Plant layout
- b. Ancillary plants & other factory facilities
- c. Equipment requirement and selection
- d. Product standardization
- e. Basic product evaluation
- f. Staffing
- g. Financial management – estimation of capital investment, analysis of plant cost and profitability
- h. Legal aspects for operation
- i. Effluent treatment and handling plant
- j. Sanitation and hygiene

With respect to the following:

Exercise I - Bakery and confectionery unit

Exercise II – Fruit and vegetable processing Unit

Exercise III – Dairy processing unit

Exercise IV – Meat, Fish and poultry processing unit

Exercise V – Grain processing unit

Exercise VI – Spice processing unit

Exercise VI - Visit to industries and plants and study the management practices

Each student will be asked to visit a food processing plant system and develop a plant design report which shall include product identification and selection, site selection, estimation of plant size, process and equipment selection, process flow-sheet, plant layout. BIS plant layout

Objective

To provide knowledge on food safety and standards to maintain food quality

Unit I - Principles of food safety and quality (12 hours)

Food safety and quality - definition, principles of food safety and quality. Quality control-raw material, process and finished product control. Hazards - physical, chemical and biological. Pesticide- types and limits for pesticide, metal toxicity contamination

Unit IV - National standards (14 hours)

Standards for foods – milk and its products, fruits and vegetables, spices, meat, fish and poultry foods. Standards for food packaging and labelling – Food Safety and Standards Authority of India (FSSAI) - Bureau of Indian Standards (BIS), Agricultural Grading and Marketing (AGMARK), The Agricultural and Processed Food Product Export Development Authority (APEDA).

Unit V - International standards (10 hours)

Food and Drug Administration Act (FDA), International Organization for Standards (ISO) and its implication, Generally Recognized As Safe (GRAS), European Council (EU), Codex Alimentarius Commission (CAC), Total Quality Management (TQM). Kosher, HACCP, HALAL, GMO free, Organic certification, Phytosanitary.

Unit III - Quality evaluation of foods (12 hours)

Quality attributes – physical, chemical and physico-chemical (moisture, TSS, acidity, ash, colour, viscosity and texture). Chemistry and physiology of taste. Principles for subjective and objective evaluation of foods. Sensory evaluation of foods using different sensory test.

Unit II – Food additives (12 hours)

Colours - types, sources – natural and synthetic, uses and permissible level as per Indian standards. Preservatives - organic and chemical. Classification, uses and permissible limit as per standards. Food adulteration - definition, adulterants types and identification of food adulterants.

Text books

1. Sara Mortimore and Carol Wallace. 1997. HACCP- A practical approach. Chapman & Hall.
2. Manoranjan Kalia. 2002. Food analysis and Quality control. Kalyani Publishers. Ludhiana
3. Ranganna, S. 1997. Manual of analysis of fruits and vegetable products. Tata Mc- Graw Hill publication company Ltd. New Delhi.

Reference books

1. Taylor, R.J. 1980. Food Additives, John Wiley & Sons, New York.
2. Swaminathan. M.S. 1987. Food Science, Chemistry and Experimental Foods, Bangalore Printing & publishing Company, Bangalore.

Objectives

- To understand the concept of food business management and various management issues in starting a business

Unit I - Introduction business management (6 hours)

Food business – definition – evolution of food business – food business status in developed and developing nations. Special features of food business – scope for food business in India. Government promotional programmes in food business.

Unit II - Business organization (6 hours)

Classification of enterprises - micro, small, medium and large. Forms of business organization – sole proprietorship – partnership –private and public limited. Cooperative unit, Small Farmers Agri Business Consortium, Farmers Producer Company.

Pricing strategies, cost concepts - seven cost curves - short run and long run costs.

Unit III - Marketing plan and promotion (6 hours)

Marketing – definition and importance, marketing management - concepts, consumer market and buying behavior, business markets -- market segmentation - market measurement, forecasting - export and government regulations - GATT and WTO. Online marketing, direct marketing, digital marketing

Unit IV- Project management (6 hours)

Situation analysis - project preparation and feasibility analysis. Business strategy - concept - long term and short term focus. Introduction to accounting system - double entry system of book keeping and principles. Accounting - concepts and conventions of accounting.

Data analysis – raw material, skilled labour, technology, market requirement, accessibility

Unit V- Project preparation (6 hours)

SWOC analysis of agro based industries - estimation of cost of production / processing and breakeven analysis - investment analysis – estimation of market potential, supply chain management in food industries – case analysis and preparation of bankable project on food processing unit.

Text books

1. Chanda Prasanna. 2005. Financial Management: Theory and Practices, Tata McGraw - Hill Publishing Company Limited, New Delhi.
2. Price Gittinger, J. 1992. Economic Analysis of Agricultural Projects, The Johns Hopkins University Press, Baltimore.

Reference book

1. Charles W L Hill and Steven L McShane, 2007, 'Principles of Management', Tata McGrawHill, NewDelhi.

16FPB37

Entrepreneur skill development

(2 hours/ week)

Objectives

- To enable the student to develop entrepreneurial competency
- To make the students aware of the importance of entrepreneurship opportunities available in the society.
- To acquaint them with the challenges faced by entrepreneur

Unit – I Business

(6 hours)

Business – meaning – characteristics of business – business opportunity – identification – components of business – requisite for successful business, technology transfer and joint venture.

Unit – II Entrepreneurship

(6 hours)

Entrepreneurship – definition – nature and characteristics of entrepreneur – types of entrepreneur – factors affecting entrepreneurial growth – problems of entrepreneurs.

Unit – III Institutional support to entrepreneurs

(6 hours)

Commercial banks – District industry centre – National Small Industries Corporation – Small Industries Development Organization – MSME – State Directorate of Industries – Small Scale Industries Development Corporation – Industrial Estates – SIPCOT, Trade promotion organization of India, Commodity boards).

Unit – IV Project implementation

(6 hours)

Start – up process – project identification – selection – project formulation – assessment of project feasibility – market survey – risk analysis – break-even analysis – preparation of project report – legal consideration – basic start up problems – guideline for setting up cottage, small, medium and large scale industries.

Unit – V Incentives and subsidies

(6 hours)

Industry promotion subsidy scheme from state and central government bodies and banks, Incentives and subsidies – rural entrepreneurship – women entrepreneurship. Sickness in small industries – reasons and remedies.

Textbook

1. Gupta C B and Kanaka S S, (2012), Entrepreneurship and small business management, 5th edition, Sulthan Chand & sons, New Delhi
2. Radha V, (2009), Entrepreneurial development, Prassanna and Co., Chennai

Reference

- 1.S.S.Khanka.1999. “Entrepreneurial Development” S.Chand & Co. Ltd. Ram Nagar New Delhi.
- 2.Hisrich R D and Peters M P, 2002. “Entrepreneurship” 5th Edition Tata McGraw-Hill.

Objectives

- To understand the nutritional requirements of individuals
- To plan nutritious meals and menus for specific populations across the lifespan

Unit I - RDA, Menu Planning and Nutrition and food security (10 hours)

Introduction to menu planning, principles, steps in menu planning, portion size and balanced diet for adults, Recommended Dietary Allowances (RDA) for Indians, basis for requirement. Dietary guidelines, Plan a menu.

International nutrition and world food problems – the scale of the problem, promotion and protection of nutritional well being: the ICN approach, the six Ps. Global food production, food security and demand – national food security and household food security, practical solutions to nutrition problems.

Unit II - International, national and non-governmental organisations (10 hours)

International organisations concerned with food and nutrition – FAO, WHO, UNICEF and World Food Programme (WFP)

National organizations concerned with food and nutrition – ICMR, NIN, NNMB, CFTRI, DFRL, CHEB and NIPCCD

Non Governmental Organizations – Cooperative for Assistance and Relief Everywhere (CARE), World Vision, Catholic Relief Service (CRS) and Action for Food Production (AFPRO)

Unit IV - Nutrition for adolescence, adulthood and old age (15 hours)

Adolescence – nutritional requirements, food requirements and dietary guidelines.

Adults - nutritional requirements, food requirements and dietary guidelines, menopausal and post menopausal changes, plan a menu. Formulate a food product to meet 1/3rd of the RDA.

Pregnancy - importance to nutrition during pregnancy, nutrient requirements during each trimester, food requirements and dietary guidelines, plan a menu. Formulate a suitable food product for pregnant women

Lactation – human milk composition, nutrient requirements during lactation, special foods during lactation, plan a menu. Formulate a suitable food product for lactating mother.

Old age - nutritional requirements, food requirements and dietary guidelines, nutrition related problems of old age, plan a menu. Formulate a food product meeting 1/3rd of RDA

Unit III - Nutrition for infants and children (13 hours)

Infants – nutrient and food requirements for infants, formula milk, weaning and supplementation, prepare low cost weaning foods. Formulate different infant formula mix.

Pre-school children – nutrition requirements for pre-schoolers, food requirements and dietary guidelines, plan a menu, Formulate a suitable food product for a pre-school child.

School going children – Nutritional requirements, food requirements and dietary guidelines, packed lunches, plan a menu and formulate different ready to eat foods for school going children

Unit V - Nutrition for fitness and sports

(12 hours)

Fitness nutrition – definition of physical fitness, components of fitness - cardiorespiratory fitness, muscular endurance and power, flexibility, athletic fitness- balance, coordination, agility etc. Dietary and protein supplements

Sports, games and exercise - principles, dietary guidelines for aerobics, yoga, isometric and isotonic exercise. Nutritional and food requirements and dietary guidelines, water and electrolyte balance. Pre, during and post event meal. Plan a day's menu and formulate a sports drink.

Text Books

1. Srilakshmi, B. (2011), Dietetics, Edition VI, New Age International Publishers: New Delhi.
2. Swaminathan S.: Advanced Textbook On Food & Nutrition Vol. 1, Bapp Co. 1985.
3. Roday (2007), Food Science and Nutrition, Oxford University Press
4. Joshi (2010), Nutrition and Dietetics, Edition III, Tata McGraw Hill Publishers: New Delhi
5. Mudambi (2012), Fundamentals of food, nutrition and diet therapy, Edition VI, New Age International Publishers: New Delhi.

Reference Books

1. Nutrient Requirements and Recommended Dietary Allowances for Indians, ICMR-NIN
2. Krause's Food and Nutrition Therapy 2010, 12th Edition
3. Robinson. Basic Nutrition and Diet Therapy (8th Edition)
4. Whitney and Rolfes 2002 Understanding Nutrition
5. Michael C. Latham, (1997), Human nutrition in the developing world, Food and Nutrition Series - No. 2, FAO Food and Agriculture Organization of the United Nations, ISSN 1014-3181, Rome
6. Park Textbook of Preventive and Social Medicine,
7. National Aeronautics and Space Administration, Space Food and Nutrition - An Educator's Guide with Activities in Science and Mathematics,
8. Smith M. S., Street, J. D., Neasbitt L., Zwart S.R., (2012), Space Nutrition.USA
9. Park and Park, (2000), Textbook of Preventive and Social Medicine Preventive and social medicine, 20th Edition, Misc publishers
10. Nutrition in Spaceflight and Weightless Models. Lane, H. W. and Schoeller, D. A. Ed. 1999, CRC Press, Boca Raton, Florida
11. Food and Nutrition during Spaceflight. Phillips, R. W. In Fundamentals of Space Life Sciences, Churchill, S. E. Ed. 1997, Krieger Publishing Co. Malabar Florida.

Objective

- To enable the students to understand the basic accounting concepts and system.

UNIT I: Introduction to Accounting

Accounting - Meaning – Principles, Concepts and Conventions – Double Entry Book Keeping – Advantages –Journal.

UNIT II Double Entry System – Ledger and Trial Balance

Ledger – Meaning – Format – Posting and Balancing Ledger Accounts from Proper Journal. Trail Balance – Meaning and Definitions – Advantages and Limitations Debit and Credit Balance – Preparation of Trail Balance. (simple problems only).

UNIT III Final Accounts

Final Accounts of Sole Trading Concerns – Trading, Profit and loss Account and Balance Sheet with simple adjustment.

UNIT IV Cost Accounting

Cost Accounting – Meaning – Scope, Objectives – Advantages And Limitations Of Cost Accounting. Difference Between Cost Accounting And Financial Accounting – Elements Of Cost Sheet – Preparation Of Cost Sheet.

UNIT V Marginal Costing

Marginal Costing – Break Even Analysis – Assumptions – Uses and Limitations – BEP – Margin of Safety – Profit Volume Analysis – Applications of marginal costing Budgeting and Budgetary Control – Flexible Budget – Cash Budget – Purchase and Production Budget.

Text Book

1. Grewal T.S, “Double Entry book-keeping”, Sultan Chand & Sons, New Delhi.

Reference Books

1. Jain S.P. and Narang K.L., “Advanced accountancy”, Kalyani Publishers, New Delhi
2. Gupta R. L and Radhasamy M., “Advanced Accountancy”, Sultan Chand & Sons, New Delhi.
3. Gupta R. L and Radhasamy M., “Financial Accounting,” Sultan Chand & Sons, New Delhi.
4. Reddy T.S and Murthy A., “Financial Accounting” Margham Publications, Chennai.

16FPB39B**Food standards and regulations****(4 hours/ week)****Objectives**

1. To acquaint the students with important food laws.
2. To acquaint with food quality parameters and food safety hazards control measures, food standards and regulations.
3. To introduce the concept of food hygiene and importance of safe food storage and distribution.

Unit I - Food laws and regulations**(10 hours)**

Introduction to food acts, laws and standards, national food safety and standard act – regulatory. Food Safety and Standards (FSS) Act, 2006, FSS Rules and Regulations, 2011, Agricultural Produce (Grading and Marketing) Act, 1937, Sugar (Control), Order, Export (Quality Control & Inspection) Act, 1963 and Rules, Bureau of Indian Standards, International Food Control Systems including CODEX

Unit II - Food quality and evaluation**(12 hours)**

Concept of quality: quality attributes - physical, chemical, nutritional, microbial, and sensory; sampling procedures their measurement and evaluation and Sensory and instrumental methods for testing quality.

Unit III - Food quality and management**(13 hours)**

Quality management systems in India; various organizations dealing with inspection, traceability and authentication, certification and quality assurance (FSSAI - PFA, FPO, MMPO, MPO, AGMARK, BIS); labelling issues; International quality management systems Food safety management systems

UNIT IV - Introduction to food safety and hygiene**(10 hours)**

Quality assurance, Total Quality Management; GMP/GHP; GLP, GAP; sanitary and hygienic practices; HACCP; quality manuals, documentation and audits; laboratory quality procedures, IPR and patent.

Unit V - Testing and evaluation**(15 hours)**

Testing and evaluation of quality attributes of raw and processed foods; Detection and estimation of food additives and adulterants; quality assurance procedure, GMP, GAP documentation; preparation of quality policy & documentation, application of HACCP to products, preparation of HACCP chart; preparation of documentation & records, visit to units with ISO systems; visit to units with HACCP certification; visit to units implementing GMP, GAP; mini-project on preparation of a model laboratory manual.

Text books

1. Macrae R, Roloson R & Sadlu MJ. 1994. Encyclopedia of Food Science & Technology & Nutrition. Vol. XVI. Academic Press.
2. Piggot J.R. 1984. Sensory Evaluation of Foods. Elbview Applied Science.
3. Ranganna S. 2001. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd Ed. Tata-McGraw-Hill.

6. Export/Import policy by Govt. of India.

References

1. Amerine MA, Pangborn RM & Rosslos EB. 1965. Principles of Sensory Evaluation of Food. Academic Press.
2. Early R.1995.Guide to Quality Management Systems for Food Industries.
3. Blackie Academic. Furia TE.1980.Regulatory status of Direct Food Additives. CRC Press.
4. Jellinek G. 1985. Sensory Evaluation of Food - Theory and Practice.
5. Ellis Horwood. Kramer A & Twigg BA.1973. Quality Control in Food Industry. Vol. I, II. AVI Publ.
6. CODEX standards for food safety and hygiene (CAC/RCP - 1)
7. ISO 9001:2015; ISO 22000:2005; BRC Global Standards for Food Safety.
8. Food Safety and Standards Act, Rules and Regulations
9. AGMARK Grading Standards
10. Indian Standards on Food Products, Hygiene, methods of test.



16FPB40

Advanced quality control practical

(4 hours/ week)

1. Estimation of caffeine and tannins in beverages.
2. Estimation of pectin content in fruits.
3. Estimation of gluten content
4. Determination of the internal and external quality of an egg
5. Determination of physical parameters for food commodities
6. Nutrient composition of foods
 - Estimation of
 - a. Protein
 - b. Carbohydrates
 - c. Fat
 - d. Fiber
 - e. Energy
 - f. Ash
7. Determination of acid insoluble ash
8. Determination of volatile and non-volatile compounds
9. Determination of Ascorbic acid in fruit juices
10. Detection of adulterants in foods
11. Basic operations of spectrophotometry, TLC/HPLC, chromatography - demonstration.
12. Estimation of phytochemical constituents in foods using UV-VIS Fluorescence spectroscopy – demonstration.

