

**Institute of Zoology
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline**



Programme	BS Zoology	Course Code	ZOOL-415	Credit Hours	2
Course Title	Applied Fisheries				
Course Introduction					
Applied Fisheries is a multidisciplinary science, which draws on the disciplines of limnology, aquaculture, freshwater biology, marine biology, conservation, ecology, economics and management to attempt to provide an integrated picture of fisheries. This course highlights the history of aquaculture and its significance along with various culture systems, management and marketing. It also elaborates the various aspects for the construction and management of aquaculture facilities for various culturable fish species.					
Learning Outcomes					
On the completion of this course, the students will:					
<ol style="list-style-type: none"> 1. Acquire knowledge about history, needs and importance of fisheries and aquaculture. 2. Discuss various fish species characteristics and understand their culture requirements. 3. Estimate the soil & water quality for pond construction. 4. Understand basics of pond fish culture and other advanced culture practices. 5. Identify various fish diseases and their enemies. 					
Course Content				Assignments/Readings	
Week 1	Unit-I: Introduction to Aquaculture 1.1 Definition, History of Aquaculture 1.2 Aquaculture: A global perspective 1.3 Status of Aquaculture in Pakistan			Read and trace the historical development of aquaculture from ancient practices to modern-day advancements.	
Week 2	Unit II: Construction and Management of Aquaculture Facilities 2.1 Types of Fish pond, Watershed pond, Excavated Ponds, Semi-Excavated, etc. 2.2 Pond Preparation for Stocking 2.3 Fish culture systems 2.4 Integrated Aquaculture 2.5 Cage Culture in inland waters			Short quiz Group Presentations	
Week 3	Unit III: Water Quality Characteristics 3.1 Physical Characteristics 3.2 Chemical Characteristics of Water			Visit to various local bodies and Report detailing the characteristics observed, variations among sites, and potential environmental factors affecting the water quality.	
Week 4	Unit IV: Pond fertilization and its significance 4.1 Introduction and importance of fertilizers 4.2 Types of organic and inorganic fertilizers. 4.3 Doses of fertilizers and its uses.			Short quiz	
Week 5	Unit V: Fish Hatchery and Management 5.1 Purpose and Layout Plan of Hatchery 5.2 Types of Ponds at Fish Hatchery			Discussion on the specific purposes of each pond type and their management	

		practices.
Week 6	Unit VI: Site Selection for Pond and Hatchery 6.1 Introduction to site selection 6.2 Legal, Technical and Environmental Factors 6.3 Infrastructure and Economic factors	Assignment on the critical role of site selection in the success of pond and hatchery operations.
Week 7	Unit VII: Natural Feed 7.1 Phytoplanktons 7.2 Zooplankton	Group Presentations
Week 8	Unit VIII: Artificial feed and feeding 8.1 Feed ingredients of plant origin 8.2 Feed ingredients of animal origin 8.3 Feed types and Feed formulation 8.4 Adaptation of fish on pelleted feed 8.5 Macro and micro nutrients, feeding methods 8.6 Objectives and Characteristics of artificial feed	Research and discussion on recent innovations in artificial feed formulation.
Week 9	Unit IX: Breeding and cultivation of Cyprinids 9.1 Indian Major carps and Chinese carps 9.2 Natural breeding 9.3 Artificial breeding 9.4 Induced spawning 9.5 Hormonal induced spawning	Assignment on the effectiveness and application of artificial and induced breeding techniques in aquaculture.
Week 10	Unit X: Breeding and cultivation of Salmonids and Catfish species 10.1 Rainbow trout and brown trout 10.2 Catfish species 10.3 Natural breeding 10.4 Artificial breeding 10.5 Induced spawning 10.6 Pituitary gland and ovaprim, their role in induced spawning	Short quiz
Week 11	Unit XI: Fish diseases and their control 11.1 Types of Fish Diseases, 11.2. Environmental, nutritional, infectious and Stressors 11.3. Viral diseases	Group Presentations
Week 12	11.4 Bacterial diseases 11.5 Fungal diseases 11.6 Parasitic diseases (protozoan, helminths, leeches, crustaceans) 11.7 Prophylactic measures diseases	Short Quiz
Week 13	Unit XII: Aquatic Vegetation and their control 12.1 Types of aquatic vegetation 12.2 Benefits and drawbacks 12.3 Methods of control	Visit a local pond, lake, or river to identify and document the types of aquatic vegetation present.
Week 14	Unit XIII: Fish enemies and their control 13.1 Insects 13.2 Voracious fish 13.3 Amphibians, Reptiles, Birds, Mammals	Group Presentations
Week 15	Unit XIV: Fish Harvesting, netting and transportation	Assignment on different

	14.1 Fishing methods 14.2 Means of live and fresh fish transportation	transportation methods used to transport fish.	
Week 16	Unit XV: Fish marketing 15.1 Introduction of fish Market 15.2 Types and characteristics 15.3 Maintenance of flesh quality and price control.	Visit to local fish markets. Report on the findings, including market types, quality maintenance methods, and price control strategies.	
Textbooks and Reading Material			
<ol style="list-style-type: none"> 1. Fitzsimmons, K., Janjua, R.S.N. and Ashraf, M., 2015. Aquaculture Handbook Fish Farming and Nutrition in Pakistan, Feeding Pakistan, SoyPak Health Through Nature. 2. Stickney, R. R. 2009. Aquaculture: An Introductory Text. CABI Publishing, London, UK. 3. Sharma, O. P. 2009. Handbook of Fisheries and Aquaculture Moyle, P.B. and Joseph, J.C. 2004. Fisheries: An Introduction to Ichthyology, Pearson Education Ltd., London 4. Parker R. O., 2004. Aquaculture Science (4th ed.). Delmar Learning, London. 5. Pillay, T.V.R. 2002. Aquaculture: Principles and Practices. Blackwell Science Limited. UK. 6. Kestin, 2001. Farmed Fish Quality Multiline Books 7. Ruth, 2000. Freshwater Aquaculture Multiline Books 8. Ali, S.S. 1999. Fresh Water Fisher Biology. Naseem Book Depot, Hyderabad. 9. Bromage, 1995. Broodstock Management and Egg and Larval Quality Pak Book Corp. 10. Woo, 1995. Fish Diseases and Disorder: Protozoan and Metazoan Infections Pak Book Corp. 11. Huet, M., 1986. Text Book of Fish Culture: Breeding and Cultivation Fishing News Books Ltd, England 			
Teaching Learning Strategies			
Teaching will be a combination of written assignments, class quizzes, presentations and class participation.			
Assignments: Types and Number with Calendar			
<ol style="list-style-type: none"> 1. Quiz: Week 2, 4, 10 & 12 2. Presentations: 2,7, 11,& 14 3. Field visit: 13& 16 4. Report 3 & 16 			
Assessment			
Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.