UZO-497 Ichthyology Cr. (2)

Course Objectives:

1. To improve the skill of understanding of fish identification and classification.
2. To provide the concrete knowledge about anatomy of the fish.
3. To explain the morphology and physiology of most important commercial fishes.

Course Learning Outcomes:

Upon successful completion of the course, the student will be able to:

1. **CLASSIFY** the most important commercial fish species.
2. **UNDERSTAND** the concepts of basic internal and external morphology and physiology.
3. **SOLVE** the challenges in field of fish taxonomy and providing them concept of latest keys of identification.
4. **ANALYZE** the morphological and taxonomical features of various species.
5. **EVALUATE** the problems in identification of fishes.
6. **DEMONSTRATE** Fishes should be dissected to show all the key features in identifying the fishes and also show all the external and internal organs for better understanding.

Course Contents:

a) Classification and distribution of freshwater fishes

- Systematic position of fish in animal kingdom
- Distribution of various commercial and noncommercial fishes of Pakistan

b) Morphology of fishes

- External features of fishes

c) Coordination of fishes

- Fish muscular system, locomotion and energetics of swimming.
- Physiology of respiration and air breathing among fishes.
- Cardiovascular system,
- blood and its circulation and hydromineral balance: Osmoregulation, ionic regulation, stress responses, freezing resistance and acid-base balance.
- Digestion and control of gastro-intestinal motility in fish. Physiology of gas bladder: Use of gas by the fish as a source of static lift.
- Gas in the gas bladder: Loss, retention and secretion of gas.
- Process of aestivation in fish.

- Control of kidney function in fish. Sensory system and communication in fish: Acoustico-lateralis system, sound reception and production.

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. Lagler, K.F., J.E. Baradach and R.R. Miller. 2009. Ichthyology. John Wiley and Sons, Inc., New York, USA.
2. Moyle, P.B. and J.J. Cech. 2008. Fishes: An Introduction to Ichthyology. 6th Ed. Prentice Hall, New Jersey, USA.
3. David, H. 2003. The Physiology of Fishes 3rd Ed. CRC Press, UK.
4. Smith, L.S. 2002. Introduction to Fish Physiology. 2nd Ed. Argent Labs. Washington DC, USA.
5. Shammi, Q.J. and Bhatnagar, S. 2002. Applied Fisheries, Agro bios, India.
6. Ali, S.S. 1999. Fresh Water Fisher Biology. Naseem Book Depot, Hyderabad.
7. Mirza, M.R. and Sharif, M. 1996. Key to Identification of Fishes of Punjab. Ilmi Pub. Lahore.
8. Garg, S. K., BHatnagar, A., Kalla, A., Johal, M.S. 2008. Experimental Ichthyology, Publisher: CBS publisher ISBN: ISBN 81 239 0771 0

UZO-498 Ichthyology (Lab) Cr. (1)

Course Objectives:
1. To improve the skill of understanding of fish identification and classification.
2. To provide the concrete knowledge about anatomy of the fish.
3. To explain the morphology and physiology of most important commercial fishes.

Course Learning Outcomes:
Upon successful completion of the course, the student will be able to:
1. **CLASSIFY** the most important commercial fish species by using identification key.
2. **COLLECTION AND PRESERVATION** of fish samples from natural resources for identification.
3. **UNDERSTAND** the concepts of basic internal and external morphology and physiology.
4. **SOLVE** the challenges in field of fish taxonomy and providing them concept of latest keys of identification.
5. **ANALYZE** the morphological and taxonomical features of various species.
6. **EVALUATE** the problems in identification of fishes.
7. **DEMONSTRATE** Fishes should be dissected to show all the key features in identifying the fishes and also show all the external and internal organs for better understanding.

Course Contents:
1. Collection and preservation of fish samples
2. Identification of some freshwater and marine water fishes.
3. Dissection of fishes for studying anatomical features (Reproductive, Digestive, Respiratory and circulatory systems).

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. Lagler, K.F., J.E. Baradach and R.R. Miller. 2009. Ichthyology. John Wiley and Sons, Inc., New York, USA.
2. Moyle, P.B. and J.J. Cech. 2008. Fishes: An Introduction to Ichthyology. 6th Ed. Prentice Hall, New Jersey, USA.
3. David, H. 2003. The Physiology of Fishes 3rd Ed. CRC Press, UK.
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