

COLLEGE OF FISHERIES, KISHANGANJ
BIHAR ANIMAL SCIENCES UNIVERSITY, PATNA

M.F.Sc. Programme

LECTURE PLAN

Course Code: FPT 505

Course Title: Applied Fisheries Biochemistry

Credit Hours: 2+1

Instructor: Dr. Abhishek Thakur, Assistant Professor

Department: Fish Processing Technology

A. Theory Lecture Plan

Week	Theory Class I	Theory Class II
1	Introduction to applied fisheries biochemistry; biochemical composition and nutritional significance of fish and shellfish.	Classification of fish proteins; overview of structural, sarcoplasmic and connective tissue proteins.
2	Structural proteins of fish muscle: actin, myosin, tropomyosin, actomyosin and paramyosin.	Sarcoplasmic proteins: myoalbumin, globulins, hydrolases and oxidoreductases; connective tissue proteins and collagen.
3	Fish pigments, heme proteins, hemocyanins and antifreeze proteins; their biological and technological significance.	Functional properties of seafood proteins: solubility, emulsification, viscosity and water-holding capacity.
4	Protein gelation and factors affecting gel formation in fishery products.	Protein denaturation, dissociation, aggregation, coagulation and reversibility; effects on seafood processing and quality.
5	Lipids in fish: composition, classification, nutritive value and variations among species.	Fatty acid composition of fish liver oils and body oils; triglycerides and phospholipids.
6	Lipid fractionation; polyunsaturated fatty acids (PUFAs), omega-3 fatty acids and their health benefits.	Autoxidation of fatty acids; mechanisms and factors affecting lipid oxidation in fish and fishery products.
7	Pro-oxidants and antioxidants; oxidation indices used in fish and fish oil quality assessment.	Lipid-protein and oxidized lipid-protein interactions; rancidity, lipases and phospholipases and their effects on seafood quality.
8	Carbohydrates: classification, biological significance and occurrence in fish and fishery products.	Structure and properties of monosaccharides, disaccharides and polysaccharides.

9	Modified starches and other carbohydrates as food additives; use as thickening and binding agents.	Changes in carbohydrates during processing; gelatinization and relationships between carbohydrates and food stability.
10	Vitamins: classification into water-soluble and fat-soluble vitamins; functions and nutritional significance.	Heat-labile vitamins, vitamin losses during processing, and factors affecting vitamin retention in fishery products.
11	Minerals in fish: major and minor minerals, trace elements and their biological functions.	Health benefits and nutritional significance of minerals; factors affecting mineral retention during processing.
12	Seafood flavour, taste and odour; chemical basis of flavour perception.	Volatile fatty acids and other flavour compounds; influence of handling, storage and processing on seafood flavour.
13	Non-protein nitrogenous compounds: free amino acids, peptides, nucleotides and guanidines.	Urea and quaternary ammonium compounds; their biochemical significance and contribution to seafood characteristics.
14	Fundamental techniques in food analysis: principles, applications and selection of analytical methods.	Electrophoresis: basic principles, factors affecting separation and applications in fisheries biochemistry.
15	Chromatography: fundamental principles, stationary and mobile phases, and mechanisms of separation.	Thin-layer chromatography (TLC) and paper chromatography: principles and applications in food analysis.
16	Liquid chromatography and high-performance liquid chromatography (HPLC): principles, components and applications.	Gas chromatography (GC): instrumentation, separation principles and applications in fatty acid analysis.
17	Gas chromatography with a pulsed ionization detector (GC-PIS), as specified in the syllabus: overview and analytical applications.	Spectrophotometry: basic principles, Beer–Lambert law, instrumentation and analytical applications.
18	Biochemical analysis of fish proteins: principles of protein quantification and selected protein quality indicators.	Biochemical analysis of fish lipids: extraction, fractionation, fatty acid profiling and lipid oxidation assessment.
19	Biochemical changes in fish during processing and storage; relationships between biochemical composition and product quality.	Overview of seafood toxins and toxic substances; general classification, occurrence, toxic effects and significance for seafood safety.
20	Integrated revision of proteins, lipids, carbohydrates, vitamins, minerals,	Course review, discussion of analytical applications, clarification of difficult concepts and examination preparation.

	seafood flavour and analytical techniques.	
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B. Practical Class Plan

Week	Practical Exercise
1	Introduction to the biochemical laboratory; laboratory safety, glassware, analytical instruments and preparation of reagents and buffers.
2	Protein purification based on differences in solubility.
3	Separation of proteins based on molecular size and charge using polyacrylamide gel electrophoresis (PAGE).
4	Separation and identification of amino acids using thin-layer chromatography (TLC).
5	Separation of amino acids using paper chromatography.
6	Enzyme assay using a spectrophotometer; preparation of a standard curve where applicable.
7	Introduction to amino acid analysis by HPLC, including sample preparation and chromatogram interpretation.
8	Determination of protein carbonyls as an indicator of protein oxidation.
9	Extraction of lipids from fish and fishery products using an appropriate laboratory method.
10	Comparison of lipid extraction methods and calculation of lipid content on the selected reporting basis.
11	Fractionation of lipids using thin-layer chromatography (TLC).
12	Identification and interpretation of lipid fractions using suitable standards and visualization procedures.
13	Preparation of fish lipid samples for fatty acid analysis by gas chromatography (GC).
14	Analysis and interpretation of fatty acid composition using GC chromatograms and reference standards.
15	Texture profile analysis of fish muscle or a fishery product using a texture analyzer.
16	Estimation of unsaponifiable compounds in fish oil.
17	Calculation, presentation and interpretation of results from protein and lipid analyses.
18	Practical data analysis: chromatogram interpretation, identification of major peaks and preparation of laboratory reports.

19	Integrated practical exercise involving biochemical analysis of a selected fish or fishery product.
20	Practical revision, record-book verification, viva voce and discussion of experimental results.
