

Course structure

Year	Course code	Course title	Type/status	Number of credits
Year 1 1 st Semester	AQFM 51014	Fish and Fisheries Biology	Compulsory	4
	AQFM 51024	Aquaculture Systems and Management	Compulsory	4
	AQFM 51034	Fish Population Dynamics and Fisheries Management	Compulsory	4
	AQFM 51043	Fish Biology, Fisheries, Population Dynamics and Aquaculture Laboratory	Compulsory	3
Year 1 2 nd Semester	AQFM 52052*	Fish Nutrition, Genetics and Biotechnology in Aquaculture	Compulsory	2
	AQFM 52063*	Fish Health Management	Compulsory	3
	AQFM 52073*	Fish Post Harvest Technology and Economics in Fisheries & Aquaculture	Compulsory	3
	AQFM 52083*	Aquatic Ecology and Fish Conservation Biology	Compulsory	3
	AQFM 52092*	Statistical Methods in Fisheries and Aquaculture	Compulsory	2
	AQFM 52102	Coastal Resource Management	Optional	2
	AQFM 52112	Inland Fisheries Management	Optional	2
	AQFM 52122	Fisheries Enhancement	Optional	2
Year 2	AQFM 6301X	Research Project	Compulsory	30
Total number of Credits for the compulsory course units				58

*Course units with theory cum practical components

Syllabus

Course code : AQFM 51014

Course Title: Fish and Fisheries Biology

Learning Outcomes:

At the end of this course unit, the students should be able to

- describe and discuss the major aspects of fish biology,
- critically discuss marine and inland fisheries of the world with special reference to Sri Lanka.

Course Contents:

Classification of fish, fish and their habitats, external and internal features, locomotion, buoyancy, the role of nervous, endocrine and sensory systems, food and feeding, blood circulation and respiration, Excretion and osmoregulation, reproduction and life histories.

Major characteristics of fisheries, Fishing methods and fishing gear technology, Recent trends in world fisheries, Anthropogenic activities on world fisheries, Tuna and tuna like fisheries, Effects of legal regime of the sea on fisheries, Shared stocks, Untapped resources, Enhancement strategies in fisheries, Fisheries of the Indian Ocean, Marine fisheries of Sri Lanka, Estuarine fisheries of Sri Lanka, Freshwater fisheries of Sri Lanka, Plans for future development of fisheries of Sri Lanka,

Method of Teaching and Learning: A combination of lectures, seminars, tutorials and assignments.

Assessment: Continuous assessment and end of course examination.

Course Code : AQFM 51024

Course Title : Aquaculture Systems and Management

Learning Outcomes :

At the end of this course unit, the students should be able to

- describe different aquaculture practices and systems and critically discuss the management procedures adopted for different aquaculture practices and systems
- explain principles of aquaculture engineering and discuss the design and procedures of constructing different aquaculture facilities used in hatcheries and grow-out systems
- critically discuss the procedures of maintaining proper water quality in culture environments
- critically discuss the procedure of producing good quality seed for aquaculture and management of different hatchery and grow-out systems in order to enhance production in eco-friendly manner under food safety regulations

Course Contents:

Present status in world aquaculture. Role and potential of aquaculture in national development, Aquaculture systems and practices, Practices to maximize carrying capacity of aquatic habitats to sustain aquaculture. Culturable freshwater, brackish-water and marine species of food and ornamental fin fish with special reference to Sri Lanka, Culturable species of crustaceans, molluscs, aquatic plants and seaweed. Food safety management in cultured fish (Food Safety Management System – ISO 20,000 including HACCP system).

Site suitability and water resources for aquaculture practices, Properties of soils, Layout designs, Engineering surveys after site selection, Selection of equipment and materials, Design and construction of fish hatcheries, grow out ponds and related structures, Design of cages, pens and rafts, Use of filters and treatment systems in aquaculture, Water pumping systems, Aeration and oxygenation.

Important water quality parameters in aquaculture, Water quality criteria for screening and production, Monitoring of water quality, Maintenance of optimum water quality in culture environment, Correcting problems in water quality.

Brood stock management, Domestication of brood stock, Seed quality, Specific pathogen free brood stocks, Methods of controlled spawning in edible fin fish, ornamental fish, shrimp and freshwater prawn. Techniques used in packing seeds and brood stock for transport.

Culture of fin fish and shrimps in earthen ponds, Ornamental fish culture in tanks and ponds, Captive based aquaculture, Culture of edible fin fish in cages and pens, Mollusc culture practices in rafts, trays, poles, ropes and substrates, Integrated fish farming practices, Fish farming in flow through and recirculation systems, Fish culture in seasonal tanks, Ocean ranching, Culture of ornamental aquatic plants, Sea weed culture, Techniques used in packing live fish.

Method of Teaching and Learning: A combination of lectures, seminars, tutorials and assignments

Assessment: Continuous assessment and end of course examination

Course Code : AQFM 51034

Course Title: Fish Population Dynamics and Fisheries Management

Learning Outcomes:

At the end of this course unit, the students should be able to

- demonstrate the analytical ability in fish population dynamics
- critically discuss important aspects of fisheries management procedures
- apply stock assessment methodologies in fisheries management.

Course contents:

Concept of unit stock, Age and growth of fish, Mortality, Recruitment, Gear selection, Estimation of population sizes, Estimation of past population sizes using virtual population analysis and cohort analysis, Concepts of Maximum sustainable yield, Surplus yield models, Yield per recruit models, Semi-quantitative methods in fish stock assessment, Assessment of multi-species fisheries.

Introduction to fisheries management, Problems associated with the management of fisheries, Steps of a management procedure, Past and present management devices, Community-based fisheries, Alternative approaches to fisheries management and relevance of co-management, Conflict resolution, Reservoir fisheries management, Concept of Maximum Economic Yield and Maximum Social Yield.

Method of Teaching and Learning: A combination of lectures, seminars, tutorials and use of stock assessment software.

Assessment: Continuous assessment and end of course examination.

Course Code : AQFM 51043

Course Title: Fish Biology, Fisheries, Population dynamics and Aquaculture
Laboratory

Learning Outcomes:

At the end of this course unit, the students should be able to demonstrate

- practical skills in fish and fisheries biology
- practical and analytical skills in stock assessment methodologies, fisheries data analysis using computer software packages
- skills in carrying out engineering surveys for site selection and in designing different aquaculture facilities used in hatcheries and grow-out systems
- competencies in recognizing edible fin fish species and shell fish species and ornamental fish species,
- skills in producing good quality seed for aquaculture and managing different hatchery and grow-out systems in order to enhance production in eco-friendly manner under food safety regulations

Course contents:

Practical sessions on common edible fish species of Sri Lanka, exotic species, ornamental fish species, morphometric and meristic studies of fish, food and feeding of fish, fish morphology in relation to food and feeding habits, reproductive biology. Field visits to fish landing sites

Practical sessions on identification of cultured edible fin fish and shell fish species and ornamental fish species, larval food and larval rearing techniques, culture of microalgae, hypophysation of fin fish and other induced breeding techniques and aquarium techniques. Field studies at shrimp culture sites, shrimp farms, mollusc culture sites, freshwater fish breeding stations and ornamental aquaria

Practical sessions on morphometric and meristic characteristics of fish, age and growth, length weight relationships and body condition, approximate methods of fish stock assessment, estimation of growth parameters of fish stocks, gear selection, estimation of mortality rates, dynamic pool models for determining optimal fishing strategies, surplus yield models and length based stock assessment methods, use of computer software packages in population dynamics and modelling, Fields studies at fish landing sites.

Method of Teaching and Learning:Laboratory and field studies and the use of stock assessment software.

Assessment: Continuous assessment and end of course examination.

Course code : AQFM 52052

Course Title : Fish Nutrition, Genetics and Biotechnology in Aquaculture

Learning Outcomes :

At the end of this course unit, the students should be able to

- critically discuss the importance of fulfilling nutritional requirements of cultured fish and discuss the procedures of culturing natural food and formulating feed for different life stages of cultured fish using suitable ingredients,
- discuss the importance of conducting genetic improvement programme for cultured fish and critically discuss the relevant procedures and essential requisite of designing,
- describe and critically discuss biotechnologies available for fish nutrition, broodstock improvement, disease diagnosis and for the development of specific pathogen resistant stocks
- demonstrate skills in culturing natural food and formulating feed for different life stages of cultured fish using suitable ingredients,
- Use computer software packages to analyse data on genetic improvement of some cultured fish

Course Contents:

Natural and formulated feeds, Essential nutrients, their functions, requirements, deficiency signs, Nutritional bioenergetics; vitamin & mineral mixes, Nutrient sources, additives, nutrient composition tables, Evaluation of Ingredients, Toxins in Ingredients; Larval feeds and culture of natural food; Grow out feeds, Supplemental feeds, Complete feeds, Brood stock feeds, Feed formulation, Feed manufacture, Problems in storage and preventive measures, Diet Evaluation, Feeding practices.

Principles of fish genetics, genetic basis of improvement of fish stocks, inbreeding, heterosis, designing and conducting a genetic improvement programme, genetic markers, Genetic engineering and gene transfer (transgenic fish).

Biotechnologies available for fish nutrition, brood stock improvement, Chromosome set manipulation, polyploidy, gynogenesis, androgenesis, Sex determination and sex control (monosex culture), Cross breeding and hybridization, Disease diagnosis using biotechnology, specific pathogen resistant stocks.

Practical sessions include culturing natural food and formulating feed for different life stages of cultured fish using suitable ingredients. Case studies on genetic improvement programmes of some cultured fish, Use of computer software packages to analyse data on genetic improvement of cultured fish

Method of Teaching and Learning: A combination of lectures, seminars, tutorials, assignments and laboratory studies

Assessment: Continuous assessment and end of course examination

Course code : AQFM 52063

Course Title : Fish Health Management

Learning Outcomes :

At the end of this course unit, the students should be able to

- discuss principles of fish health management
- discuss aetiology, clinical signs and diagnostic procedures of common diseases of cultured fin fish and shell fish
- demonstrate skills in identifying common infectious and non-infectious diseases of cultured fin fish and shell fish
- apply the knowledge in controlling fish diseases and in preventing and treating the affected fish in an eco-friendly manner

Course Contents:

Principles of fish health management, Predisposing factors, Environmental stress, Defensive mechanisms in fish to combat stress/ foreign organisms.

Infectious diseases: host, pathogen and environment relationship, Common infectious diseases of fin fish and shrimp (in the hatchery, nursery and grow out systems): viral, bacterial, fungal and parasitic diseases. Non-infectious diseases: dietary deficiencies, genetic abnormalities, neoplasms. Ill health conditions in the cultured molluscs, Disease diagnosis: clinical signs, histopathology, microbiological and other laboratory techniques involved in disease diagnosis, Control and prevention of diseases. Treatment methods for fin fish and shellfish diseases.

Practical sessions include diagnosis of common infectious and non-infectious diseases of cultured fish and shell fish using clinical signs, parasitic surveys, identification of pathogens and parasites, histopathological studies on infected organs, microbiological and other laboratory techniques, treatment methods for common diseases of fin fish and shellfish.

Method of Teaching and Learning: A combination of lectures, seminars, tutorials, assignments, laboratory and field studies

Assessment: Continuous assessment and end of course examination

Course Code : AQFM 52073

Course Title : Fish Post Harvest Technology and Economics in Fisheries and Aquaculture

Learning Outcomes :

At the end of this course unit, the students should be able to

- explain the concept of freshness, quality, hygiene and sanitation in fishery products
- describe and critically discuss the traditional and modern methods of fish preservation in relation to Food Safety Management System ISO – 20,000 including HACCP system
- demonstrate skills in procedures used in testing hygiene and sanitation of fishery products
- critically discuss bio-economic and socio-economic factors affecting fisheries and aquaculture production
- demonstrate skills in preparing budget and cash-flows for aquaculture farms targeting profit maximization in aquaculture enterprises

Course contents :

Nutritive value of fish, Concept of freshness, Concept of quality, Hygiene and sanitation, Fish spoilage, Traditional and modern methods of fish preservation, (drying, salting, fermentation, smoking, canning, ice-storage, cold-storage, freezing), Convenient fish food, Quality control of fish and fishery products, Food Safety Management System ISO – 20,000 including HACCP system in Quality control of fishery products.

Introductions to economics, Economics in Fisheries, Bio-economic factors affecting fisheries and aquaculture production, Underlying biological and economic relationship in production, Profit maximisation in aquaculture enterprises, Farm income concept and productivity valuation; Farm budgeting and preparation of cash-flows; Farm records and accounting, Socio-economics, Aquaculture marketing, Laws, regulations and constraints in fisheries and aquaculture.

Practical sessions include preparation of a brief report on the quality of fish and methods used for preservation at a fish wholesale outlet, microbial and chemical analysis of fish available at the fish market, microbial analysis of cultured shrimps and quality assessment of fish and fishery products available at supermarkets and retail outlets.

Method of Teaching and Learning: A combination of lectures, assignments, laboratory and field studies

Assessment: Continuous assessment and end of course examination

Course Code : AQFM 52083

Course Title: Aquatic Ecology and Fish Conservation Biology

Learning Outcomes:

At the end of this course unit, the students should be able to

- discuss the structure and functioning of aquatic ecosystems;
- critically discuss effects of pollutants on fish, issues relevant to environmental degradation, and the conservation of fish biodiversity.
- demonstrate skills on selected aspects of fish conservation biology

Course contents:

Basic principles related to the structure and functioning of marine, brackish water and freshwater ecosystems, Environmental degradation and habitat destruction.

Effects of toxic gases, heavy metals, organic pollutants and therapeutic compounds on fish, measurements of toxicity, bioaccumulation and biotransformation of toxicants in fish .

Impact of fishing and aquaculture on environment and fish biodiversity, Concept of minimum viable population size, Current practices employed in the conservation and management of aquatic habitats and inhabitants, Endangered species and restoration ecology. Practical sessions include studies on endemic fish species and threatened fish species in Sri Lanka.

Method of Teaching and Learning: A combination of lectures, seminars, tutorials, assignments and laboratory studies

Assessment: Continuous assessment and end of course examination.

Course code : AQFM 52092

Course Title: Statistical Methods in Fisheries and Aquaculture

Learning Outcomes:

At the end of this course unit, the students should be able to

- demonstrate a basic knowledge on statistical procedures that are useful for aquaculture and fisheries data analysis,
- apply suitable statistical methods in analysis of fisheries and aquaculture data,
- demonstrate competence in using computer software packages in statistical analysis of aquaculture and fisheries data and interpret the results.

Course Contents:

Sampling methods, Population parameters and sample statistics, Density and distribution functions, Confidence intervals, Hypothesis testing, Goodness of fit techniques, Simple linear correlation, Simple linear regression, Analysis of variance and multiple comparison procedures, Non-parametric statistics. Multivariate statistical analysis

Practical sessions include use of computer software packages in statistical analysis of aquaculture and fisheries data.

Method of Teaching and Learning: A combination of lectures, tutorials, assignments and computer-assisted learning.

Assessment: Continuous assessment and end of course examination.

Recommended reading:

1. Fowler, J. and L. Cohen (1994), Practical Statistics for Field Biology. John Wiley & Sons, Chichester.
2. Zar, J.H. (1999) Biostatistical Methods. Prentice-Hall, New Jersey.
3. Sokal, R.R. and F. Rohlf (1995), Biometry. W.H. Freeman and Company, New York.

Course Code : AQFM 52102

Course Title: Coastal Resource Management

Learning Outcomes:

At the end of this course, the students should be able to

- appreciate some of the complexities at the nexus of human-coastal/marine interactions and
- demonstrate a comprehensive knowledge on the policies and techniques used in the coastal resources management.

Course contents:

Basic themes in coastal and marine geography; Coastal and marine hazards; Coastal development; Coastal pollution; Climate change and sea level rise; Mapping the marine environment; Policy, legislation and institutional arrangement for coastal management;

Overview of coastal management concepts and principles, Management of coastal fisheries, aquaculture, seagrass beds, Mangroves, estuaries and coral reefs.

Method of teaching and learning: A combination of lectures, tutorials and field studies.

Assessment: End of course examination.

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Course code : AQFM 52112

Course Title: Inland Fisheries Management

Learning Outcomes:

At the end of this course unit, the students should be able to,

- describe the characteristics of lake and reservoir fisheries
- demonstrate a comprehensive knowledge on inland fisheries and their management.

Course contents:

The nature of inland waters (lakes, reservoirs, rivers, flood-plains, swamps, marshes, rice fields, lagoons), nature of inland fish populations, fisheries and fishing communities, fishing techniques, fish utilization, inland fishery resource evaluation, inland fisheries management, habitat management, inland fisheries enhancement, mitigation and rehabilitation of inland fisheries, biodiversity and conservation issues, legislation.

Method of Teaching and Learning: A combination of lectures, tutorials and field studies.

Assessment: End of course examination

Course Code : AQFM 52122

Course Title: Fisheries Enhancement

Learning Outcomes:

At the end of this course unit, the students should be able to,

- describe and critically discuss the fish stock enhancement strategies
- demonstrate a comprehensive knowledge on the importance of fish stock enhancement methods for fisheries management.

Course contents:

Techniques for fish stock enhancement: Species introduction, stocking, fertilization, elimination of unwanted species, constructing faunal composition, engineering water

bodies, protection of fish habitats, brush parks, artificial reefs, fish aggregation devices, culture-based fisheries, cost-effectiveness of fish stock enhancement.

Method of Teaching and Learning: A combination of lectures, tutorials and field studies.

Assessment: End of course examination

Course code : AQFM 6301X

Course Title: Research Project

Learning Outcomes:

At the end of this course unit, the students should be able to demonstrate competence in

- planning and carrying out a research project according to the scientific method
- analysing the data statistically and interpreting the results
- presenting the research in the form of a dissertation
- presenting the synopsis of the research in a logical manner at a seminar, and
- defending the dissertation

Course contents:

Research project of 10 - 12 months duration is assigned to each student under the supervision of a senior academic staff member at the beginning of the second academic year. The project may be carried out in the areas of Aquaculture, Fish Biology, Fish health management, Fisheries management or Post Harvest Technology. Before commencement of the research work, plan and methodology of the project should be presented at a seminar. A dissertation embodying the results of the research project should be submitted at the end of the second year. On submission of the dissertation, the candidate is required to present a seminar on the research project.

Method of Teaching and Learning: Literature survey, laboratory and/or field work, data analysis and interpretation, dissertation

Assessment: dissertation, oral presentation and oral examination
