



# St. Albert's College (Autonomous)

An initiative of Archdiocese of Verapoly

Affiliated to Mahatma Gandhi University, Kottayam

(Accredited with "A" Grade by NAAC)

# Programme Outcomes

## Programme Specific Outcomes

## Course Outcomes

Research Department of Fisheries and Aquaculture

## M.Sc. Applied Fisheries & Aquaculture

### Programme Outcomes

The programme is designed to mould highly skilled fisheries and aquaculture technicians having a thorough understanding of the core areas of the subject including skills related to taxonomic identification, chemical analyses, applied computing, aquarium fisheries management, health management in aquaculture, biotechnological applications, capture and culture technology management, resource conservation management and post harvest technology management.

In addition, the students attain the following

- Specialized knowledge in a range of current issues, including growth, nutrition, health and disease resistance, genetics and environmental interactions.
- Practical experience in aquarium construction, maintenance and breeding and rearing of ornamental fishes.
- Quantitative skills such as statistical applications and digital technological applications, making themselves efficient for prospective employers.
- Essential research skills including project planning, literature reviewing, data analysis and interpretation which will be beneficial for future research career.
- Knowledge and skills required to assess the abundance and distribution of fish and to understand key elements of the provision of advice for fisheries management.
- Thorough understanding of the physical and biological oceanography, biodiversity, trophic interactions, species survival and reproduction issues required to implement spatially explicit, sustainable ecosystem-base management, conservation and effective marine spatial planning.
- Reflect current theory and practice in the interface between ecology, conservation and society explored through structured social outreach program during the course and they will be able to address these issues in different perspectives.
- Generated sufficient abilities and skills to generate hypotheses and design ways of testing them and to analyse, report and discuss the findings of their projects.
- Take responsibility for implementing their own plans and modifying them as needed based on geographical and environmental requirements.

On successful completion of the programme the student will be fully competent to pursue a career through self entrepreneurship, research, as an employee in a central, state, private or non-governmental organization.

## **Programme Specific Outcomes**

On completion of the two year post graduate program in Applied Fisheries and Aquaculture a student will have attained the following unique skill sets.

- Quantitative and analytical aptitude to apply the statistical and computational skills to project planning, research and data management.
- In depth knowledge in specific areas such as biotechnological applications in aquaculture for ethically sustainable enhancement of production.
- Practical skills in fish and shrimp nutrition and health management in aquaculture farms to assist scientifically managed farms.
- Entrepreneurial skill attainment in breeding and hatchery management of aquarium fishes and food fishes.
- High employability potential in the processing industry due to the skill sets attained in post harvest technology.
- Applicable knowledge in farming of marine organisms to enable sustained availability of essential marine life for commercial utilization.
- Skilled in areas of harvesting technology to apply the technical advancements suitably as well as to create awareness among the fishermen community of the need for ecosystem conservation and sustainable exploitation

## **Course Outcomes**

### **SEMESTER – I**

#### **PAQ1CRT01- Taxonomy and Systematics of Culturable Aquatic Organisms**

On completion of this course students will able to

- Demonstrate information literacy by locating, critically analyzing, and discussing primary literature.
- Clearly communicate, orally and in writing, using a standard scientific format.
- Utilize identification keys effectively to identify different taxonomic levels.
- Understand the role of modern phylogenetic methods in fish and other aquatic organisms.
- Understand species concept and methods for species determination.
- Solve taxonomic problems and describe how species and other taxa are named.
- To present taxonomic information to others in an effective manner.
- To describe the latest development fish diversity research like DNA bar coding.

### **PAQ1CRT02 - Biochemistry**

On completion of the course the students will have the ability to

- Analyse and evaluate the nutritional and biological importance of vitamins, clinical significance of organ based function tests and biochemical basis of metabolic disorders
- Explain/describe the synthesis of proteins, lipids, nucleic acids, and carbohydrates and their role in metabolic pathways.
- Use updated biochemical techniques to plan and carry out experiments in respect of fisheries science.
- Explore the basics of membrane biochemistry and enzyme catalysis.

### **PAQ1CRT03 - Biophysics and Research Methodology**

On completion of this course the student will be able to

- Demonstrate and employ physical principles, kinetics and methods related to different biological processes like diffusion and osmosis
- To observe and analyze various scientific aspects and theories related to biophysical fields of bioenergetics and radiation
- An expert in handling and demonstrating different instruments and techniques like chromatography, microscopy, Electrophoresis, Spectroscopy, AAS, NMR, RIA, ELIZA, Flame photometry, Colorimetry, Centrifugation and museum specimen preparation etc.
- Have deep knowledge on scientific paper/article/report writing, data interpretation and analytical techniques.

### **PAQ1CRT04 - Biostatistics and Computer Application**

On completion of the course the students will have attained the following

- Ability to present the statistical data in order to comprehend the complicated practical field scenarios.
- Decision making ability with application of computer-based data presentation and analytical tools
- Understanding of data distribution pattern and their application in field scenarios.
- Ability to establish to linear relationship among variables of given data set and deriving model regression for better predictability.
- Ability to perform various numerical data processing in Microsoft Office.

- Develop measures that can be used to summarize a data set: mean, median, mode, percentiles, variance, standard deviation, and range.
- Develop measures that can be used to indicate the amount of variation in the data set- percentiles, variance, standard deviation, and range.
- Know how to use sample data to estimate a population mean, a population variance, and a population proportion and know how to compute point and interval estimates of the population parameters
- Knowledge in estimation of total marine fish landings and inland fish capture production.

## **PRACTICAL**

### **PAQ1CRP01 - Taxonomy, Biochemistry, Biophysics, Biostatistics and Computer Applications**

On completion of the practical sessions the student would have

- Develop observational, analytical and evaluation skills relate to Taxonomy, Biochemistry, Biophysics, Biostatistics and Computer applications.
- Ability to apply different techniques to identify commercially important fishes and shell fishes.
- Skill in the application of different taxonomical tools and techniques.
- Developed the skill of bone separation and its study in fishes.
- Analytical skills in the physic-chemical parameters of aquatic systems.
- Acquired the knowledge to quantifiably estimate different biochemical substances.
- Skilled in the use different techniques and instruments like Chromatography, electrophoresis, camera Lucida, phase contrast microscope, micrometry and microphotography.
- Acquired the skill of permanent slide preparation and histological techniques.
- Developed the skill of different statistical procedures and communicate the results of statistical analyses effectively.
- Skilled in the use digital technology and statistical knowledge for data analysis and interpretation.

## **SEMESTER II**

### **PAQ2CRT01 - Inland Aquaculture**

By the end of the course students will have attained the following.

- Knowledge of the basic principles of inland culture fish, crustacean and mollusks.
- Understanding about the site selection for fish culture and important aquaculture candidate species.
- Developed sufficient knowledge in culture methodologies and common problems.
- Demonstrate the basic technical skills necessary for work in cage culture and pen culture, aquaponics, integrated aquaculture systems and other cultural practices
- Knowledge of the important aquaculture candidate species and their artificial breeding technique, induced spawning, brood stock maintenance, larval rearing and grow out systems.

### **PAQ2CRT02 - Ornamental Fisheries**

On course completion the students will have attained the following.

- Thorough knowledge about various techniques of ornamental fish breeding, rearing and marketing.
- Clear understanding of the techniques of construction of glass aquariums for private and public requirements.
- Ability to maintain freshwater and marine aquariums.
- Knowledge on the production of aquatic plants in mass scale.
- Deep understand of ornamental fish food production and ability to convert it into business.
- Sufficient professional knowledge in ornamental fisheries to start own enterprise.

### **PAQ2CRT03 - Genetics and Biotechnology in Aquaculture**

Upon course completion the students will have attained the following:

- Able to recognize the importance of molecular marks in ecology and the mechanism of evolutionary changes.
- Thorough knowledge on molecular identification methods and practicability of these methods for species definition, population and sex determination.
- Sufficient skills in conservation genetics and management of endangered species to solve the genetic issues in threatened species, diagnosis genetic problems, conservation of selective breeding and restoration programmes.

- Clear understanding of genomics in fisheries science including comparative genomics, metagenomics and transcriptomics.
- Thorough knowledge on the nucleic acids and origin of life, genotype and phenotype variations, gene sequencing and its applications.

#### **PAQ2CRT04 - Health Management in Aquaculture Systems**

On course completion the students will have attained the following:

- Understand and apply biosecurity requirement in shrimp aquaculture.
- Apply the knowledge of diseases in-fish culture and common diseases in fishes.
- Utilize the knowledge on disease management tools for the benefit of the fishermen community.
- Apply the information of policies and regulatory issues in the use of antibiotics and drugs for treatment of fish and shellfish diseases.
- Capacity to analyze and interpret data used in HACCP and GMP in shrimp disease.
- Knowledge of techniques used by fisheries biologist and ecologist in the study of aquatic animal health, bacteriology, virology, mycology, parasitology and histopathology.
- Analyses and apply the procedures for collection of disease live and dead samples for preservation of tissues samples, record keeping in aquatic animal health management.
- Clear understanding of fisheries Immuno and molecular diagnostics in aquatic animal health care.
- Knowledge of applications of PCR, RT-PCR, ELISA, Dot Blot Hybridization, FAT, IFAT, RIA and applying them for research.

#### **PRACTICAL II**

##### **PAQ2CRP01 - Inland Aquaculture, Ornamental Fisheries and Fish Health Management**

On completion of the practical sessions the student would have

- Developed sufficient knowledge of the commercially important aquaculture candidate species.
- Attained a clear understanding on weed and predatory fishes in aquaculture systems.
- Expertise in pre-stocking pond preparation steps such as liming of pond.
- Ability to identify fresh water and marine ornamental fishes, crustaceans and plants.
- Skilled in aquarium setting and maintenance improving their employability potential.
- Clear understanding on breeding and larval rearing of ornamental fishes enhancing their

entrepreneurial abilities.

- Acquired sufficient skills in identifying and monitor the health of species and symptomatic assessment of diseases as well as application of treatment methods.

## **SEMESTER – III**

### **PAQ3CRT01 - Mariculture**

Upon completion of the course student will be able to

- To develop understanding about different finfish being cultured around the world.
- To develop basic knowledge in major candidate species for mariculture and their techniques.
- To develop skill and knowledge about steps and procedures involved in the culture of various marine fishes, crustaceans, molluscus, aquatic plants and invertebrates.
- To develop knowledge about artificial breeding technique in fin fishes and crustaceans
- To develop basic knowledge on brood stock maintenance, hatchery technology, induced breeding technology and larval rearing of various finfishes and crustaceans.

### **PAQ3CRT02 - Fish Nutrition**

Upon course completion the students will have gained the following

- Thorough knowledge basic principles of nutrition and formulation of fish feed.
- Clear understanding of the methods for feed formulation.
- Understand and interpret critical scientific and ethical issues in feed formulation and larval rearing.
- Capacity to analyze and distinguish nutritional quality of feeds.
- Concrete knowledge on the methods of manufacture, evaluation and quality control of fish and shrimp feeds.
- Ability to manage feeding strategies and feeding equipments in commercial aquaculture systems.
- Thorough knowledge of the nuances in larval nutrition and management strategies in hatcheries.



### **PAQ3CRT03 - Microbiology and Quality Control**

On completion of the course the students will have gained

- In depth knowledge about the fundamentals of microbiology and quality control in seafood.
- Thorough knowledge on quality control aspects and microbiological techniques to cater to the needs of quality food production systems.
- Awareness of the updated quality standards administered in processing plants and culture units.
- Possess the ability to identify and control spoilage issues in seafood and thereby eliminate the chances of contamination and food related hygiene issues.
- Capacity to understand and find solutions to spoilage related issues in fish and fishery products.
- Essential knowledge required to work as a technologist and quality assurance manager/ quality control manager in the seafood industry.

### **PRACTICAL III**

#### **PAQ3CRP01 - Aquaculture and Fish Nutrition**

On completion of the practical sessions the student would have

- The ability to work in an aquaculture system through the application of various analytical techniques to produce the best yield.
- Acquired sufficient knowledge on maturation and reproductive cycle of prawn and fish.
- Practical ability through hands on training of the extraction of pituitary hormone and induced breeding technique.
- Identify and apply physical parameters such as primary productivity, soil pH and other environmental health management techniques of an aquaculture system.
- Gained thorough knowledge on nutritional balance of fish feed, feed formulation and feed preparation methods.

### **PRACTICAL IV**

#### **PAQ3CRP02 - Microbiology and Quality Control**

On completion of the practical sessions the student would have

- Practical laboratory skills in basic safety and handling protocols in a microbiology laboratory.

- Expertise in staining techniques, sterilization and disinfection principles, preparation of culture media and enumeration and isolation techniques of bacteria aimed at improving the employability skills in the seafood processing sector.
- Skilled in organoleptic assessment of raw materials as well as products in the fishing industry in order to maintain the quality standards of the purchasing and processing sectors.
- Proficiency in enumerating and proposing bacteriological standards to be maintained in different aquatic environments.
- Practical expertise in assessment of spoilage of fish through chemical analytical techniques which is an important requirement from the consumer point of view.

## **SEMESTER – IV**

### **PAQ4CRT01 - Fisheries Business Management**

On completion of the course the students will have attained the following

- In depth knowledge on principles and economics of the fish markets, economics of capture and culture operations and economics of trade and commerce of fish and fishery products.
- Thorough knowledge on the exploitation, management and conservation of varied fishery resources.
- Clear understanding of human resource management in the fisheries business environment.
- Adept in the management techniques and regulatory mechanisms in the processing sector.
- Mastery in the existing measures and nuances in management of the mariculture sector.
- Expertise in environmental impact assessment methods and regulatory procedures aimed at responsible fishing and aquaculture.
- Ability to apply project formulation techniques for future fisheries and aquaculture development in the country.
- Discuss and justify the use of various types of knowledge and sources of information applied in the decision-making processes of fisheries management.
- Evaluate and analyzes the fisheries management systems including policies, legislation, strategies, plan of management and international agreements.

### **PAQ4CRT02 - Fish Capture Technology & Management**

On completion of the course the students attain the following

- Clear understanding of the evolutionary significance of fishing crafts, types of propulsion systems used in fishing craft, limitations of indigenous craft and advantages of mechanized craft.
- Technical knowledge on aspects of bio-deterioration and maintenance of fishing vessels.
- Ability to recognize the environmental influences on fish behavior.
- Expertise in identifying fishing gear materials and designing commercial fishing systems.
- Thorough knowledge on navigation, seamanship and ropework.
- Effective knowledge on capture fisheries management including energy management of fish capture systems.

### **PAQ4CRT03 - Fish Processing Technology**

On completion of the course the students attain the following

- In depth knowledge on freezing technology and adoption of techniques to control food spoilage during frozen storage
- Thorough understanding of the thermal processing techniques and advances packaging technology for fish and fishery products.
- Adept in techniques of curing and dehydration preservation of fish.
- Sufficient expertise in value addition of fish and fishery products aimed at entrepreneurship.

## **PRACTICAL V**

### **PAQ4CRP01 - Fish Capture Technology**

On completion of the practical session the student would have

- Acquired expertise in net mending skills like baiting, creasing, tailoring and fly meshing.
- Skilled in the different methods of mounting of webbing at different hanging coefficient for various types of fishing gears.
- Ability to identify Signal Flags and navigation of vessels at sea with the help of charts.
- Acquired the basics of First Aid techniques on board fishing vessels.

- Skilled to identify different types of ropes like Twisted ropes, Braided ropes and Combination ropes.
- Acquired sufficient skills in the fabrication and installation of Fish Aggregation Devices aimed at resource conservation.

## **PRACTICAL VI**

### **PAQ4CRP02 - Fish Processing Technology**

On completion of the practical sessions the student would have

- Hands on experience in pre-processing techniques like fish filleting, chilling, glazing and freezing techniques.
- Research oriented expertise in frozen storage studies in fishes and shrimps.
- Expertise in canning of different fish and shellfish and quality evaluation processes.
- Skilled in the preparation of a variety of fishery products of industrial significance.
- Skilled in the manufacture of fish and shrimp feeds and nutritional evaluation techniques as well as on site testing skills to cater to the fish/shrimp feed industry.