
SIXTEEN WEEK TEACHING PLAN

Course & Course Code	Ichthyology (ZOOL-4107)
Credit Hours	3
Department	Department of Life Sciences
Course Type:	Theory
Theory/Lab	Theory
Program	Zoology
Semester	Spring-2025
Course Instructor name/Designation	
Office	BSH building, 2 nd floor
E-mail	

Note: For practical/lab work, a separate teaching plan can be prepared.

Week 1	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Classification and distribution of freshwater fishes
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	PPT slides , handouts
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) Theory paper
Others	Nil
Week 2	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Systematic position of fish in animal kingdom
Appropriate Teaching Strategies / Methods	Lecture method

Learning Material	PPT slides
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	3. Quiz 1 (before mid exams) 4. Quiz 2 (before final exams)
Others	Nil
Week 3	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Distribution of various commercial and noncommercial fishes of Pakistan
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	PPT, Handouts
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil
Week 4	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Distribution of various commercial and noncommercial fishes of Pakistan
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	PPT, Handouts
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil
Week 5	
Objectives / Learning Outcome	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.

Contents / Sub Contents	External features of fishes
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	PPT slides
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil
Week 6	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Fish muscular system, locomotion and energetics of swimming.
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	PPT slides
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil
Week 7	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Physiology of respiration and air breathing among fishes.
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	PPT slides
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil
Week 8	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Cardiovascular system, blood and its circulation and hydromineral balance
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	Lagler, K.F., J.E. Baradach and R.R. Miller. 2009. Ichthyology. John Wiley and Sons, Inc., New York, USA. Moyle, P.B. and J.J. Cech. 2008. Fishes: An Introduction to Ichthyology. 6th Ed. Prentice Hall, New Jersey, USA. David, H. 2003. The Physiology of Fishes 3rd Ed. CRC Press, UK. Smith, L.S. 2002. Introduction to Fish Physiology. 2nd Ed. Argenta Labs. Washington DC, USA
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	4. Quiz 1 (before mid exams) 5. Quiz 2 (before final exams) Theory paper
Others	Nil
Week 9	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Osmoregulation, ionic regulation, stress responses, freezing resistance and acid-base balance
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	Lagler, K.F., J.E. Baradach and R.R. Miller. 2009. Ichthyology. John Wiley and Sons, Inc., New York, USA. Moyle, P.B. and J.J. Cech. 2008. Fishes: An Introduction to Ichthyology. 6th Ed. Prentice Hall, New Jersey, USA. David, H. 2003. The Physiology of Fishes 3rd Ed. CRC Press, UK. Smith, L.S. 2002. Introduction to Fish Physiology. 2nd Ed. Argenta Labs. Washington DC, USA
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil
Week 10	
Objectives / Learning Outcome	1. To improve the skill of understanding of fish identification and classification. 2. To provide the concrete knowledge about anatomy of the fish. To explain the morphology and physiology of most important

	commercial fishes.
Contents / Sub Contents	Osmoregulation, ionic regulation, stress responses, freezing resistance and acid-base balance
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	Lagler, K.F., J.E. Baradach and R.R. Miller. 2009. Ichthyology. John Wiley and Sons, Inc., New York, USA. Moyle, P.B. and J.J. Cech. 2008. Fishes: An Introduction to Ichthyology. 6th Ed. Prentice Hall, New Jersey, USA. David, H. 2003. The Physiology of Fishes 3rd Ed. CRC Press, UK. Smith, L.S. 2002. Introduction to Fish Physiology. 2nd Ed. Argenta Labs. Washington DC, USA
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil
Week 11	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Digestion and control of gastro-intestinal motility in fish.
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	Lagler, K.F., J.E. Baradach and R.R. Miller. 2009. Ichthyology. John Wiley and Sons, Inc., New York, USA. Moyle, P.B. and J.J. Cech. 2008. Fishes: An Introduction to Ichthyology. 6th Ed. Prentice Hall, New Jersey, USA. David, H. 2003. The Physiology of Fishes 3rd Ed. CRC Press, UK. Smith, L.S. 2002. Introduction to Fish Physiology. 2nd Ed. Argenta Labs. Washington DC, USA
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil
Week 12	
Objectives / Learning Outcome	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.

Contents / Sub Contents	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.
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	Lagler, K.F., J.E. Baradach and R.R. Miller. 2009. Ichthyology. John Wiley and Sons, Inc., New York, USA. Moyle, P.B. and J.J. Cech. 2008. Fishes: An Introduction to Ichthyology. 6th Ed. Prentice Hall, New Jersey, USA. David, H. 2003. The Physiology of Fishes 3rd Ed. CRC Press, UK. Smith, L.S. 2002. Introduction to Fish Physiology. 2nd Ed. Argent Labs. Washington DC, USA
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil
Week 13	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Process of aestivation in fish.
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	Lagler, K.F., J.E. Baradach and R.R. Miller. 2009. Ichthyology. John Wiley and Sons, Inc., New York, USA. Moyle, P.B. and J.J. Cech. 2008. Fishes: An Introduction to Ichthyology. 6th Ed. Prentice Hall, New Jersey, USA. David, H. 2003. The Physiology of Fishes 3rd Ed. CRC Press, UK. Smith, L.S. 2002. Introduction to Fish Physiology. 2nd Ed. Argent Labs. Washington DC, USA
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil
Week 14	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Sensory system and communication in fish

Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	Lagler, K.F., J.E. Baradach and R.R. Miller. 2009. Ichthyology. John Wiley and Sons, Inc., New York, USA. Moyle, P.B. and J.J. Cech. 2008. Fishes: An Introduction to Ichthyology. 6th Ed. Prentice Hall, New Jersey, USA. David, H. 2003. The Physiology of Fishes 3rd Ed. CRC Press, UK. Smith, L.S. 2002. Introduction to Fish Physiology. 2nd Ed. Argenta Labs. Washington DC, USA
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	4. Quiz 1 (before mid exams) 5. Quiz 2 (before final exams) Theory paper
Others	Nil
Week 15	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Acoustic-lateralis system, sound reception and production.
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	Lagler, K.F., J.E. Baradach and R.R. Miller. 2009. Ichthyology. John Wiley and Sons, Inc., New York, USA. Moyle, P.B. and J.J. Cech. 2008. Fishes: An Introduction to Ichthyology. 6th Ed. Prentice Hall, New Jersey, USA. David, H. 2003. The Physiology of Fishes 3rd Ed. CRC Press, UK. Smith, L.S. 2002. Introduction to Fish Physiology. 2nd Ed. Argenta Labs. Washington DC, USA
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil
Week 16	
Objectives / Learning Outcome	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.
Contents / Sub Contents	Acoustic-lateralis system, sound reception and production.
Appropriate Teaching Strategies / Methods	Lecture method
Learning Material	Lagler, K.F., J.E. Baradach and R.R. Miller. 2009. Ichthyology. John

	Wiley and Sons, Inc., New York, USA. Moyle, P.B. and J.J. Cech. 2008. Fishes: An Introduction to Ichthyology. 6th Ed. Prentice Hall, New Jersey, USA. David, H. 2003. The Physiology of Fishes 3rd Ed. CRC Press, UK. Smith, L.S. 2002. Introduction to Fish Physiology. 2nd Ed. Argent Labs. Washington DC, USA
Appropriate Assessment Tools	Quiz and theory exam
Assessment Schedule	1. Quiz 1 (before mid exams) 2. Quiz 2 (before final exams) 3. Theory paper
Others	Nil

Course Contents:**1. Classification and distribution of freshwater fishes**

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

2. Morphology of fishes

- a. External features of fishes

3. Coordination of fishes

- a. Fish muscular system, locomotion and energetics of swimming.
 - b. Physiology of respiration and air breathing among fishes.
 - c. Cardiovascular system,
 - d. blood and its circulation and hydromineral balance: Osmoregulation, ionic regulation, stress responses, freezing resistance and acid-base balance.
 - e. 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.
 - f. Gas in the gas bladder: Loss, retention and secretion of gas.
 - g. Process of aestivation in fish.
- Control of kidney function in fish. Sensory system and communication in fish: Acoustico-lateralis system, sound reception and production.

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