

AQB Ph.D. Course work

Name of Program	Ph.D. Course work
Abbreviation	AQB
Duration	12 weeks
Eligibility Criteria	A candidate who has been enrolled in Department Ph.D. Course
Objective of Program	The main objective of the course is to strengthen the students for research career in fishery resources management and sustainable utilization of aquatic resources by providing an outstanding environment of teaching and research in the specific aspects of the designed course. This structured course will facilitate students to enhance their research in fishery sector and help in the management of Aquatic pollution. Students will be acquainted with the use of instruments for their research and be capable of formulating research design.
Program Outcome	<p>PO1 : Basic Knowledge Enhancement</p> <p>The designed course enhances students with the basic knowledge of the subject matter in order to capable students develop research skills which include laboratory techniques, aqua farm field techniques, disease management in aquaculture sector, feed technology, biochemistry, microbiological assessment, fish genetics, biotechnology and bioinformatics, aquarium setup, ornamental fisheries, marine and freshwater fisheries and Planktonology.</p> <p>PO2 : Skill Development</p> <p>The course develops the skills and techniques to use instruments to conduct their research work.</p> <p>PO3 : Familiar with Advanced Emerging Technologies</p> <p>The course trains students with the latest technologies that is being used in the aquaculture sectors and aquatic pollution management.</p> <p>PO4 : Develop students for facing challenging situation in aquaculture sectors</p> <p>The course is planned to help researchers to tackle any situation that occurs in farming, water resources management and fisheries sectors.</p> <p>PO5 : Familiar with advances in fishery and analytical research</p> <p>The course will make research scholar acquaint with advance technologies in fishery sector and their implementation in field.</p>

		<p>Healthy discussion in recent technology and pollution amendments and fisheries technology enables acquaintances of the students with the practical aspects. Students will be capable of analyzing the field data's .</p> <p>PO6 : Familiar with technical aspect</p> <p>The designed syllabi enrich students with the technical aspects to identify aquatic problems in the natural environment and input the remedial measures.</p>																																																	
Program Outcomes	Specific	<p>PSO1: Develop and strengthen the basic knowledge and concepts that are required to manage fishery resources.</p> <p>PSO2: Enhance the student capacity to formulate and develop research design.</p> <p>PSO3: Raising the students capable for handling instruments and use of latest technology to find remedial measures with respect to fisheries and pollution.</p> <p>PSO4: Develop students for self-learning and challenging situation in aquaculture sectors.</p> <p>PSO5: Enable students to use recent technologies for analysing the research and practical concepts.</p> <p>PSO6: Development for incessant learning and research for successful academic and industrial career.</p>																																																	
Mapping between POs and PSOs		<table border="1"> <thead> <tr> <th></th> <th>PSO1</th> <th>PSO2</th> <th>PSO3</th> <th>PSO4</th> <th>PSO5</th> <th>PSO6</th> </tr> </thead> <tbody> <tr> <th>PO1</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>PO2</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>PO3</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>PO4</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>PO5</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>PO6</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1							PO2							PO3							PO4							PO5							PO6						
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Medium of Instruction		English																																																	
Programme structure		12 weeks																																																	
Name of the Paper	Teaching schedule (hrs)	Exam Schedule				Total marks	Credit																																												
		Internal exams		External exam																																															
		Mode of Evaluation	Marks	Mode of Evaluation	Marks																																														

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AQB1001: Research Methodology & Instrumentation	45	i. Exams ii. Seminar	50	Exam conducted by Uni.,	50	100	4
AQB 1002:Advances in Fishery science	45	i. Exams ii. Seminar	50	Exam conducted by Uni.,	50	100	4
AQB 1003: Aquatic Pollution	45	i. Exams ii. Seminar	50	Exam conducted by Uni.,	50	100	4
Total			150		150	300	

Course Code	1001
Course Title	Research Methodology and Instrumentation
Credit	4
Teaching per Week	2 Hr
Minimum weeks per Semester	12
Effective From	June 2020
Purpose of Course	The purpose of the course is to help scholars to design research and develop the operation skill of the instruments that help to analysis different physical, chemical and biological parameters.
Course Objective	To acquaint the students handling and operation of the instruments and formulate research work.
Course Outcomes	CO1: Help scholar to formulate& design research problem CO2: The course helps the scholars acquaint with methods for statistical analyses and its application in research work CO3: Train the students for handling the instruments in the

	<p>laboratory.</p> <p>CO4: Explain the principles of the instruments that help them to understand the working of the instrument</p> <p>CO5: Make scholar proficient to use the advances technology and instruments to speed up the analysis process with acceptable error level</p> <p>CO6: Make scholars to know the correct application of different instruments in the field of Aquatic Biology.</p>																																																	
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Pre-requisite	M.Sc. in Science disciplines																																																	
Course Content	<p>Unit I</p> <p>Introduction of Research Methodology: Objectives of research, significance of research, type of research, Formulation & designing of research problem Sampling designing Data collection: Methods of Primary and secondary collection Article / Thesis writing</p> <p>Unit II</p> <p>Methods for statistical Analyses</p> <p>Hypothesis testing: Independent and Dependent sample 't' test, Analysis of variance, Correlation and regression, Non parametric tests Statistical Software: Introduction of SPSS, Microsoft EXL</p> <p>Unit III</p> <p>Microtomy: microtome Histological Procedures: Tissue fixation, washing,</p>																																																	

	<p>dehydration, embedding, block preparation, sectioning staining, mounting & photography</p> <p>Unit IV</p> <p>Principles and applications of following analytical instruments used for Aquatic Biology</p> <p>GC</p> <p>HPLC</p> <p>AAS</p> <p>PCR</p> <p>LCMS</p>
Reference Books	<ul style="list-style-type: none"> • C. R. Kothari (2004). Research Methodology: Methods & Techniques, New age international pvt. limited • D K Bhattacharyya (2003). Research Methodology, Excel Books. • Loraine Blaxter, Christina Hughes, Molcolm Tight, How to Research, Viva Books Pvt.Ltd. • Fisher, R. A. (1970) Statistical Methods for Research Workers, 14th Edition, Oliver and Boyd Publ. • Brown, S.B (1980). An introduction to spectroscopy for Biochemists, Academicpress, London, New York. • E.D.P. Robertis and E.M.F. Robertis (2001). Cell and Molecular Biology, Lippincott Williams & Wilkins, London • Hawcroft, D.M. (1996). Electrophoresis. The Basics IRL press, Oxford. • Jennings, W.G. (1993). Analytical Gas chromatography. Academic Press. New York. • Skoogs, H, P.andNieman, M (2006). Principle of Instrumental analysis. Thomson Inc. Ltd.
Teaching Methodology	Classwork, Discussion, Self-Study, ICT
Evaluation Method	50% Internal assessment based on class attendance, seminar, internal examination, etc. 50% External based on University examination
Course Code	1002
Course Title	Advances in Fishery Science
Credit	4
Teaching per Week	2 Hr

Minimum weeks per Semester	12																																			
Effective From	June 2020																																			
Purpose of Course	The purpose of the course is to develop the skill about executing the different scientific techniques regarding fishery to improve aquaculture production and quality as well as manage fishery resources.																																			
Course Objective	To make the students acquaint regarding advances and approaches in taxonomy and its importance, fish biotechnology, bioinformatics and population studies.																																			
Course Outcomes	<p>CO1 : Inculcate students about taxonomy and its importance which helps in correct identification of fish. It is very important for successful culture practices as well as national and international fish trade.</p> <p>CO2 : This paper describes application of hormonal biotechnology which helps in molecular and genetic diagnostics as well as genetic upgradation of cultivable species with minimum risk of infection.</p> <p>CO3 : Train students to deal with bioinformatics in the field of Aquatic Biology. It provides the skillful digital database information which certainly required for aquaculture and aquatic resource management.</p> <p>CO4: Explain students about fish population dynamics, population studies and stock assessment which helps in regulation of aquaculture sector and aquatic resources.</p>																																			
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Pre-requisite	M.Sc. in Science discipline																																			
Course Content	<p>Unit I Advances in Taxonomy Taxonomy and its importance. Approaches in taxonomy: Embryological, anatomical, biochemical, ecological and ethological approaches. Molecular taxonomy and DNA Bar coding.</p> <p>Unit II Cryopreservation and hormonal biotechnology</p>																																			

	<p>Cryopreservation of gametes and embryos. Role of Hormone in Aquaculture product enhancement and Induced breeding by hormonal manipulation</p> <p>Unit III Bioinformatics Definition, nature, concepts and scope of bioinformatics. Bioinformatics versus computational biology. Branches of bioinformatics. Computational phylogenetics- various approaches.</p> <p>Unit IV Population studies Principles of fish population dynamics: Recruitment, Growth, Mortality, Catch per unit effort. Population studies and stock assessments: Age-length and sex composition, Estimation of population size, marketing and tagging, Population dynamics, Population models.</p>
Reference Books	<ol style="list-style-type: none"> 1. Jhingran, V. G. (2007). Fish and Fisheries of India (3rd ed.). Hindustan Publishing Corporation. New Delhi. 2. Lakra, W. S. (2000). Fish Genetics and Biotechnology. CIFE, Mumbai. 3. Lakra, W. S., Abidi, S. A. H., Mukherjee, S. C. and Ayyappan, S. (2004). Fisheries Biotechnology. Narendra Publishing House. 4. Nagabhushanam, R., Diwan, A. D. and Gyananath, G. (2009). Biotechnology Fundamentals and Applications. Narendra Publishing House, Delhi, India. 5. Malvee, S. (2008). Fish Genetics, SBS Publishers, New Delhi. 6. Lesk, A. M. (2003). Introduction to Bioinformatics Oxford Uni. Press. 7. Claverie, M. and Notredame, C. (2003). Bioinformatics A Beginners Guide. Wiley India Private Limited. 8. Murthy, C.V.S. (2004). Bioinformatics. Himalaya Publishing House. 9. Rashidi, H. H. and Buehler, L. K. (2003). Bioinformatics Basics: Applications in Biological Sciences and Medicine. 10. Srivastava, C.B.L. and Srivastava, S. (2006). A textbook of Fishery Science and Indian Fisheries. Kitab Mahal. 11. Jayakumar, N., Durairaja, R., Jawahar, P. and Felix, S. (2018). Fish Population Dynamics and Stock Management. Daya Publishing House. 12. Gupta, S. K. and Gupta, P. C. (2002). General and Applied Ichthyology (Fish and Fisheries). S. Chand and Company, New Delhi.
Teaching Methodology	Classwork, Discussion, Self-Study, ICT
Evaluation Method	50% Internal assessment based on class attendance, seminar, internal examination, etc. 50% External based on University

	examination						
Course Code	1003						
Course Title	Aquatic Pollution						
Credit	4						
Teaching per Week	2 Hr						
Minimum weeks per Semester	12						
Effective From	June 2020						
Purpose of Course	The purpose of the course is to develop concepts of water pollution and its impacts. Also to learn how to monitor pollution in aquatic resources.						
Course Objective	To develop skill in students to identify pollution load, bioindicator in aquatic resource and how to conserve water. To acquire knowledge to monitor aquatic resources.						
Course Outcomes	CO1 : To gain knowledge for collection of water sample and its analyses. CO2 : To know about the sources of water pollution in Aquatic ecosystem. CO3 : To acquire knowledge to monitor pollution load, control and prevention of pollution by various methods. CO4: To aware about impact of pollution on aquatic resources. CO5: To familiar with water conservation and recycling methods.						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
Pre-requisite	Basics of Biology and chemistry						
Course Content	Unit I Physico-chemical and Bacteriological sampling and						

	<p>the preservation methodology.</p> <p>Identification of pollutants from different types of pollution sources and their analyses.</p> <p>Bio indicators and biodiversity indices for evaluation of Water Pollution (Nygaard's algal indices, Palmer's algal pollution indices, Species diversity indices and Sequential comparison index)</p> <p>Unit II</p> <p>Impact of pollution on Aquatic environments (Marine, Riverine and Lacustrine)</p> <p>Impact of pollution on the benthic system (Adsorption on sediments, bioavailability of toxic compounds.)</p> <p>Impact of pollution on flora and fauna of different types of water bodies (phyto and zooplankton, vascular plants, vertebrates and invertebrates)</p> <p>Impact of pollution on flora and fauna of sediments of different types water bodies.</p> <p>Specific phenomena related with water pollution (Algal bloom and Eutrophication, Biomagnifications/ Bioaccumulation, impact due to the ballasted water)</p> <p>Unit III</p> <p>Water borne diseases, decontamination methods, water legislations, standards and instructions.</p> <p>Unit IV</p> <p>Water and sewage purification, point source protection, water resourcing monitoring, water conservation and recycling.</p>
Reference Books	<ul style="list-style-type: none"> • Agarwal, S.K. (2008). Water pollution, ABH publishing corporation, New Delhi • Albert, A. (1951). Selective toxicity, John Wiley and Sons, Chichester • Cremlyn, R. (1978). Pesticides, John Wiley and Sons, Chichester • Ghosh, G.K. (2002). Water of India, A.P.H. publishing corporation, New Delhi • Goel, P.K. (2006). Water pollution, New age international publishers, New Delhi. • Kukal S.S. and Dhaliwal, G.S. (2005). Essential of

	<p>environmental science, Kalyani Publishers, Ludhiyana</p> <ul style="list-style-type: none"> • Prabhakar, V.K. (2001). Marine ecology & pollution, Anmol publications New Delhi. • Rao, M.K. (2007). Environnemental pollution & Toxicology, Manglam publishers, Delhi. • Salpekar, A.C. (2008). Marine pollution, Jnanada Prackashan, New Delhi • Schmitz, R.J. (1995). Introduction to water pollution Biology, Gulf publishing company, Texas • Sinha, P.C. (1998). Marine pollution, Anmol Publications, New Delhi • Trivedi, R.K. and Goel, P.K.(1984). Chemical & Biological methods for water pollution studies, Environmental publications, Karad • Trivedi, R.K. (2001). Aquatic Pollution & Toxicology, ABD publishers, Jaipur.
Teaching Methodology	Classwork, Discussion, Self-Study, ICT
Evaluation Method	50% Internal assessment based on class attendance, seminar, internal examination, etc. 50% External based on University examination