



UNIVERSITY OF KERALA
DEPARTMENT OF AQUATIC BIOLOGY AND FISHERIES
(UGC - SAP Centre of Advanced Study)

(Under Credit and Semester System w.e.f. 2016 Admission)

**M. PHIL. PROGRAMME IN AQUATIC BIOLOGY &
FISHERIES**
Syllabus

UNIVERSITY OF KERALA
DEPARTMENT OF AQUATIC BIOLOGY AND FISHERIES
(UGC - SAP Centre of Advanced Study)

M. Phil. Programme in Aquatic Biology and Fisheries

PROGRAMME OBJECTIVES

- To produce a student who has acquired a good all-round perception on the recent developments and research scenario in Aquatic Biology and Fisheries.
- To inculcate a research culture in students by imparting training in advanced research methodology so as to enable them to carry out original research independently.
- To impart skills in better research and science communication using latest tools in information, communication and technology.

Structure of the Programme

Semester No.	Course Code	Name of the Course	Number of Credits
I	AQB - 711	Research Methodology	4
	AQB - 712	Advances in Aquatic Ecology	4
	AQB -713	Advances in Fisheries and Aquaculture	4
II	AQB - 721	Dissertation	20
Total Credits			32

Semester : I
Course Code : AQB - 711
Course Title : RESEARCH METHODOLOGY
Credits : 4

AIM

To introduce the methodology of research to the students through inculcating the spirit of critical thinking, reviewing research in the field, development of hypothesis, methods to executive quality research, analysis and interpretation of data, and presentation and communication of results. Further, the students acquiring this knowledge and skill would be able to independently carry out original research work and further the research for higher degrees or for the betterment of the society.

OBJECTIVES

- To inculcate a research culture in students by imparting training in advanced research methodology so as to enable them to carry out original research independently.
- To impart skills in better research and science communication using latest tools in information, communication and technology.

MODULE I: Objectives and Types of Research: Research - purpose, relevance and scope; Motivation and inspiration for research; various outlooks on research; Types of Research. Innovation and creativity. Qualities of research and researchers.

MODULE II: Research Formulation: Research methodology and steps involved in research process; Identifying and defining researchable problems. Literature review - primary and secondary sources, web resources; Google scholar, Science Direct and Scopus; Bibliometrics and webmetrics; Databases for Fish & Aquatic Sciences. Identifying gap areas from literature review; Formulation of research objectives; Hypothesis. Research designs. Developing a research plan - Exploration, Description, Diagnosis, Experimentation. Determining experimental and sample designs.

MODULE III: Data Collection and Analysis: Method of Scientific Investigation - Observation, planning and collection of data - Methods of data collection – Sampling Methods- Data Processing and Analysis strategies – Interpretation and Generalization – Measures of central tendency and variation, Probability and Probability distribution, Correlation and Regression, Test of Hypothesis (Chi Test, Student t test,

ANOVA) - Introduction to statistical software (SPSS, PRIMER, Statistica, 'R') - Bioinformatics tools.

MODULE IV: Writing, Publishing and Presenting Science: Types of research papers- Research Article, research communication, scientific correspondence, general research article, review article, opinion, letters; Format of thesis. IMARD format, preparation of bibliography. Formats of a research paper- objectives of each section- reference writing styles; Proof reading and editing; Authorship; Collaborative authoring tools; Publication process- Peer review- single/double blind and open; Institutional repositories and Open Access Publications. Predatory journals. Impact factors, citation index, h, 'h-bar' and g indices; Pitfalls in interpreting impact. Reference management tools: diigo, zotero, mind manager, endnote; Academic search engine optimisation: Current Awareness: RSS feeds, TOC alerts. Planning Preparation – Practice- Making presentation – Use of visual aids, Preparation of posters. Importance of effective communication using ICT.

MODULE V: IPR, Patents, Research Ethics and Outreach: IPR awareness: Copyrights and patents; Brief overview of IPR and IPR laws in India. Brief overview of GATT, TRIPS; India as knowledge Power. Research Ethics; software for checking plagiarism- URKUND. Guidelines for using animals and humans in biological research; The Prevention of Cruelty to Animals Act, India. e-Shodh-Sindhu Consortium. SWAYAM. National Digital Library of India

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Semester : **I**

Course Code : **AQB - 712**

Course Title : **ADVANCES IN AQUATIC ECOLOGY**

Credits : **4**

AIM

To introduce the students the current status of Aquatic Ecology and to familiarize them with research and development in the field, with a view of sustainable management of aquatic ecosystems.

OBJECTIVES

- To introduce the students to advanced developments in aquatic ecology and ecosystem management, with special reference to inland and marine ecosystems.
- To introduce methodology, instruments and techniques in ecological research
- To provide an overview on management of aquatic ecosystems and research and developments in the field of ecosystem restoration.

MODULE I: Oceans for Future: Concept of Blue Growth and Blue Economy. Principles of Blue Economy. Role of oceanic resources in promoting blue growth and blue economy and research options. Assessment of the cross-cutting issues: food security and food safety; deep sea explorations for resources-available technologies; drugs from the sea- status of research. Human activities and the marine environment - habitat degradation, climate change, invasive alien species, over exploitation and pollution- status of research. Capacity-building in relation to human activities affecting the marine environment; mitigation measures for eutrophication and Harmful Algal Blooms. Conservation of oceans and marine biodiversity- current status and trends. Integrated Coastal Zone Management- Principles and Practice; Environmental Impact Assessment in marine ecosystems.

MODULE II: Inland Ecosystem Management: Status of inland aquatic ecosystems. Ecosystem integrity; community ecological principles; Disturbance, succession, fragmentation, ecosystem auditing; Ecosystem function. Emerging concepts- Assembly, Stable states; Biotic and abiotic flows and cultural interactions; Application of theory- Invasion. Climate change and inland water bodies. River continuum concept and environmental flow. Integrated Environment Management (IEM) Programme and ecosystem approach in conservation.

MODULE III: Ecosystem Restoration: Ecological restoration- Need, concept and definition; Approaches; Rationale for restoration; restoration ecology of rivers and wetlands. Differences between conservation and restoration; critical ranges of variability in biodiversity. Restoration planning; Wetland Assessment, Delineation, and Regulation; Recovery process, Mitigation, Rehabilitation and Reclamation; Dynamics and restoration of degraded wetlands; Removal of threats to the health and integrity of the restored ecosystem.

MODULE IV: Water Quality and Human Health: Water availability- Global and Indian Scenarios- trends for future. Water in the post-2015 development agenda and sustainable development goals. Water-energy-food security- environment-climate nexus. Water, development and human rights- case study of Plachimada. Water quality standards for marine and freshwater. Methods to measure water quality. Drinking water quality standards. Water quality-human health linkages. Human activities affecting water quality. Human diseases and water quality. Waste disposal and water quality criteria used in different parts of world - national and international standards; ISO-14000(EMS), EIA. Management strategies- emerging technologies. Water conservation and rain harvesting methods in India and water management.

MODULE V: Informatics for Aquatic Ecosystems: Role of informatics in aquatic ecosystems and biodiversity management. Ecoinformatics- Principles and Practice. Modern technologies for exploration of aquatic ecosystems and resource assessment- remote sensing, acoustic sampling and DNA bar-coding. Census of marine life. Biodiversity informatics. Technologies to detect and monitor marine pollution. Bioremediation; Techniques for protection of beaches; Biodegradation- marine fouling and antifouling technology; marine corrosion; Biosensors. Marine genomics- Comparative genomics, Functional genomics and Environmental genomics. Marine proteomics and drugs discovery.

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Semester : I

Course Code : **AQB - 713**

Course Title : **ADVANCES IN FISHERIES AND AQUACULTURE**

Credits : 4

AIM

The primary aim of this course is to provide comprehensive account of the recent trends in fisheries and aquaculture with a broader perspective of research on fisheries resource management and betterment of fish production sector.

OBJECTIVES

- To introduce advances in fisheries resource management in both inland and marine ecosystems.
- To impart knowledge on the current status of research and technology in aquaculture development

MODULEI: Capture Fisheries- Trends and Sustainability: Current trends in Global capture fisheries- Inland and Marine. Status of Indian inland and marine capture fisheries. Blue economy and role of fisheries and aquaculture sector. Sustainable fisheries

management and Code of Conduct for Responsible fisheries. Strategies for management of by-catch in capture fisheries. Impact of globalization on marine capture fisheries. Rights-based approaches in fisheries. Role of small-scale fisheries in food security. Certification and labeling in seafood trade relevant to Indian capture fisheries.

MODULEII: Fisheries Management: Biology and ecology considerations; fishing down the food web and shifting baseline hypothesis; social aspects of fisheries management; economic principles; legal and institutional considerations; use of scientific information for fisheries management; Fishery Monitoring, Control and Surveillance; Fisheries Management Plans. Fishing holidays and closed season. Ecosystem approach in sustainable fisheries management. UNCLOS; CCRF; CMS, CITES; TRAFFIC; Environmental (Protection) Act of India; CRZ, IPZ; Integrated Coastal Zone Management. Fisheries Data: needs, generation, analysis and interpretation.

MODULEIII: Culture Fisheries- Emerging Trends: Current global status of aquaculture; recent trends in Indian aquaculture production. Emerging trends in Indian shrimp aquaculture sector and the regulations governing it. Emerging candidate species in Indian fin fish aquaculture. Emerging trends in aquaculture technology. Recent innovations in the nutrition and health management of cultured organisms. Molecular tools in Aquaculture. Modern trends in aquarium keeping and aquarium technology.

MODULEIV: Aquaculture Management: Principles of sustainable aquaculture, integrated aquaculture, organic aquaculture, aquaponics and other emerging sectors. Impact of climate change on aquaculture. Traceability in Aquaculture. Impact of exotic species in Indian aquaculture.

MODULEV: Ecosystem Management and Sustainability: Integrated ecosystem management for sustainable fisheries and aquaculture. Environmental factors including climate change and pollution coupled with overharvesting impacting sustainability and research gaps. Impact of trade regulations on fisheries, aquaculture production and environmental management.

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<http://www.caa.gov.in/> (Coastal Aquaculture Authority)

<http://mpeda.gov.in/MPEDA/#> (Marine products export development authority)

Semester : **II**
 Course Code : **AQB - 721**
 Course Title : **DISSERTATION**
 Credits : **20**

AIM

To provide an opportunity for the students to pursue an independent research work under the guidance of a supervising teacher. It also aims to inculcate a research culture in student and to impart skills to pursue a research career or to independently execute research projects.

OBJECTIVES

- To demonstrate the ability to conduct literature reviews and gather the critical scientific information related to the research proposal
- To identify a research hypothesis/problem and create a research proposal
- To undertake a short-term research project following precise research methodology.
- To develop skills in science writing for the preparation and submission of dissertation and research papers.
- To impart skills and knowledge in order to independently execute research projects

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Open