

**Introduction:**

Fisheries refer to the management and exploitation of natural fish populations. Capture fisheries supplies much of the fish consumed in the world. Techniques in fisheries analyze how factors such as fisheries exploitation, climate change, eutrophication and socio-economic environments affect the structure of fish communities, food-web dynamics, and their resilience. This course highlights the importance of using latest techniques in fisheries research including, genetic and hormonal manipulation for increased fish production, microtomy, extraction techniques, separation techniques, spectrophotometry, gene isolation and gut content analysis.

**Course Objectives:**

The course aims to:

- Equip students with basic and advanced techniques used in fisheries and aquaculture research.
- Develop critical thinking, technical expertise and work habits.
- Expose students to the equipment, field situations, collecting techniques, laboratory procedures, data analyses, writing styles, research expectations, and frustrations of fishery science.
- Reproductive capacity and success, recruitment, food habits, migrations, population estimates, and other aspects of fishery science and management.

## Course Learning Outcomes:

After completing this course students will be able to:

- Understand basic and advanced techniques used in fisheries research.
- Solve problems by using technical expertise to design and devise strategies.
- Practically using equipment and software to formulate, analyse and elaborate results.  
Demonstrate advanced equipment and techniques used for analysis.

## Course Contents:

1. **Identification and growth indices:** Fish sampling, Fish morphometric measurements, Stock assessment, Age and growth studies, Length weight relationship, Condition factor; Daily Growth Coefficient, Hatchery operations and fish breeding techniques.
2. **Feed formulation and Proximate Analysis:** Definition, Categories: Moisture, Ash, Crude protein, Crude lipid, Crude fibre, Nitrogen-free extracts (digestible carbohydrates).
3. **Genetic and hormonal manipulation for increased fish production.** Food Conversion Efficiency, Fish Health & Safety.
4. **Microtomy:** Fixation, embedding, Section cutting (transverse, longitudinal section, mounting and staining. Sections in paraffin and cryosections.
5. **Extraction techniques:** Centrifugation, Ultracentrifugation, Distillation, Use of Soxhlet and Rotary evaporator for extraction.
6. **Gene isolation:** Probes; Recombinant DNA technology. Transgenic fish and Gene transfer technology, Molecular and immunological techniques–PCR; Immunoblotting; ELISA; Restriction fragment length polymorphism.
7. **Separation Techniques:** Chromatography: Principle, applications, types, thin layer, column, gas, ion exchange chromatography. Electrophoresis.
8. **Spectrophotometry:** Principle, applications, types, visible spectrum, UV spectrum, atomic absorption.
9. **Basic Principles of Sampling and Preservation:** Sampling soil organisms, Invertebrates, Aquatic animals, Mammals, Preservation of dry and wet specimens.

## Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos /films will be shown on occasion.

## Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

## Assessments and Examination

Sessional Work:	25 marks
Midterm Exam:	35 marks
Final term Exam:	40 marks

## Books Recommended:

1. William R. Persons, David L. Ward, and Luke A. 2015. **Standardized Methods for Grand Canyon Fisheries Research**, By Avery U.S. Geological Survey, Reston, Virginia/ First Release: 2013 Revised: January 2015 (ver. 1.1).
2. Nielsen, L. A., and D. L. **Fisheries Techniques**. American Fisheries Society, Bethesda, Maryland. Pp. xi + 428.
3. J. E. Halver and R.W. Hardy. 2002. **Fish Nutrition**, third edition. editors. Academic Press, New York.
4. **Nutrient Requirements and Feeding of Finfish for Aquaculture**. 2002. C. Lim and C. Webster, editors. CAB International Publishers, U.K.
5. **Laboratory Manual on Analytical Methods and Procedures for Fish and Fish Products**, 1992. Marine Fisheries Research Department, Southeast Asian Fisheries Development Center in collaboration with Japan International Cooperation Agency.

6. **Fish Nutrition in Aquaculture.** 1995. S. S. De Silva and T.A. Anderson. Chapman & Hall, London.
7. **Nutrient Requirements of Fish.** 1993. National Research Council. National Academy Press, Washington, D.C., USA.

## **UZO-586      Techniques in Fisheries Research (Lab.)**

**Cr. (1)**

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### **Course contents:**

1. Key to identification of fish species by studying morphometric and meristic counts
2. Age determination by studying scales and operculum bone, otolith bone
3. Gel Electrophoresis
4. Histopathology of normal and diseases fish and shellfish
5. Techniques in disease diagnosis: Microbiological, haematological. Histopathological, immunological, molecular techniques and Biochemical tests
6. Liquid handling: proper use of pipettes and micropipettes
7. Histological preparations: skeletal muscle, intestine liver and testes
8. Handling of centrifuge machines
9. Spectrophotometric estimation of glucose
10. Gut content analysis

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