UZO-571   Principles of Fish Biology-II   Cr. (2)
Introduction:

Fish are of considerable importance to humans as a source of food, both from capture fisheries and through various forms of culture. Without proper knowledge of the life, habits and behaviour of fishes, it would not be possible to plan, control and manage the fisheries resources in a satisfactory manner. This course highlights the characterization of living fish groups and major extinct fishes. It provides information about the central nervous system and skeletal structure of fishes with a brief introduction to the reproduction in fishes.

Course Objectives:

The objectives of the course are to:
- Provide information regarding extinct fishes.
- Impart knowledge of skeletal system of fishes.

- Make students familiar with the CNS of fishes.
- Make students understand breeding physiology of fishes.
- Make students learn about the fish biodiversity of Pakistan.

Course Learning Outcomes:
At the end of the course, students will be able to:
- Provide information regarding extinct fishes.
- Explain skeletal system of fishes.
- Familiarize with the CNS of fishes.
- Explain breeding physiology of fishes.
- Tell about the fish biodiversity of Pakistan.

Course Contents:
1. **Introduction to fisheries:** Characterization of living fish groups, major groups of extinct fishes. Relationships of the major groups of fishes, primitive fishes, early jawed fishes, sharks and their relatives, bony fishes.
2. **Fish anatomy:** Skeleton. Types of skeleton (membranous, axial, appenddicular skeleton). Notochord, Skull, backbone, spines; Brain and spinal cord, cranial nerves, spinal nerves.
3. **Digestion, absorption and utilization of foods:** Movement of food in the tract, intestinal surfaces, glands and digestive enzymes, absorption of digested materials
4. **Blood and circulation:** Heart and circulatory vessels
5. **Reproduction:** Sex differences, sexual maturity, reproductive cycles, breeding
6. **Integration:** The nervous system, spinal cord and spinal nerves
7. **Ecology of fishes;** Definitions, organic productivity in aquatic ecosystem. Ecological classifications of fishes, ecological factors, marine ecosystem, estuarine, ecosystem freshwater ecosystem.
8. **Freshwater fish biodiversity of Pakistan**

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

Textbook:
1. Ichthyology (2nd Ed.) By Lagler et al., 2003. John Wiley and Sons (Text Book).

Books Recommended:
2. Textbook of Fish and Fisheries. 2005. Sandhu, G.S. 1st Ed. Dominant publishers, New Delhi.
3. Textbook of Fish culture: Breeding and Cultivation. 1986. By M. Hute. Fishing News Books, UK.
4. Catfishes of India 2006. Jayram K.C. Narendra Publishing House, Delhi.
5. A Hatchery Manual for the Common Chinese and Indian Major carps. Jhingran and Rulllin 1986. Asian Development Bank, Manila, Philippines.
6. A key to the fishes of the Punjab by Mirza and Sharif. 1996. Ilmi Kitab Khana, Lahore.

UZO-572   Principles of Fish Biology-II(Lab.)   **Cr. (1)**

Introduction:
Fish are of considerable importance to humans as a source of food, both from capture fisheries and through various forms of culture. Without proper knowledge of the life, habits and behaviour of fishes, it would not be possible to plan, control and manage the fisheries resources in a satisfactory manner. This course highlights the characterization of living fish groups and major extinct fishes. It provides information about the central nervous system and skeletal structure of fishes with a brief introduction to the reproduction in fishes.

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Course Learning Outcomes:
At the end of the course, students will be able to:
- Provide information regarding extinct fishes.
- Explain skeletal system of fishes.
- Familiarize with the CNS of fishes.
- Explain breeding physiology of fishes.
- Tell about the fish biodiversity of Pakistan.

Course Contents:
Identification of freshwater fish species with the help of key. Collection and preservation of freshwater fish (optional). Study of different organs of various fish species. Study and survey of various fish collections present in museums like Natural History Museum at Islamabad; Govt. College University Museum, Lahore and Punjab University Museum, Lahore.

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

Textbook:
1. **Ichthyology** (2nd Ed.) By Lagler et al., 2003. John Wiley and Sons (Text Book).

Books Recommended:
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6. Mirza and Sharif. **A key to the fishes of the Punjab**. 1996. Ilmi Kitab Khana, Lahore.