

Lecture Schedule		
Department of Fish Processing Technology (Code-FPT)		
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(1) - FPT-111, Fish in Nutrition 1(1+0)

Objective:

- To teach composition of food and nutritive value of fish
- To teach carbohydrates, proteins and lipids vitamins, minerals in raw and processed fish
- To teach various experimental techniques used in food analysis

Theory		
S.No.	Topic	Lectures
1	Composition of fish with emphasis on nutritional value..	1
2	Concept of Biological value, Protein Efficiency ratio, Net protein utilization.	1
3	Amino acids of fish and shellfishes and importance of essential amino acids.	1
4	Fish lipids: fatty acids, nutritional quality. Role of fish lipids in human nutrition.	1
5	Non-protein nitrogen substances in fishes.	1
6	Vitamins in fish: water soluble, fat soluble, significance in human nutrition.	1
7	Minerals in fish: micro- and macro-elements, trace elements, significance in human nutrition.	1
8	Other functional bio-molecules in fish – peptides, collagen and squalene.	1
9	Effect of different kinds of cooking fish i.e. curry, frying, and steaming, smoking, fermentation on nutrition value.	2
Total		10

(2) - FPT-121, Food Chemistry

(2) - FPT-121, Food Chemistry		
Theory		
S.No.	Topic	Class
1	Composition of food and nutritional value.	2
2	Moisture in foods.	1
3	Carbohydrates-classification, monosaccharide, disaccharide and polysaccharides,	2
4	Biological oxidation,	1
5	electron transport chain, P/O ratio; oxidative phosphorylation. Carbohydrates:	2
6	Naturally occurring polysaccharides in foods.	1
7	Seaweed polysaccharides – sources and uses.	1
8	Browning reactions – enzymatic and non-enzymatic.	1
9	Lipids: lipid types, metabolism of lipids, oxidation of fatty acids, lipoproteins; VLDL and HDL and their importance.	3
10	Proteins: metabolism, deamination, decarboxylation, metabolic fate of amino acids, nitrogen balance.	3
11	Deamination reactions and nitrogen excretion with special reference to fish	2
12	Fish muscle proteins, chemical changes in muscle during contraction.	1
13	Proteins in foods, role in hydration- native and denatured proteins, gel formation, functional properties of proteins,	2
14	changes during heat treatment and processing, texturized proteins.	1
15	Chemistry of taste, flavor and odour components in foods, flavor intensifiers, synthetic flavoring substances.	2
16	Non protein nitrogenous compounds.	1
17	Food additives - types and their chemical nature, emulsifiers and antimicrobial additives, sequestrates, flavor potentiators surface active agents; non-nutritive sweeteners, color additives in food.	2
18	Assessment of quality of food by instrumental and chemical methods.	2
19	Nutritive value of foods.	1
20	Energy value and energy requirements and their estimation.	1
21	Water, electrolytic and acid-base balance.	1
Total		33
Practical		
1	Estimation of moisture, crude protein, lipid, fat, ash (including acid soluble) in fish sample.	8
2	Determination of energy value of fish.	2
3	Estimation of glucose and salt content in foods.	2
4	Colorimetric method of estimation of proteins and carbohydrates.	3
5	Use of pH meter.	1
6	Estimation of fibre in foods.	1
Total		17

(3) - FPT-211, Freezing Technology

Objective:

- To teach scientific techniques handling, storage and transport of fresh fish
- To teach various post harvest changes during chill storage of fish.
- To acquaint with various chilling and freezing equipments and there uses for fish.

Theory		
S.No.	Topic	Class
1	Introduction to freezing technology; characteristics of fish and shellfish.	1
2	Changes in fish after death, spoilage of fish, spoilage and pathogenic microorganism.	1
3	Handling of fresh fish; sanitation in processing plants.	1
4	Principles of low temperature preservations. Chilling of fish – methods and equipment for chilling;	1
5	Icing – quality of ice, ice making; refrigerated or chilled sea water, chilling rate; spoilage of fish during chilled storage;	1
6	Use of antibiotics and chemicals.	1
7	Freezing of fish fundamental aspects; heat units; freezing point depression, eutectic point; freezing rate;	1
8	Methods of freezing, freeze drying, physico– chemical changes that occur during freezing, mechanism of ice crystal formation; preparation of fish for freezing	2
9	Changes that occur during frozen storage – microbiological, physical and chemical changes, protein denaturation, fat oxidation, dehydration, drip; protective treatments – polyphosphate, glazing, antioxidants, packaging.	2
10	Thawing of frozen fish – methods of thawing.	1
11	Transportation of frozen fish, cold chain, quality control,	1
12	HACCP in freezing industry.	1
Total		14
Practical		
1	Sanitations and plant housekeeping.	1
2	Chilling and freezing equipment instruments;	1
3	Packages and product styles;	1
4	Methods of icing fish; cooling rate;	1
5	Preservation by chilled sea water;	1
6	Freezing and thawing curves.	1
7	Freezing of different varieties of fish and shellfish;	1
8	Inspection of frozen fishery products;	1
9	visits to ice plants, cold storages and freezing plants.	1
10	Estimation of drip; determination of quality changes during frozen storage;	1
Total		10

(4) - FPT-221, Fish Canning Technology 2(1+1)**Objectives:**

- To acquaint with canning principle, different canning materials, their making, appropriate use and benefits
- To acquaint with different packaging materials, characteristics, their appropriate use, and testing.

Theory		
S.No.	Topic	Class
1	Introduction to canning and its historical developments. Advantages of canning in relation to other preservation methods.	1
2	Raw materials and their characteristics and suitability for canning.	1
3	Classification of foods based on pH, commercial sterility, Absolute sterility, pasteurization and sterilization.	1
4	Canning process. General steps in canning procedure and importance, preparation of raw material, packing, pre-cooking, exhausting, seaming, retorting, cooling labeling and storage.	1
5	Principles of thermal processing. Heat resistance of microorganisms, heat penetration studies, mechanism of heat transfer. Cold spot and its importance, convection and conduction type of packs.	1
6	Process calculation by general/graphical methods, estimation of Fo value of the process(D-value, Z-Value TDT, F-value, lethal rate).	1
7	Commercial sterilization, 12-D concept. Canning of commercially important finfishes, shellfishes and cephalopods.	1
8	Spoilage of canned foods, types, causes and preventive measures.	1
9	Quality standards, plant layout, hygiene and sanitation and waste disposal.	1
10	Types of packaging materials for canned foods, metal containers (Tin Plate, TFS, Aluminium cans) and retortable pouches. HTST and aseptic canning.	2
Total		11
Practical		
1	Types of cans, canning equipments and layout of cannery.	1-3
2	Canning of different varieties of fish.	3-5
3	Cutout test of canned products.	6
4	Examination of can double seam.	7
5	Heat resistance of bacteria.	8
6	Heat penetration in canned food, thermal process calculation by general method.	9-10
7	Study of spoilage condition in canned products.	11
8	Familiarization with various packaging materials and container for fish products.	12-14
Total		

Reference:

- Advances in Fish processing Technology, Sen D. P., Pub. Allied Publishers Pvt. Ltd. New Delhi (2005).
- Fish Processing Technology (1992) G. M. Hull. (Ed), Blackie Academic and Professional, London
- Food Storage Stability, CRC Press, New York
- Freezing Effects on Food Quality, Marcel Dekker, Inc. New York
- Govindan, T. K., Fish processing Technology, Pub. Oxford & IBH Publishing Co., New Delhi (1985).
- Low Temperature Preservation of Foods and Living Matter Marcel Dekker, Inc. New York

- Post-harvest Technology of fish and fish products. (2001). Balachandran, K. K., Pub. Daya Publishing House, Delhi,
- Text Book of Fish Processing Technology; Gopakumar K. (editor), Pub. ICAR, New Delhi (2002)

(5) - FPT-222, Fish Packaging Technology 2(1+1)**Objectives:**

- To acquaint with packaging principle, different packaging materials, their making.
- To acquaint with their making, characteristics, appropriate use benefits and testing.

Theory		
S.No.	Topic	Class
1	Introduction to packaging, Importance of packaging in fish processing, functions, objectives and requirements.	1
2	Packaging materials, basic and laminates, principles of their manufacture and their identification.	1
3	Properties of packaging materials and their use in protective packaging with special reference to food.	1
4	Printing for packaging and print identification.	1
5	Closures of packaging, heat seals bottle closure. Principles of packaging fresh produce handling and transportation. Packaging for retail sale and storage.	1
6	Packaging equipment and machinery. Package design, evaluation and testing for their physical properties.	1
7	Flexible packaging materials, rigid containers, thermoform containers, glass containers, corrugated fiber boards, duplex cartons, edible packaging materials.	1
8	Laminations and co-extrusions. Retort pouch packaging-advantages and disadvantages.	1
9	Biodegradable films, vacuum packaging, active packaging, MAP, Polymeric Packaging. Packaging requirements of fresh fish, Frozen fish, Canned Fish.	1
10	Transport worthiness of packaging materials, accelerated shelf testing. Materials and their safe use in food contact application. Safety and legislation aspects of packing. Labeling and bar coding.	2
Total		11
Practical		
1	Determination of Grammage & Bursting Strength of packaging material.	1
2	Determination of Bursting Strength of packaging material	1
3	Determination of Burst Factor and Burst Index of packaging material	1
4	Mullen Tester for Paperboard material	1
5	Mullen Tester for Paper	1
6	Puncture test of paperboard	1
7	Density of plastic films	1
8	Breaking strength / breaking load of plastic films	1
9	Tensile strength and Elongation at break of plastic films	1
10	Oxygen Transmission rate	1
11	Impact Strength	1
12	Water-vapor transmission rate	1
13	Tearing strength of Paper of plastic films	1
14	Heat seal strength	1
15	Bursting strength of Paper	1
Total		15
Reference:		
<ul style="list-style-type: none">• Advances in Fish processing Technology, Sen D. P., Pub. Allied Publishers Pvt. Ltd. New Delhi (2005).		

- Fish Processing Technology (1992) G. M. Hull. (Ed), Blackie Academic and Professional, London
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(6) - FPT-321, Fish Products and Value Addition

Theory		
S.No.	Topic	Class
1	Principle of fish preservation and processing.	1
2	Processing of fish by traditional methods– salting, sun drying, smoking, marinating and fermentation.	2
3	Theory of salting, methods of salting–wet salting and dry salting.	1
4	Drying and dehydration- theory,	1
5	importance of water activity in relation to microbial growth.	2
6	Sun drying and artificial drying- solar dryer.	2
7	Packaging and storage of salted and dried fish.	1
8	Different types of spoilage in salt cured fish.	1
9	Quality standard for salted and dry fish.	1
10	Fish preservation by smoking-chemical composition of wood smoke and their role in preservation.	1
11	Methods of smoking and equipment used for smoking.	2
12	Carcinogenic compound in wood and method store move them.	1
13	Hurdle technology in fish preservation and processing.	1
14	Marinated and fermented fish products–role of acid sin marinades,	2
15	Fish and prawn pickles, fish sauce and Fish paste, traditional Indian fermented products.	2
16	Fermented fish products of Southeast Asia.	1
17	Principles and methods of preparation of various fish paste products like fish sausage, fish ham, surimi, fish cake, kamaboko etc.	3
18	Fish muscle structure, myofibriller protein and their role in elasticity formation.	1
19	Surimi-theroy of gelation, process of preparation and quality characteristics of Surimi.	2
20	Extruded products – theory of extrusion, equipments used, advantages of extruded products, methods of preparation of extruded products.	3
21	Popular extruded products from fish.	1
22	Value addition- improtance and scope.	2
23	Diversified fish products: battered and braided products-fish finger, fish cutlet, other products like fish wafer,	2
24	fish drink and fish soup powder etc. and imitation products.	1
25	HACC Pin safe products production.	1
Total		38
Practical		
1	Preparation of salted fish, dried fish and smoked fish by different methods.	3
2	Quality assessment of salted, dried and smoked fish.	1
3	Preparation of fish pickles.	2
4	Preparation of fermented fish sauce and marinated products.	2
5	Preparation of surimi and surimi based products.	2
6	Preparation of diversified and value added fish products.	3
7	Quality assessment of market sample of dried and fermented fish products.	3
Total		16

(7) - FPT-323, Fish By-Products and Waste Utilization 2(1+1)**Objectives**

- To teach students the preparation of products from low cost fish.
- To teach students the different methods of fish preservation.
- To teach students and impart training about marinated and fermented fish products.

Theory		
S.No.	Topic	Class
1	Fishmeal.Dryreductionandwetreductionmethods–specification–packagingandstorage.	1
2	Layout of fishmeal plant. Fish oil- body oil, liver oil – extraction, purification, preservation, storage, application.	1
3	Shrimp wastes–chitin, chitosan – production – uses.	1
4	Fish protein concentrate different types and use.	1
5	Fish hydrolysate, partially hydrolyzed and deodorized fish meat, functional fish protein concentrate and their incorporation to various products.	2
6	Fish silage–acid silage–fermented silage–application.	1
7	Fish maws, shark leather, fish glue, fish gelatin,	1
8	Isinglass, pearl essence, shark fin rays, beach-de-mer.	1
9	Utilization of surimi waste water.	1
10	Preparation of film from skin and waste. Biochemical and pharmaceutical products.	1
11	Utilization of sea weeds: agar agar, algin, carrageenan.	1
12	Fish waste and wastewater treatment in seafood processing.	1
Total		13
Practical		
1	Preparation of fish meal,	1
2	Preparation of fish body oil,	1
3	Preparation of fish liver oil,	1
4	Preparation of fish maws,	1
5	Preparation of isinglass,	1
6	Preparation of fish silage.	1
7	Preparation of fish silage,	1
8	Preparation of ensilage,	1
9	Preparation of fish glue,	1
10	Preparation of fish gelatin,	1
11	Preparation of chitin and chitosan.	1
12	Preparation of fish manure.	1
13	Preparation of acid and fermented silage.	1
14	Preparation of fish protein concentrate and fish hydrolysate.	2
Total		15
Reference:		
<ul style="list-style-type: none">• Advances in Fish processing Technology, Sen D. P., Pub. Allied Publishers Pvt. Ltd. New Delhi (2005).• Assessment and Management of Seafood Safety and Quality. (2003) Free amino acids. FAO Technical Paper No. 444• Fish Processing Technology (1992) G. M. Hull. (Ed), Blackie Academic and Professional, London• Food Storage Stability, CRC Press, New York• Food Refrigeration Processes (1990) By Cleland C Andrew, Elsevier Applied Sciences,		

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(8) - FPT-322, Microbiology of Fish and Fishery Products

Theory		
S.No.	Topic	Class
1	Introduction and history of microorganisms in foods.	1
2	Role and significance of microorganisms in nature and in foods.	1
3	Sources and types of microorganisms- mesophiles, thermophiles and psychrophiles.	1
4	Microorganisms of importance in fish and fishery products.	2
5	Factors (intrinsic and extrinsic) affecting the growth and survival of microorganisms in food.	2
6	Microbial growth curve, culturable and non-culturable bacteria, VBNC.	2
7	Role of microbes in spoilage.	1
8	Enumeration of microorganisms in food by conventional and rapid techniques. MPN and TPC.	3
9	Fish as a substrate for microbial spoilage.	1
10	Microbial principles of fish preservation and processing	2
11	by application of low temperature, high temperature, drying, irradiation and chemicals.	4
12	Microbiology and spoilage of fresh, semi processed and processed fish and fishery products.	3
13	Indicators of microbiological quality of fish and fishery products.	2
14	Food borne pathogens involved in infective and intoxication	1
15	type of food poisoning – <i>Vibrio cholerae</i> , <i>Vibrio parahaemolyticus</i> , <i>E. coli</i> , <i>Salmonella</i> , <i>Listeria monocytogenes</i> , <i>Clostridium botulinum</i> ,	3
16	<i>C. perfringens</i> , <i>Campylobacter</i> and <i>Staphylococcus aureus</i>	1
17	their sources in fish, occurrence, growth, survival, pathogenicity and prevention.	2
18	Other biological hazards associated with fish and fishery products- marine toxins-shellfish toxins,	2
19	scombroid toxins, ciguatera toxins and puffer fish toxins; mycotoxins, parasites and viruses.	4
Total		38
Practical		
1	Sampling and processing of samples for microbiological investigation.	2
2	Enumeration of microorganisms associated with finfish, shellfish, water and ice.	3
3	Testing of water for potability.	2
4	Isolation and identification of pathogenic bacteria associated with fish and fishery products	3
5	<i>Vibrio cholerae</i> , <i>Vibrio parahaemolyticus</i> , <i>E. coli</i> , <i>Salmonella</i> , <i>Listeria monocytogenes</i> and faecal streptococci.	3
6	Biochemical tests for characterization of bacteria.	2
7	Determination of MIC and MCC of chemical preservatives.	2
Total		17