

UNIVERSITY SCHOOL OF BIOTECHNOLOGY  
GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

M.Tech.  
(Food Processing Technology)

Revised Syllabus  
2015

Dr. (R.K.)<sup>MX.</sup> h-

## M.Tech. (Food Processing Technology)

1<sup>st</sup> Semester

Code	Subject	L	T	P/S	Credits	Marks
FT 501	Food Microbiology and Biochemistry	3	1	0	4	100
FT 503	Technology of Functional Foods and Nutraceuticals	3	1	0	4	100
FT 505	Advance Techniques of Food Analysis	3	1	0	4	100
FT 507	Food Safety and Quality Assurance	3	1	0	4	100
FT 509	Food Enzyme Technology	3	1	0	4	100
<b>Total Theory</b>					<b>20</b>	<b>500</b>
FT 591	Advance Food Chemistry and Microbiology Lab	0	0	6	3	100
FT 593	Seminar*	0	0	0	3	100
<b>Total Practical/Sessional</b>					<b>6</b>	<b>200</b>
<b>Total</b>					<b>26</b>	<b>700</b>

2<sup>nd</sup> Semester

Code	Subject	L	T	P/S	Credits	Marks
FT 502	Post Harvest Food Technology and Management	3	1	0	4	100
FT 504	Advance Food Processing Technology	3	1	0	4	100
FT 506	Food Packaging Technology	3	1	0	4	100
FT 508	Utilization of Food Industry Waste	3	1	0	4	100
FT 510	Food Product Development	3	1	0	4	100
<b>Total Theory</b>					<b>20</b>	<b>500</b>
FT 592	Advance Food Analysis Lab	0	0	6	3	100
FT 594	Seminar*	0	0	0	3	100
<b>Total Practical/Sessional</b>					<b>6</b>	<b>200</b>
<b>Total</b>					<b>26</b>	<b>700</b>

3<sup>rd</sup> Semester

Code	Subject	L	T	P/S	Credits	Marks
FT 601	Food Laws and Acts	3	1	0	4	100
FT 603	Technology of Milk, Meat, Fish and Poultry Processing	3	1	0	4	100
<b>Total Theory</b>					<b>8</b>	<b>200</b>
FT 691	Minor Project	0	0	0	16	100
FT 693	Seminar*	0	0	0	3	100
<b>Total Practical/Sessional</b>					<b>19</b>	<b>200</b>
<b>Total</b>					<b>27</b>	<b>400</b>

4<sup>th</sup> Semester

Code	Subject	L	T	P/S	Credits	Marks
FT 692	Comprehensive Viva Voce	0	0	0	5	100
FT 694	Major Project	0	0	0	20	100
<b>Total</b>					<b>25</b>	<b>200</b>

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Total Credits = 104 (One Hundred and Four)

Total Credits to be required for the award of the Degree = 100 (One Hundred)

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FT 501

## Food Microbiology and Biochemistry

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1. Laboratory design & equipments. Standards for design & construction. The building, internal structure, fittings & services, work flow & equipments. Laboratory operation & Practice. Standard operating procedures, laboratory staff & personnel practices.
2. Microorganisms associated with foods: Bacteria, fungi, viruses, protozoa, toxic algae. Bacterial classification, Microbial grouping in practice. Total colony counts, indicator organisms.
3. Factors affecting the growth, survival & death of microorganisms. Important characteristics of food contaminant microorganisms. Characteristics of microbial growth & factors affecting microbial growth.
4. Food spoilage & food-borne illness. Microbial contamination – sources, routes & control. Fate of microorganisms in food. Consequences of microbial growth in food, food spoilage, food-borne illness.
5. Food preservation and fermentation. Controlling shelf life by preservation systems. Temperature of processing & storage. Microbial fermentations and biotechnology.
6. Application of microbiology in food industry. HACCP- based systems. Microbial risk assessment of raw food materials / ingredients. Hygiene monitoring.
7. Food Biochemistry: Introduction, biochemical changes in carbohydrates, proteins & amino acids, lipids & plant pigments in foods. Selected biochemical changes important in handling & processing of foods. Browning reactions, Maillard reaction, caramelization, ascorbic acid browning, lipid browning, and aminophospholipids browning. Structures, crystallinity and chemical degradation of fats in foods. Chemical modification and functional role of fat and fat replacements.
8. Protein cross-linking in foods. disulfide cross-links, from tyrosine, melanoidins. Manipulation of protein cross-linking during food processing (chemical & enzymatic methods) & applications.
9. Biochemistry of milk constituents. Lactose, milk lipids, proteins, milk salts & vitamins. Thermal processing of milk, cheese & fermented milks, whey processing.
10. Biochemistry of fruit & vegetable processing. Chemical composition, Harvesting & processing, canning, enzyme application. Biochemical composition & nutritional value of processed products.

**References:**

1. Adams. M.R. & Moss. M.O. (2000). Food Microbiology 2nd edn. Royal Society of Chemistry London.
2. Jay J.M. (2007). Modern Food Microbiology, 7th Edition. Aspen Publishers Inc. Maryland. USA.
3. Food Microbiology & Laboratory Practice by (2005) Chris Bell, Paul Neaves and Anthony P. Williams, Blackwell Science, USA.
4. Food Biochemistry & Food Processing (2006), Y.H. Hui editor, W.K. Nip, Leo. M.L. Nolle, Gopinath Paliyath & B.H. Simpson, Blackwell Publishing, Iowa, USA.

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FT 502

## Post Harvest Food Technology and Management

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1. Scope and importance of post harvest management of fruits and vegetables in Indian economy. Nature of post harvest losses in fruits and vegetables, Classification of fruits and vegetables, structure and cellular components, factors affecting post harvest losses.
2. Maturity criteria; Maturity indices- computational, physical, chemical and physiological methods; methods for maturity determination, types of maturity indices and their components; Harvesting of fruits and vegetables: harvesting tools, containers and methods
3. Post harvest physiological and biochemical changes in fruits and vegetables; ripening of climacteric and non- climacteric fruits, control of ripening; ethylene generation and regulation; sources of ethylene; standards and specifications for fresh fruits and vegetables
4. Field heat of fruits and vegetables and primary processing for sorting and grading at farm and cluster level: Methods of pre-cooling (Room cooling, Hydro cooling, Forced air cooling, Vacuum cooling, Package icing), alternate methods (Radiant cooling, High altitude cooling)
5. Storage practices for fruits and vegetables: Controlled atmosphere storage, Modified atmosphere storage, Cold storage, Hypobaric storage, Zero energy cool chamber
6. Commodity pre-treatments: Chemicals, wax-coating, inhibition of sprouting, pre-packaging, vapour heat treatment and irradiation.
7. Post harvest handling systems: systems for fruits and vegetables of regional importance such as citrus fruits, mango, banana, pomegranate, tomato, papaya and carrot.
8. Physiological post harvest disorders: Chilling injury and diseases; Mechanical injury-types; Technologies to control post harvest losses; Respiration and transpiration loss; methods to measure respiration and transpiration losses; Spoilage of fruit and vegetable; Enzymatic browning and its control
9. Packing house operations: Types of packaging for fruits and vegetables, materials used for packaging and their properties, principles of transport and commercial transport operations
10. Minimal processing concept; Processing methods and equipment for fruit and vegetable products. Processing of traditional fermented foods. Quality, safety, nutritive value and public health aspects of these traditional foods.

**References:**

1. Kadar AA. 1992. Post-harvest Technology of Horticultural Crops. 2nd Ed. University of California.
2. Verma LR. & Joshi VK. 2006. Volume I and Volume II. Post Harvest Technology of Fruits and Vegetables. Indus Publ.
3. R. B. H. Wills, W.B. Mc Glasson, D. Graham, T. H. Lee and E.G. Hall. "Post Harvest. An Introduction to physiology and Handling of Fruits and Vegetables". CBS Publishers and distributors, New Delhi. 1996.
4. Lal G, Siddapa GS & Tandon GL. 1986. Preservation of Fruits and Vegetables. ICAR.
5. Pantastico B. 1975. Post Harvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables. AVI Publ.
6. Salunkhe DK, Bolia HR & Reddy NR. 1991. Storage, Processing and Nutritional Quality of Fruits and Vegetables. Vol. I. Fruits and Vegetables. CRC.
7. Thompson AK. 1995. Post Harvest Technology of Fruits and Vegetables. Blackwell Sci.

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FT 503

## Technology of Functional Foods and Nutraceuticals

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1. Biotechnology for the production of plant based functional foods (Biofortification with essential micronutrients, phytochemicals, modification of macronutrients); production of hypoallergenic foods; reduction of antinutrients. Biotechnology for the production of animal based functional foods (meat products, dairy foods).
2. Improving the bioavailability of polyphenols (bio availability of flabonoids, factors affecting bio availability, strategy to improve bio availability of flavonoids). Function of next generation polyphenol "Oligonol".
3. Increased production of nutriments by genetically engineered bacteria (Glutathione, Ala-Gln, Hydroxyproline, Hyaluronic Acid, N-Acitleglucosaamine, Cystidine 5 – Diphosphate Choline). Improved and enhancement of phyto ingredients using new technology of genetic re-combinatin.
4. Pro-biotics & Pre-biotics : Health benefits, Efficacy & Safety. Designers food, specialty foods, substitutes (eg. Milk replacers, low sodium slat, sugarless sweet meats, food for sports, geriatric). Nutraceuticals with reference to Indian Context and Ayurveda
5. Solubility and Product Recovery in super critical fluid separation process. Super fluid technology for extraction of bio active components.
6. Dehydration technologies to retain bio-active components (artificial drying, drug drying, spray drying, freeze drying, vacuum drying, micro-wave vacuum drying, membrane seperation technology in processing bioactive components (preconcentration, fractionation, hybrid process, new membrane processes)
7. Packaging technologies for functional foods: fruits & vegetables (processed plant products, fresh plant products), probiotics (yogurt, dried cultures), intermediate moisture products, oils and fats. choice of packaging materials. active packaging. Microencapsulation and nano emulsion technology for delivery of nutraceuticals and functional foods.
8. Application of nanotechnology to functional foods and nutraceuticals to enhance their bioactivities: nanonisation of functional foods and nutraceuticals (functonal foods, nutraceuticals, medicines). improvements in the bioactivity of functional foods and nutraceuticals (hepatoprotective, antioxidant), nanotechnology fuctional foods and drug delivery systems.
9. Microalgal biotechnology in the production of nutraceuticals: microalgal in food chain, scale of microalgal nutraceutical production, health concerns with microalgal products, lipid, carotenoids, production with microalgal.
10. Future strategies for the development of biotechnology- enhanced functional foods and their contribution to human nutrition.

**References:**

1. Advances in food research by G.F.Stewart, 1966
2. Functional foods: Designer foods, pharma foods and neutraceuticals by Goldberg, 1994
3. Advances in food and nutrition research by Steve L. Taylor, 2007
4. Functional food Ingredients & Nutraceuticals by John Shi, Taylor & Francis 2007
5. Biotechnology in functional foods & nutraceuticals by Debasis Bagchi, Francis C. Lau and Dilip K. Ghosh, CRC Press, Boca Raton, 2010

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FT 504

## Advanced Food Processing Technology

3-1-0

1. Scope of food processing; historical developments; principles of food processing and preservation. Unit operations in food processing.
2. Raw material preparation; size reduction, mixing and forming, separation and concentration of food components
3. Processing and preservation by heat – blanching, pasteurization, sterilization and UHT processing, canning, extrusion cooking, dielectric and ohmic heating, microwave heating, baking, roasting and frying, etc.
4. Processing and preservation by low-temperature- freezing, freeze drying and freeze concentration, chilling
5. Processing and preservation by drying: concentration and evaporation-types of dryers and their suitability for different food products; ultra- filtration, reverse osmosis, dehydration
6. Processing and preservation by non-thermal methods: irradiation, high hydrostatic pressure, pulsed electric field, hurdle technology
7. Use and application of enzymes and microorganisms in processing and preservation of foods; food fermentations, pickling, smoking etc
8. Controlled and Modified Storage and packaging
9. Food additives: definition, types and functions, permissible limits and safety aspects
10. Post Processing Operations; Coating or enrobing, Packaging, Filling and Sealing of containers, material handling, Storage and distribution

**References:**

1. Fellows PJ. 2005. *Food Processing Technology: Principle and Practice*. 2<sup>nd</sup> Ed. CRC.
2. Potter NN & Hotchkiss 1997. *Food Science*. 5th Ed. CBS.
3. Jelen P. 1985. *Introduction to Food Processing*. Prentice Hall.
4. Ramaswamy H & Marcotte M. 2006. *Food Processing: Principles and Applications*. Taylor & Francis.

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FT 505

## Advance Techniques of Food Analysis

3-1-0

1. Sample preparation. Sampling, homogenization, particle size reduction, particle size measurement & sample storage, etc.
2. Determination of moisture, ash content of food & Rheology. Drying & factors affecting rate of drying, methods (direct & indirect methods like GC, IR, NIR, Microwave & Mass Spectroscopy). Dry & wet ashing Texture, Viscosity & Rheology evaluation of solid foods.
3. Sensory evaluation testing. Recruitment, screening, detection of basic tests. Test ranking, training, descriptive analysis, performance evaluation, method validation, sensory laboratory, etc.
4. Enzymes in food analysis; Supercritical fluid extraction in food analysis; Rapid methods for detection of food pathogens, biosensors, automation and use of computers in food analysis
5. Alcohols in foods & beverages. Separation of alcohols & clean up, derivatization, detection & quantitation. Applications in wines & musts, vinegars, beers & malt beverages, dairy products, fruits, vegetables & juices.
6. Determinate of fat soluble and water soluble vitamin in foods. Sample preparation, clean-up analysis by HPLC & simultaneous determination of multiple vitamins.
7. Analysis of organic acids & organic bases including nitrosamines, volatile amines, & spicy foods alkaloids.
8. Application of modern techniques including spectroscopy, chromatography including GC, GC-MS, HPLC, gel permeation, ion-exchange, HPTLC, NMR, GC-FTIR.
9. Identification tests. DNA methods, biological & microbiological methods, chemical methods, lipid method using radio-induced volatile hydrocarbons. thermo luminescence, electron spin resonance. Comparative methods of toxicity testing in (novel) foods; biosensors.
10. PCR based diagnostic techniques, Kit based detections in food analysis. RT-PCR, electrophoresis, electro blotting and capillary blotting: population & evolutionary genetics, gene mapping: microbial gene transfer mechanisms.

**References:**

1. Flavours in food by Voilley, Andre, 2006,
2. Spectral method in food analysis by Magdi Mossoba, 1999
3. Sensory evaluation technique by Morton C. Meilgaard, 2007
4. Sensory evaluation of food: Principle & practices by Harry L. Lawless, Hildegard, Heymann, 1999
5. Food Chemistry by W. Grosch by Belitz, H.D., Grosch, W. 2nd ed., 1999
6. Handbook of Food Analysis (Vol I & II) (1996) by Leo M.L. Nollet Marcel Dekker, USA

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1. Introduction: Definition, importance and scope of packaging of foods, Types and roles of active and intelligent packaging
2. Packaging materials: Origin of packaging materials, types, properties, advantages & disadvantages of packaging materials.
3. Forms of packaging – box, bottle, tetra, pouch, shrink, vacuum, gas, CAP, MAP, aseptic etc
4. Analysis of packaging materials: WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test, puncture test, impact test etc.
5. Oxygen, ethylene and other scavengers; antimicrobial food packaging; non-migratory bioactive polymers in food packaging; time-temperature indicators; freshness indicators.
6. Novel MAP applications for fresh-prepared produce; product safety and nutritional quality; reducing pathogen risks in MAP-prepared produce; detecting leaks in modified atmosphere packaging; MAP with other preservation techniques
7. Novel packaging and particular products, Active packaging in practice: meat, fish, fruits and vegetables, other fresh produce.
8. Legislative issues relating to active and intelligent packaging, recycling packaging materials, green plastics for food packaging, Packaging-flavour interactions; Food-packaging interactions; characteristics of food-grade packaging material
9. Minimum-packaging technology for processed foods
10. Packaging Machinery: Bottling, can former, form fill and seal machines, bags – their manufacturing and closing, vacuum packs unit, shrink pack unit, tetra pack unit.

**References:**

1. A handbook of food packaging by Frank Albert Paine, Heather Y. Paine 2<sup>nd</sup> Ed.(1992) Chapman & Hall
2. Novel food packaging techniques by Raija Ahvenainen (2003) Woodhead Publishing.
3. Active packaging for food applications by Aaron L. Brody, Eugène R. Strupinsky, Lauri R. Kline (2001) Technomic Pub. Co.



FT 507

## Food Safety and Quality Assurance

3-1-0

1. Types of food hazards: biological, chemical and physical; Risk assessment; Existing and emerging pathogens due to globalisation of food trade; Newer systems of safety evaluation such as HACCP
2. Testing of food ingredients & additives; Animal studies including LD50; Ames test for teratogenicity; Natural toxic constituents in plant foods; Shellfish poisoning;
3. Chemicals from processing such as fumigants, chlorinated solvents, autoxidation products, carcinogens in smoked foods and pyrolysis, pesticides and herbicides
4. Intentional and unintentional additives; Toxicity due to microbial toxins including botulinum and staphylococcal toxins, mycotoxin and due to other food pathogens;
5. Food allergy and intolerance; Detoxication strategy
6. Good Hygienic Practices (GHP), Good Manufacturing Practices (GMP), HACCP, ISO 9001 (Quality Management System),
7. ISO 22000 (Food Safety Management System), Traceability, Food Recall
8. Need for Food analysis, Accreditation of Food Laboratory, Referral labs. Risk analysis and management in food safety,
9. What is food surveillance, Steps to be taken for reporting and dealing with food incidents. Food alerts.
10. International Food safety standards: British Retail Consortium Food Standard, FSSC 22000, SQF, GFSI, IFS, PAS 220

**Reference:**

1. Handbook of food toxicology by S. S. Deshpande
2. Nutritional and safety aspects of food processing by Tannenbaum SR
3. Microbiological safety of food by Hobbs BC, 1973,
4. Chemical toxicology of food by Galli, C.L, 1978
5. Principle method of toxicology by Andrew Wallace Hayes, 2001
6. Food toxicology by William Helferich, Karl Winter, 2001
7. The food safety information handbook by Cynthia A. Robert, 2009 Food safety: a reference handbook 2<sup>nd</sup> Ed. by Nina Redman (2007) ABC-CLIO publishers, USA
8. Food Safety Culture by Frank Yiannas (2009) Springer
9. Make It Safe: A Guide to Food Safety by CSIRO Food and Nutritional Sciences (2010) CSIRO Publishing

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FT 508

## Utilization of Food Industry Waste

3-1-0

1. Waste and its consequences in pollution and global warming, Types of food processing waste and their present disposal methods.
2. Treatment methods of solid wastes: Biological composting, drying, Incineration; Design of solid waste management system: Landfill digester, Vermicomposting Pit.
3. Treatment methods for liquid wastes from food process industries: Design of Activated Sludge process, Rotating Biological Contactors, Trickling filters, UASB, Biogas Plant.
4. Fruits and vegetables: Production of Citrus oil from peels of Citrus fruits, Manufacture of candied peel and pectin from albedo of citrus Fruits. Production of Single Cell Protein by utilizing fruits and vegetable waste, Use of potato waste.
5. Dairy Industry: Status and utilization of Dairy by-products i.e Whey, buttermilk and ghee residues.
6. Meat Industry: Availability and Utilization of by-products of meat industry: Utilization of organs and glands of animal as human food. Production of Human food from animal blood and blood protein.
7. Fish and poultry industry: Availability and utilization of by- products of Fish and poultry industry. production of fish meal, Fish meal concentrate, Texturised fish protein concentrate, Marketable products like chitin, chitosan and fertilizers from shells.
8. Cereals Feed for live stock from wheat and corn bran, Extraction of oil and wax from rice bran, Puffed cereals from broken rice; Starch, modified starch and industrial alcohol from non usable cereals; Silica from rice husk; Extraction of Prolamin; Protein from sorghum.
9. Drinking water treatment: Types of treatments: Flocculation/ Sedimentation, Filtration; Ion – Exchange, Absorption, Disinfection (Chlorination/ ozonation)
10. Utilization of Food Packaging Waste Glass, Plastic, Aluminium, Paper/ carton, Polymers

**References:**

1. Utilisation of By- products and treatment of waste in the food industry ed. By Vasso Orepoulou, Winfried Russ (2007) Springer.
2. Waste Management for food industries by Ioannis S. Arvanitoyannis(2008) Academic Press.

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FT 509

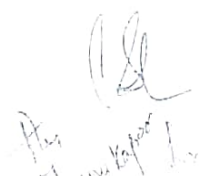
## Food Enzyme Technology

3-1-0

1. Introduction to enzymes: What are enzymes? history of enzyme usage in food, nomenclature of enzymes & classifications, specificity of enzymes, enzyme kinetics & catalysis, Regulations of enzymes
2. Extraction & Purification of enzymes: a) selection of starting material as source of enzyme b) preparation of crude extract c) concentration of enzymes d) separation of enzymes d) characterization of enzymes
3. Importance of enzymes in food; Origin of enzymes: native enzymes, contaminating enzymes, controlled addition; Aims of analysis of enzyme activity: monitoring heat treatments, testing hygienic quality, determination of constituents,
4. Biodynamics of food; Future application of food enzymes: tailoring enzyme properties and functions, in vivo modification of food quality
5. Enzymes in dairy applications: Enzymes in cheese making and processing, Lipases, Lysozymes, Transglutaminase, enzymes in milk processing, beta-galactosidase
6. Enzymes in baking: Amylases, Xylanases, Oxidoreductases, Lipases, Protease, Transglutaminase
7. Enzymes in fruit juice: Enzymes involved in treatment of pulp in juice extraction, juice clarification, liquefaction, maceration, Pectic enzymes, Cellulases, Amylases, Proteases
8. Enzymes in brewing: Enzymes in malting and mashing, Enzymes for process improvement, starch-haze removal
9. Other food applications of enzymes: Enzymes involved in meat processing, protein cross-linking, flavor development, oil degumming.
10. Enzyme safety and regulations: Safe handling of enzymes, possible health effects & control technology, regulations of enzyme products: enzymes for food, feed, & industry.

**References:**

1. Handbook of Food Enzymology Ed. by John R. Whitaker, Marcel Dekker, 2003
2. Enzymes in Industry; Product & Applications Ed. by Wolfgang Aehle, Wiley-VCH, 2004



FT 510

## Food Product Development

3-1-0

1. The new product success equation: building success into the new product development process (an objective-based product development process); strategic planning; innovation as science. Commercial viability and sustainability of raw materials. food waste and energy efficiency of the whole process.
2. Trends monitoring: sorting fad from long-lasting; wide world of new products: a unique perspective of new products around the world that have hit their mark with consumer.
3. Personalizing food; creating food concepts to guide product development and marketing; defining and meeting customer needs: beyond hearing the voice of the consumer.
4. Getting the food right for children: how to win with kids; food packaging trends; recent development in consumer research food; getting the positioning right: advertising planning.
5. The importance of product innovation; research for creativity, constraints to innovation, communication & phases of new product development.
6. Sources of new product ideas; general techniques, criteria for screening ideas; how to work with uncertainty, factors shaping future product and process development and new food for the future.
7. Therapeutic nutrition & formulation of special dietary foods; relation of food and diseases.
8. Deficiencies of essential nutrients; assessment of nutritional status & RDA; Effect of processing on nutrients.
9. Functional foods and nutraceuticals with attributes to control cardiovascular diseases, cancer, obesity, ageing.
10. Case studies: product development in bakery, confectionary industry, breweries, fruits, Meat & fish, snack foods, dietary & health foods and nutraceuticals.

**References:**

1. New Food Product Development: From Concept to Marketplace by Gordon W. Fuller (2011) CRC Press. Taylor & Francis Group
2. An Integrated Approach to New Food Product Development ed. By Howard R. Moskowitz, Israel Saguy, Tim Straus (2009) CRC Press. Taylor & Francis Group
3. Product and process innovation in the food industry ed. By Bruce Traill, Klaus G. Grunert (1997) Springer
4. The new cultures of food: marketing opportunities from ethnic, religious and cultural diversity ed. By Adam Lindgreen, Martin K. Hingley (2009) Gower Publishing, Ltd.
5. Food, Nutrition and Diet Therapy by Krause and Mahan 1996,
6. Modern Nutrition in Health & Disease by Young & Shils.
7. Latest research and industry innovations published in journals and news.

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FT 601

## Food Laws and Acts

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1. Salient features of Food Safety & Standards Act, 2006, Structure of FSSAI, Administrative set up at the State level. Roles and Responsibilities of diff. Food safety Regulators, Food Safety Commissioner, Designated Officer,
2. Food safety Officer, Adjudicating Officer Licensing and registration, Licenses to be granted by Central Licensing Authority, Documents/ Format required for Registration/ Licensing
3. Introduction to Food Safety, Food Contaminants (Microbial, Chemical, Physical), Food Adulteration (Common adulterants), Food Additives (functional role, safety issues), Food Packaging & labeling (Packaging types, understanding labeling rules & Regulations, Nutritional labeling, labeling requirements for pre-packaged food as per CODEX)
4. Organic food, Identification of Organic foods, Advantages, The Organic Certification Process, Organic Food labeling, GM food. Why are GM food produced, main issues of concern for human health, how are GM food regulated internationally, regulation in India.
5. Role of WHO to improve evaluation of GM food, benefits & controversies, irradiated food, labeling of irradiated food. freeze dried food, functional foods & nutraceuticals,
6. Functional foods from plant sources, animal sources, dietary supplements. Regulations & World Trade Organization (WTO), Principles of trading system. SPS and TBT, Differences between SPS & TBT. WTO agreement on the application of SPS measures.
7. Food & Agriculture Organization (FAO), FAO in India, Technical Cooperation programmes, Bio-security in Food and Agriculture, World Health Organization (WHO), World Animal Health Organization (OIE), International Plant Protection Convention (IPPC)
8. Codex Alimentarius Commission - Codex India - Role of Codex Contact point, National Codex contact point (NCCP), National Codex Committee of India - ToR, Functions, Shadow Committees etc.
9. International Food Laws & Acts: USFDA, FDA Food Safety Modernization Act (FSMA)-2010; Food Standards Agency, UK; Food Law, England - practice guideline 2012; Canadian Food Inspection Agency - Acts & regulations.
10. Food Import Control, FSSAI instructions & Guidelines; Export Inspection and Certification System. Directorate of Marketing and Inspection (DMI), Plant Quarantine (Regulation of Import into India) Order 2003, Export (Quality Control and Inspection) Act, 1963, Export Inspection Council.

**References:**

1. Environmental regulation and food safety by Veena Jha.
2. Microbiological safety of food by Hobbs, 1973
3. Emerging technologies; food process by Da-wen, 2005
4. Food safety by Laura K Egendorf, 2000
5. International standards of food safety by Naomi Rees, David Watson, 2000
6. Codex alimentarius by FAO & WHO, 2007

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FT 603


## Technology of Milk, Meat, Fish and Poultry Processing

3-1-0

1. Milk composition and structure. Milk Components, properties. General Aspects of Processing of milk—standardization, tonning of milk, homeogenization, pasteurization, sterilization, storage, transportation and distribution of milk.
2. Processing of milk for production of condensed milk, evaporated milk, whole and skimmed milk and powder, cream, butter, oil, cheese spread, khoa, channa, paneer. fermented milk products, dahi, yoghurt, shrikhand, ice cream.
3. Grading and quality testing of milk and milk products .In plant cleaning system.
4. Meat and scope of meat industry in India. Structure, chemical and biochemical constitution of muscle. Effect of feed, breed and management on meat production and quality. Pre slaughter care of meat and poultry animal. Ante mortem and post mortem examination.
5. Manufacturing of sausages, comminuted meat products: ham, bacon, meat analogues. Slaughtering of animals and poultry. Evaluation, Inspection and grading of meat. Conversion of muscle to meat. Hygiene in meat processing. Naturally occurring toxicants.
6. Smoking, drying, curing, chilling, freezing, canning of meat. Tenderization of meat. Ageing of meat. By products utilization.
7. Poultry: classification, composition, preservation methods and processing. Structure, composition, nutritive value and functional properties of eggs and its preservation by different methods. Processing of egg products. Factor affecting egg quality and measures of egg quality.
8. Fish, types of fish, structure, composition and post-mortem changes in fish. Effect of method of catching and handling on the quality of fish, handling fish from catching to transportation. Post mortem changes, rigor mortis, autolytic changes, bacteriological changes, rancidity, physical changes.
9. Canning, smoking, freezing and dehydration of fish. Preparation of fish products, fish sausage and home makings.
10. Overview and causes of meat and seafood intoxication. Amnesic shellfish, Ciguatera fish, Diarrhetic shellfish and Puffer fish poisoning. Cyanobacterial intoxication. Treatment and prevention of seafood intoxication, safety precautions for handling toxic seafood

**References:**

1. Dey, S. (1994). Outlines of Dairy Technology. Oxford University Press, New Delhi.
2. Rosenthal, I. (1991). Milk and Milk Products. VCH, New York.
3. Macrae, R., Robinson, R.K and Sadler, M.J. (1993). Encyclopaedia of Food Science, Food Technology and Nutrition. Academic press, London.
4. Gracy J F, Collens D S and Hucy R J (2000). Meat Hygiene (10<sup>th</sup> ed.) WB Saunders Co. Ltd.
5. Lawrie RA (2002). Meat Science. (6<sup>th</sup> ed.) Pergmon Press UK.
6. Hedrick HB, Aberle ED, Forrest JC, Judge MD and Markel R A (1994). Principle of Meat Science (3<sup>rd</sup> ed.) WH Freemann and Co., New York.
7. Warris PD (2000). Meat Science – An introductory Text. CABI. Publ. Co., UK.
8. Stadelman W.J. and Cotterill O.J. (2001) Egg science and technology. 4<sup>th</sup> edition, C.B.S. Publishers.

  
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