

THE AMERICAN COLLEGE – COMMUNITY COLLEGE

MADURAI – 625 002

Diploma in Aquaculture

Sem	Course No	Course Title	Hrs/wk	Cr.
I	General Education			
	END 1403	Conversational Skill	4	4
	CSD 1403	Fundamentals of Computers	4	4
	LSD 1403	Fundamentals of Life Coping Skills	4	4
	Skill Component			
	DAQ 1409	Basic of Aquaculture	4	4
	DAQ 1411	Fin fish and Shell Fish Culture	4	4
	DAQ 1113	Aquaculture Lab – I	10	10
	Job Training			
	DAQ 1415	Internship I	120/sem	4
		Total		34
II	General Education			
	END 1404	Reading and writing skills	4	4
	CSD 1404	Office Automation tools	4	4
	LCD 1404	Performance and Life Coping Skills	4	4
	Skill Component			
	DAQ 1410	Ornamental Fish Culture	4	4
	DAQ 1412	Shrimp Farming	4	4
	DAQ 1114	Aquaculture Lab – II	10	10
	Job Training			
	DAQ 1416	Internship II	120/sem	4
		Total		34

redit = 15 hours/Semester

- Internship – 1 credit = 30 hours/Semester

THE AMERICAN COLLEGE – COMMUNITY COLLEGE

MADURAI – 625 002

Advanced Diploma in Aquaculture

Sem	Course No	Course Title	Hrs/wk	Cr.
III	General Education			
	ENA 2403	Studies skills	4	4
	CSA 2403	Operating System	4	4
	LSA 2403	Coping with Psychological and Physical Issues	4	4
	Skill Component			
	AAQ 2409	Fish Seed Production	4	4
	AAQ 2411	Live Feed Production	4	4
	AAQ 2113	Aquaculture Lab – III	10	10
	Job Training			
	AAQ 2415	Internship III	120/sem	4
		Total		34
IV	General Education			
	ENA 2404	Career skills	4	4
	CSA 2404	Programming Techniques using C	4	4
	LSA 2404	Coping with Social and Environmental Issues	4	4
	Skill Component			
	AAQ 2410	Fish Feed Technology	4	4
	AAQ 2412	Post harvest technology	4	4
	AAQ 2114	Aquaculture Lab – IV	10	10
	Job Training			
	AAQ2416	Internship IV	120/sem	4
		Total		34

Theory / Lab courses - 1 credit = 15 hours/Semester

- **Internship – 1 credit = 30hours/Semester**

B.voc in aquaculture

THE AMERICAN COLLEGE, MADURAI- 625002

Sem	Course No	Course Title	Hrs/wk	Cr.
I	General Education			
	EVS 3401	Environmental studies	4	4
	LSV 3401	Entrepreneurship development	4	4
	CSV 3401	Information and communication technology	4	4
	Skill Component			
	VAQ 3401	Fish microbiology and biotechnology	4	4
	VAQ 3403	Intensive and integrated fish farming	4	4
	VAQ 3113	Lab -V	10	10
	Job Training			
	VAQ 3415	Internship -V	120/sem	4
		Total		34
II	General Education			
	VEV 3402	Youth in the global context-value education	4	4
	LSV 3402	Soft skills	4	4
	CSV3402	Data base management system	4	4
	Skill Component			
	VAQ 3402	Mariculture	4	4
	VAQ 3404	Aquatic animals health management	4	4
	VAQ 3114	Lab -VI	10	10
	Job Training			
	VAQ 3416	Internship -VI	120/sem	4
		Total		34

- Theory / Lab courses - 1 credit = 15 hours/Semester
- Internship – 1 credit = 30 hours/Semester

Programme specific outcomes

1. Apply the knowledge of aquaculture in various aspects of environment / industry.
2. Identify and analyze problem related to aquaculture.
3. Designing solution for problems arise in aquaculture practice and environment, society.
4. Connecting investigations to solve the problems arise aquaculture practice and environment.
5. Adapting procedure for laboratory analysis in biochemistry, molecular biology, biotechnology and microbiology.
6. Apply the concepts aquaculture to benefit of society.
7. Contribute the sustainable development of aquaculture to save the environment.
8. Development ethical and working concept of environmental friendly and aqua practice based on inputs of biotechnology, microbiology and genetics.
9. Develop communications skills through seminar and oral presentation.
10. Integrate to individual and teamwork projects and laboratory work.

Mapping of Courses Outcome (COs) with Programme Specific Outcomes (PSOs)

Courses	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
DAQ 1409	√	√	√				√	√		
DAQ 1411		√				√		√		
DAQ 1113	√	√		√			√		√	
DAQ 1410	√	√		√			√			
DAQ 1412	√	√	√							
DAQ 1114	√	√			√					
AAQ 2405	√	√								
AAQ 2407	√	√	√							
AAQ 2903		√	√		√		√			
AAQ 2406	√	√		√						
AAQ 2408	√	√					√			
AAQ 2904			√		√	√				
VAQ 3401	√	√					√			
VAQ 3403	√	√	√				√			
VAQ 3113			√	√	√	√				
VAQ 3402	√	√					√			
VAQ 3404	√	√	√				√			
VAQ 3114	√	√			√		√			

END 1401

Conversational Skills
[Con Skills]

(3h/Wk) (2cr)

The Course aims at helping students converse in English on the matters that matter to them in daily life. It provides the learners with ample opportunities and social contexts through conversations so that they can freely and fluently use informal English. It also exposes them to the apt vocabulary of such informal conversations.

Course Outcomes

At the end of the course, student will be able to:

- i.articulate spoken utterances clearly and fluently,
- ii.speak simple sentences in English with one another in unpredictable situations,
- iii.participate in dyadic communication,
- iv.use phatic communion, and
- v.employ word-stress and intonation in spoken utterances.

Unit 1 : Conversational skills

Unit 2 : Day-to-day matters like eating, emotions, fashion, health, money, romance, housing, job, faith & hope, busy life, memory, shopping, time, Traffic, travelling, vacation, weather

Unit 3 : Social expressions

Unit 4 : English sounds

Unit 5 : English accent and intonation

Textbook

Sekar, J. J. (2014). Conversational Skills. Madurai. Department of English, The American College.

	K1	K2	K3	K4	K5	K6
CO 1				3		
CO 2						6
CO 3						6
CO 4						6
CO 5			3			

Mean: 4.8

Course Outcomes

At the end of the course the student will be able to:

- i. Classify the Generations of a Computer and its applications.
- ii. Recall the components of a Computer.
- iii. Analyze Primary and Secondary storage devices.
- iv. Use Data representation methods.
- v. Develop Data Conversion examples.

Unit I: Introduction to computers Generations of computers –components of computer hardware – software -classification of computers – advantages and limitations – applications of computer

Unit II: Components of the Computer CPU - I/O devices – Types and Features.

Unit III: Computer Memory Primary memory – secondary memory-auxiliary storage devices– cache memory CD – DVD –Pen drive – backup.

Unit IV: Data representation Data – Meaning - Information –Representation - files - Computer words.

Unit V: Number Systems in computer Decimal, Binary, Octal and HexaDecimal - Representation - Conversions.

Text book:

Alphonse X, ICRDCE publication, December 2011.

Reference:

Curtin, D. P. Foley, K.Kunalsen, Morin.C “Information Technology- The Breaking Wave”, TataMcGraw Hill, 2002.

Blooms's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K 1: Remembering		X			
K 2: Understanding	X				
K 3: Applying				X	X
K 4: Analysing			X		
K 5: Evaluating					
K 6: Creating					

FUNDAMENTALS OF LIFE COPING SKILLS

LSA 1203

2 hrs/Wk – 2 Credits

***Objectives:** To prepare the students through the fundamentals of life coping skills for better citizens. To make them sociable and help them develop their personality. Understanding the need for self transformation which will guide them throughout their life in handling relationships and life challenges. To enlighten them with the necessity of learning communication and negotiation skills for achieving greater heights in their personal life and their career.*

Unit - I Introduction to Skills

Introduction to skills – Definition of Coping - Social Skills – Four levels: Foundation, Interactive, Affective, Cognitive – Understanding Body Language

Unit - II Personality Development

Definition of Personality – Characteristics of Personality – Ways to develop personality – Personality types – Four basic temperament

Unit - III Self Transformation

Self Identity – Self Concept – Self acceptance – Self discovery – Self Esteem: High & Low Self esteem – Johari Window

Unit - IV Communication Skills

Understanding communication – Types of communication – Patterns of communication – Importance of communication – Effective & Efficient communication

Unit - IV Assertive Skills

Assertive Behaviour – Benefits of being Assertive – Types of Assertion – Assertion rights – Developing assertive skill

Books for Reference:

1. Alphonse, X. 2011, “We shall overcome” A Text book on Life coping skills”, ICRDCE Publication, Chennai
2. AIACHE Publication 2014, New Delhi, “Human Values Development”

Course Outcome: At the end of this course the student will be able,

CO1: To demonstrate how to be sociable in all demanding situations

CO2: To prepare themselves a better personality through self transformation

CO3: To identify need and importance of an effective and efficient communicator

CO4: To apply the assertive skill techniques in the appropriate life situations

CO5: To formulate personal principles based on the fundamentals of life coping skills

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering			X		
K2: Understanding		X			
K3: Applying	X				
K4: Analyzing				X	
K5: Evaluating					
K6: Creating					X

This theory course deals with the basic and applied aspects of nutritive values of fish, different types of aquaculture practices in India with special reference to exotic and major carps. Various ornamental fishes, shrimps and mollusc are also included. The physico-chemical analysis of water and their impact on aquatic systems are given importance. Emphasis is given to live feed, dry feed and their formulation to enhance production.

Specific learning outcome: At the end of the course students will be able to

- Understand the basic needs of proteins food.
- Explain the types of aquaculture practices.
- Differentiate different types of fishes and invertebrates.
- Describe the need for water quality management and nutrient requirement.
- Diagnose the aquatic pathogens and their control measures.

UNIT-I. Introduction

Food Security-protein crisis-PEM-nutritive value of fish and fishery products-need for aquaculture - culture Fisheries-selection of candidate species

UNIT-II. Types and practices of aquaculture

Types-Inland, brackish water, mariculture and metahaline aquaculture. Practices-culture in ponds, riverside, dams and lakes, temple and irrigation tanks and raceways-Integrated farming.

UNIT-III. Cultivable organisms

Indian major carps-exotic carps-air breathing fishes-cat fishes-ornamental fishes-shell fishes-crustaceans and molluscs.

UNIT-IV. Water quality and nutrition:

Ecosystem-lotic-lentic-brackish water-marine environment-water-physical, chemical and biological characteristics-fish nutrition-nutritional requirements-feed-formulation and preparation-supplementary feed.

UNIT-V Microbial infections and disease diagnosis and control measures

Microbial world and their structural characters- Bacteria, Viruses, fungi, algae- pathogenicity and virulence-source of infection- morphological, physiological and sociological diagnosis-microbiological water quality management- application of probiotics, drugs, chemicals and antibiotics.

References:

1. Jingaran, V.G.1991 Fish and Fisheries of India. Hindustan Publ.Corporation (India).
2. Pillay, T.V.R., 1990: Aquaculture, Principles and practices. Fishing News books Ltd. Mpeda publication.
3. Aline.w.- Fish diseases.
4. Gilbert. B. 1990: Aquaculture – Vol II. Horwood.

B.vocprogramme
Basic of Aquaculture

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Outline the basic needs of protein foods and to analyse nutritive value of fish and fisheries products	PSO1
Unit II	Explain the types and practice of aquaculture along with integrated farming	PSO3
Unit III	Discuss anatomy and physiology of Indian major carps, ornamental fishes and shell fishes	PSO2
Unit IV	Access the important of water quality management and nutrient requirement in aquaculture	PSO7
Unit V	Apply the knowledge on microbial infection and diseases, diagnosis and control measures	PSO8

Blooms taxonomy for Basic of aquaculture

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	CO5
K1:Remembering					
K2: Understand	1		3		
K3: Applying					5
K4: Analyzing		2			
K5: Evaluating				4	
K6: Creating					

Mean: 3

This course is designed to introduce the various techniques involved in the construction of fish ponds and their management. The second section deals with the various techniques involved in fish seed production. The third section deals with seed collection, storing and rearing. The last unit is concerned with fresh water prawn culture and management.

Specific learning outcome: At the end of the course students will be able to

- Explain the designing and managing fish pond.
- Describe the procedure adopted for composite and integrated fish farming.
- Understand the techniques involved freshwater prawn culture.
- Design cages, pen for fish cultivation.

UNIT-I. Construction of fish farm

Site selection-fish pond structure – construction-types of fish ponds-pond community-control of aquatic weeds and predatory fishes.

UNIT-II. Fish farm management

Nursery, rearing and production ponds-Indian major carps, Chinese carps-induced breeding - jar hatchery- seed fish production-transport of breeders and seed fish.

UNIT-III. Composite fish culture, integrated fish farming and composite fish culture

Composite fish culture-Species-feeding-seed collection-feeding- pond rearing techniques-economics-pearl and edible oyster culture-mussel culture. Fish culture in rice fields-freshwater fish culture with pigs, chicks and ducks -waste by products used as in puts in fish farming- vegetables gardening and using vegetable waste as fish/ pig feed.

UNIT-IV. Culture of fresh water prawn

Characteristics and distribution- prawn, seed production, collection of seeds-growth, production management of ponds.

Unit -V. Cage, pen culture and crab culture

Rearing fish within fixed or floating net- construction of cage -bamboo, wood or metal for pond fish culture-Harvesting difficulties-designing pen with enclosures-Evection pen cages at fish pond/ reservoir bottom-pond crab *Scylla* Species culture with over hanging fencing-monoculture with intensive farming-Feeding commercial and fish wastes.

Reference:

1. Michael B. and somsakSingholka 2002 FAO, Manual on freshwater Prawn farming. UNDP –FAO, Rome
2. Midlen and T.A.Redding (1998) Environmental Management for Aquaculture. Kluwer academic publishers, London.
3. New, M.B. 2000. Fresh water prawn farming.CRC Publications.

4. Welcomme.R.L. 2001: Inland Fisheries: Ecology and Management, Fishing news Books.

Fish and shell fish culture

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Apply the knowledge in designing and management of fish pond and to control of aquatic weeds and predatory fishes	PSO8
Unit II	Create knowledge on pond management and in transport of seed fish	PSO3
Unit III	Describe the procedure for integrated fish farming and waste products	PSO2
Unit IV	Discuss the techniques involved fresh water prawn culture and its management	PSO3
Unit V	Design cages, pen for fish cultivation and discuss the harvest in techniques and problems involved.	PSO6

Blooms taxonomy for Fish and shell fish culture

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand				4	
K3: Applying	1				
K4: Analyzing		2			
K5: Evaluating			3		
K6: Creating					5

Mean: 3

The laboratory component includes exercises for collection and identification of Fin fish and shell fish and their physiology. Maintenance of pond and culture techniques is studied.

Specific learning outcome: At the end of the course the students will be able to

- Identify the commercially important fishes.
 - Analyze the gut content, fecundity and GSI in fishes.
 - Examine the water quality parameters.
 - Perform hypophysation and learn induced breeding techniques.
- 1) Collection and identification of commercially important fresh water and marine fishes.
 - 2) Gut content analysis of fishes with different feeding habits
 - 3) Estimation of fecundity and gonad somatic index of commercially important fishes.
 - 4) Assessment of seed quality and feed ration calculation.
 - 5) Lime and fertilizer requirement calculations.
 - 6) Analysis of water: Turbidity, pH, Dissolved oxygen
 - 7) Primary productivity, estimation by Light and Dark bottle method.
 - 8) Preparation of pituitary extract.
 - 9) Visiting nearby aquaculture farms and dams
 - 10) Inviting experts for ornamental presentation and interaction.

Reference:

T.V.R.Pillay (1990) Aquaculture: Principles and practices. Fishing news books. Cambridge University press, Cambridge. U.K.

Lab 1

Upon completion of this course students will be able to	PSO'S
Identify commercially important fish species and their physiology	PSO2
Analyse the reproductive potentiality of commercial species	PSO7
Identify the problems related to physico-chemical parameters maintenance.	PSO4
Explain the procedure for productivity and quality of water	PSO1
Acquire knowledge visiting farms and hearing experiences	PSO9

Basic of aquaculture and fin fish and shell fish culture

Blooms taxonomy for Lab-1.

Basic of aquaculture and fin fish and shell fish culture

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand	1			4	
K3: Applying					5
K4: Analyzing		2			
K5: Evaluating			3		
K6: Creating					

Mean: 3

END 1402

**Reading & Writing Skills
[RWS]**

(3h/wk) (2Cr)

The Course aims at improving the learners' productive skills of English. It offers professional guidance on meaningful and aggressive reading experiences by familiarizing them with techniques and micro-skills of reading, comprehension abilities through literary and non-literary reading materials. It also strengthens their writing skills through the forms of writing that are useful to them academically and vocationally.

Course Outcomes

At the end of the course, students will be able to :

- i. practise the reading of simple prose texts silently and fast,
- ii. produce their comprehension abilities,
- iii. write letter of requests, permission and apology,
- iv. write paragraphs with topic sentence and supportive sentences, and
- v. write five-paragraph essays on simple, contemporary themes.

- Unit 1** : Reading and comprehension skills
Unit 2 : Reading at various speeds, skimming & scanning, inferring
& interpreting, predicting, reorganizing material, comprehension skills
Unit 3 : Writing leave letters and apology letters
Unit 4 : Paragraph writing, five-paragraph essay writing,
Unit 5 : Types of essay and paragraph writing: descriptive, argumentation,
narrative, and expository

Text book

Sekar, John, J. 2014. Reading and Writing Skills. Madurai. Department of English, the American College.

	K 1	K 2	K 3	K 4	K 5	K 6
CO 1			3			
CO 2			3			
CO 3						6
CO 4						6
CO 5						6

Mean: 4.8

CSD 1404

Office Automation Tools

(4h/wk) (4Cr)

Course Outcomes

At the end of the course, students will be able to:

- i. Edit and format text data and tables to make a Document.
- ii. Design worksheet and manipulate data and represent through graphs
- iii. Design a Slide show presentation and show in Multimedia form.

Unit I: Microsoft Word - Working with text - Formatting paragraph -Numbered and Bulleted lists -Working with Tables

Unit II: Mail Merging and Graphics - Spelling and Grammar Checking - Page format – Working with graphics

Unit III: Microsoft Excel - Modifying a Worksheet - Formatting cells - Formula cells

Unit IV: Functions and Charts - Formulae and Functions - Sorting and Filtering – Graphics – Charts.

Unit V: Power-Point -Working with slides -Color Schemes – Graphics – Slide Effects – Master Slides – Presentations-Slide Shows–Animations.

Text book

MS-Office 2003 Manual by Microsoft

Reference

Curtin D.P, Kim Foley K, Kunalsen, Morin. C, “Information Technology- The Breaking Wave”, TataMcGraw Hill 2002.

PERFORMANCE AND LIFE COPING SKILLS

LSA 1204

2 hrs/Wk – 2 Credits

Objectives: *To prepare the students better individuals in the society through life coping skills. To make them understand the need for learning life skills which will guide them to face the challenges. Training them to learn stress management and time management skills in order to achieve their life goals.*

Unit - I GOAL SETTING

Definition – Importance of Goals – SMART Goal & Time management – Types of Goals - Obstacles – Successful and Meaningful life

Unit - II MOTIVATION SKILL

Introduction to Motivation & Inspiration – Internal and External motivation – Methods of Motivation – Effects of de motivation

Unit - III PROBLEM SOLVING SKILL

Definition of problem – Reasons for problems – Stages of solving problems: Evaluation, Managing, Decision making, Resolving, Results

Unit - IV STRESS MANAGEMENT

Definition of Stress: Positive (Eustress), Negative (Destress) – Stressors: Internal, External – Causes of Stress – Types of Stress – Ways to manage stress

Unit - V TIME MANAGEMENT

Need for time management – Poor Time management – Saboteur Time styles – Techniques for managing time

Books for Reference:

1. Alphonse, X. 2011, “We shall overcome” A Text book on Life coping skills”, ICRDCE Publication, Chennai

Course Outcome: At the end of this course the student will be able,

CO1: To plan and set goals for their life

CO2: To assess the need for motivation for successful completion of tasks

CO3: To reflect the problem solving skill in day today life

CO4: To predict stressful situations and causes of stress in order to overcome them

CO5: To identify need for dealing with emotions for positive mental health

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering				X	
K2: Understanding					X
K3: Applying			X		
K4: Analyzing					
K5: Evaluating		X			
K6: Creating	X				

DAQ 1410

Ornamental fish culture

4h/wk-4credits

This course is designed to impart views and essential methods regarding various aspects of ornamental fish culture with practical approach. It introduces the types of aquaria, aquarium fishes and aquarium plants, breeding techniques and their transportation. Finally various diseases attacking the fishes and control measures are dealt with.

Specific learning of outcome: At the end of this course student will able to

- Explain the methodology to keep an aquarium
- Describe the characters of ornamental fishes and plants
- Enlist the various feed and their impact on growth
- Understand the methods of rearing marine ornamental fish and invertebrates
- Explain the diagnostic methods for ornamental fish diseases

UNIT-1: Aquarium keeping History - kinds of aquaria - setting up of an aquarium - requirements for maintaining an aquarium - aquarium accessories - risk factors.

UNIT-II: Popular ornamental fishes

Life bearers, nest builders, mouth bearers, egg layers - life cycle and spawning - plants for aquarium -exotic and indigenous plants.

Unit – III: Marine ornamental fishes in aquarium

Marine ornamental fishes in aquarium – status and breeding – methods of collection and rearing of marine ornamental fishes - keeping marine invertebrate in aquarium

UNIT-IV: Food, feeding, breeding and transport methods

Importance live feed - induced maturation technique - Transport methods and preservation

UNIT-V: Diseases and Economics

Infections bacterial and viral diseases, parasitic and mycotic diseases. Diseases and non infection diseases control and management - quarantine tanks - prophylaxis – vaccines, immune stimulants and probiotics - pet shops and fish dealers.

References:

1. Yadav, B.N 2006. Fish and fisheries 4 th edition. Daya publishing House.
2. Stickney, R.R.1979 Principles of Aquaculture. John wiley& Sons, NY
3. Axelrod, H.R., 1967.Breeding aquarium fishes.TFH publications Inc.England.
4. Srivastava, C.B.L., 1985.Textbook of fishery science and Indian Fisheries. KutubMahal Publications, Allahabad.
5. Thabrow De, W.V. 1981.Popular aquarium plants. Thornbill Press.UK.
6. Madhusoodanakurup. Et al, ornamenta fish – breeding, farming and trade.

Ornamental fish culture

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Apply methodology for aquarium keeping and to avoid the risk factors	PSO4
Unit II	Explain the anatomy and physiology of ornamental fishes and aquatic plants	PSO1
Unit III	Discuss methods for rearing marine ornamental fish and invertebrates	PSO2
Unit IV	Analyzing the composition and effects of various feed and their impact on growth	PSO2
Unit V	Assess the various diagnostic methods for ornamental fish diseases and pet shop management	PSO7

Blooms taxonomy for ornamental fish culture

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand		2	3		
K3: Applying	1				
K4: Analyzing				4	
K5: Evaluating					5
K6: Creating					

Mean : 3

This course aims at providing students with a comprehensive knowledge on important aspects of the shrimp farming techniques. Basic concepts in shrimp biology, their culture methods including water quality maintenance in ponds and feeding will be thought. Special emphasis is given for disease prevention and various control measures. The harvesting techniques and grading the catch is discussed in the later part. Finally organizations involved in export and government schemes are dealt.

Specific learning outcome: At the end of session students will be able to

- Explain the stages of growth In shrimps
- Describe different breeding techniques
- Understand the need to improve water quality during culture
- Explain the feeding schedule and diseases diagnosis in shrimp culture

UNIT-I. Shrimp biology

Habit and habitat-life cycle of different Penaeids-culture based on economic and commercial considerations-developmental stages-culture based on types and designs of culture sites.

UNIT-II. Seed collection and Induced breeding

Wild collection and breeding-hatchery practices-eye stalk ablation and hormone induction-use of growth promoters and probiotics.

UNIT-III. Culture methods

Monoculture-Polyculture- Grow out ponds-pre treatment of inlet water-Water quality maintenance – water recycling – treatment of farm effluent and sediments.

UNIT-IV: Feeding, diseases, diagnosis and treatment.

Natural and supplementary feed-feeding ratio-feeding device and methods - factors affecting digestibility -nutrition deficiency diseases -infectious diseases and diagnosis-antibodies, drugs and chemicals and their mode of action-methods of treatment.

UNIT- V. Harvesting, preservation, mortality and Economics

Harvesting methods-precautions observed during harvesting-preservation techniques-sorting and grading the catch-seafood export promotion and organizations involved-role of co-operatives in shrimp export.

Reference:

1. Chen, T.P. 1976 Aquaculture practices in Taiwan. Fishing News (Books) Ltd., England.
2. Pillay, T.V.R. and Dill.M.A. 1979 Advances in Aquaculture. Fishing News (Books) Ltd., England.
3. Bose, A.N. Gosh.C.T,Yong and A.Mitra, 1991 Coastal Aquaculture Engineering. Oxford & IBH Publishing company Pvt.Ltd.
4. Kurien, C.V and Sebastian.V.O. 1976 Prawns and prawn Fisheries of India. Hindustan Pub.Co.

5. Chakra barty . C & Sadhu A.k. 2000 – Biology hatchers and culture technology of tiger Prawn and giant freshwater Prawn, Daya publication house.

Shrimp farming

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Explain the growth stages in growth in shrimps based on types	PSO1
Unit II	Demonstrate the different breeding techniques by using growth promoters and probiotics	PSO2
Unit III	Describe the various culture methods and water quality maintenance in shrimp farming	PSO2
Unit IV	Analyze the feeding methods, diseases diagnosis in shrimp culture and treatments for them	PSO2
Unit V	Explain the harvesting and preserving methods and roll of co operatives in shrimp exports	PSO1

Blooms taxonomy for shrimp farming

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering	1				
K2: Understand		2			5
K3: Applying					
K4: Analyzing			3	4	
K5: Evaluating					
K6: Creating					

Mean: 3

The laboratory component includes exercises for identification of various ornamental fishes and their breeding techniques. In Shrimp farming the large scale cultivation techniques pond preparation work and its maintenance will be taught.

Specific learning outcome: At the end of the course students will able to

- Identify commercial ornamental fish and shrimp
 - Prepare feed with natural food ingredients
 - Analyze water quality parameters
 - Identify the diseases symptoms in shrimps
- 1) Collection and identification of commercially important ornamental fishes.
 - 2) Estimating the growth parameters
 - 3) Conditioning and packing of ornamental fishes
 - 4) Preparation of feed for ornamental fishes. Floating and sinking
 - 5) Identification of ornamental fish diseases and prophylactic measures.
 - 6) Collection and identification of commercially important shrimps.
 - 7) Types of fertilizers-pond preparation in shrimp culture.
 - 8) Analysis of Water quality parameters.
 - 9) Estimation of feed intake and growth monitoring.
 - 10) Study of disease causing microbes
 - 11) Estimation of bacterial population in water and shrimps.

References:

1. Kurien, C.V and Sebastian.V.O. 1976 Prawns and Prawn Fisheries of India. Hindustan Pub. Co.
2. Boyd, C.E. 1982 Water quality Management for pond fish culture. Elsevier scientific Publishing Company.
3. Srivastava, C.B.L., 1985.Textbook of fishery science and Indian Fisheries.KutubMahal Publications, Allahabad.

Lab -2

Ornamental fish culture and shrimp farming

Upon completion of this course students will be able to	PSO'S
Describe the characters to identify commercially important ornamental fishes	PSO1
Explain the procedure for transportation and feed preparation	PSO2
Identify the nature and diagnosis procedure for ornamental fish diseases	PSO5
Analyse the procedure for pond preparation and water quality maintenance	PSO5
Access the role of pathogenic microbes in shrimp culture	PSO5

Blooms taxonomy for Ornamental fish culture and shrimp farming

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand	1				
K3: Applying		2			
K4: Analyzing				4	5
K5: Evaluating			3		
K6: Creating					

Mean: 3

(S S)

The third sequential General English Course aims at empowering second year undergraduate students with study skills necessary to continue their chosen major disciplines. The course assumes importance in the context of students lacking study skills and strategies for academic success.

Course Outcomes

Upon completion of this course, the student will be able to:

- i. practise healthy study habits and homework habits,
- ii. organise their academic skills,
- iii. apply time management skills,
- iv. explain psychological traits, and
- v. use ICT skills

Unit 1: General, Definition & scope of study skills, their needs, learning styles, study habits, homework habits and strategies to improve study skills

Unit 2: Academic Skills, Effective, active listening, effective reading strategies & essay writing, note taking & making, summarizing, paraphrasing, information transfer, library skills, and dictionary skills.

Unit 3: Time Management, Motivation & success, choosing study partners, creation of study space, barrier to time management, strategies to overcome barriers, punctuality & time management, time management during exam

Unit 4: Psychological Traits, Concentration skills, memory, remembering, stress management, coping with test anxiety, critical thinking

Unit 5: ICT -ICT skills, computer literacy skills at basic, intermediate and advanced levels.

Textbook

Sekar, J.J. (2015). Study Skills. Madurai: Department of English, The American College

	K 1	K 2	K 3	K 4	K 5	K 6
CO 1			3			
CO 2				4		
CO 3			3			
CO 4				4		
CO 5						6

Mean: 4

Course Outcomes

Upon completion of this course, the student will be able to:

- i. Understand the role of Operating system as an interface between user and computer.
- ii. Understand the basic functionality of Operating system.
- iii. Understand the operation of Mobile OS.

Unit I: Introduction to operating system BIOS – DOS – Windows - types of operating system – operating system services - desktop operating system

Unit II: Network operating System - Server operating system – mainframe operating system – embedded operating system.

Unit III: Windows - Features of Windows Operating system – Multiprogramming

Unit IV: Process / Memory Scheduling - Multitasking – Buffering – Spooling – Time sharing – Browser support.

Unit V: Introduction to Android Application of Android – Features of Android – Messaging -Voice based features- Multitasking-Screen Capture-Video Calling-Multiple Language support.

Text books

1. Alphonse X, 2011 ICRDCE publication, December
2. Silberchatz, Galvin and Gagne, 1999. Operating system concepts, John Wiley and sons.

References

1. Curtin D.P, Foley K, Kunalsen, Morin, C. (2002). Information Technology- The Breaking Wave, Tata McGraw Hill.
2. http://en.wikipedia.org/wiki/List_of_features_in_Android

COPING WITH PSYCHOLOGICAL AND PHYSICAL ISSUES

LSA 2203

2 hrs/Wk – 2 Credits

Objectives: *To enlighten the students about psychological and physical issues everyone goes through in their life and how to manage them for successful living. To acquaint them about the consequences of fear, shyness, emotions and stress in order to overcome them for maintaining better relationship with others and in their personal and professional life.*

Unit - 1 Coping with Fear and Shyness

Understanding Fear - Types of Fear – Overcoming Fear – Shyness – Types – Managing Shyness

Unit - II Coping with Emotions & Stress

Types of Emotions – Managing Emotions – Stress – Types & Need for understanding stress – Ways to manage stress

Unit - III Communication & Failure

Communication – Types & Styles – Ways to improve communication – Failure – Managing Failures

Unit - IV Coping with Addictions

Drug addictions – Causes of addiction – Physical & Societal implications – Internet Addiction – Cyber crime - Types and causes – Managing addictions

Unit - V Coping with Sexuality

Sex and Gender – Understanding Gender discrimination – Coping with gender discrimination – Understanding Sexuality – Consequences of Premarital & Extra martial sexual issues – Managing sexuality

References:

1. “We shall overcome - A Text book on Life coping skills”, Indian Centre for Research and Development of Community Education (ICRDCE) Publication, Alphonse, X. 2011, Chennai
2. “Living with Honour”, Macmillan Publishers India Ltd., Shiv Khera 2003
3. “Smart Guide to Relieving Stress”, Wiley, Carole Bodger, 1999
4. “Managing Stress”, National Press Publications, Kristine C. Brewer 1995

Course outcome: At the end of this course the student will be able,

- CO1: To understand the types of fear and shyness and the ways of overcoming them
- CO2: To manage emotions and stress for better living
- CO3: To assess the types and apply the styles of communications in their daily walk of life
- CO4: To identify the ways of coping with social media and substance addictions
- CO5: To evaluate the distinction between Gender and Sexuality and their significance

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering				X	
K2: Understanding	X				
K3: Applying		X			
K4: Analyzing			X		
K5: Evaluating					X
K6: Creating					

This course on fish seed production deals with various reproductive behaviors and breeding techniques. It also includes the hypophysation and using other ovulating agents in fish breeding. Various methods in transporting the seed fish and breeders are also discussed in detail.

Specific learning outcome: At the end of the course students will be able to

- Explain the reproductive strategies in fishes
- Describe the artificial breeding techniques and problems
- Adopt themselves for proper transportation of live stock

UNIT-I. Reproductive biology of carps, air breathing fishes and breeding season

Reproduction in carps-sexual dimorphism, maturation, spawning of fish-factors affecting reproduction of air breathing fishes - *channa*, *clarius* and *anabas*.

UNIT-II. Natural and Induced breeding

Survey of seed resources and requirements-carp and prawn wild seed resources in brackish water and major rivers-bundh breeding types, techniques and problems-fecundity and mortality.

UNIT-III. Induced breeding

Hypophysation of major carps and exotic carps-pituitary gland collection and preservation-other ovulating agents, their dosage for injections-precautions-water quality.

UNIT IV. Seed production and hatchery

Criteria for site selection of hatchery and nursery-hatchery system design and operation-larval rearing stages, rearing technology-culture and use of different live feed in hatcheries.

UNIT-V. Transport of seed fish and Breeders

Transport methods in fish seed and brood fishes-causes of mortality during transport, open and closed system-use of anesthetics.

References:

1. John.E.Bardach John H.Ryther,WilliamO.McLarney, 1972 Aquaculture-The Farming and Husbandry of Freshwater and Marine organisms. John Wiley& Sons, NY.
2. Pondey, A.C.1990 Air Breathing Fishes. Reliance Publishing House, New Delhi.
3. Chondar, C.L.1980 Hypophysation of Indian major carps, Satish Book Enterprise, Agra.
4. Thomas,P.C. .2003. Breeding and seed production of finfish and shell fish, Daya publishing house, New Delhi.
5. CMFRI Bulletin, 1987- national seminar on shell fish resources and farming.

6. Jhingaran, V.G.1991 Fish and Fisheries of India. Hindustan Publ.Corporation (India).

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Explain the reproductive patterns strategies in fishes and breeding season	PSO1
Unit II	Discuss the knowledge in natural and induced breeding techniques and its problems	PSO2
Unit III	Utilize the knowledge in induced breeding techniques	PSO1
Unit IV	Analyse the procedure for selecting sites, producing seeds through hatchery	PSO2
Unit V	Describe the procedure for proper transportation of life stock	PSO2

Fish seed production

Blooms taxonomy for fish seed production

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand	1			4	5
K3: Applying					
K4: Analyzing					
K5: Evaluating		2			
K6: Creating			3		

Mean: 3

Live feed production is emerging areas where the live organisms are cultivated in mass to fulfill the feed requirements. Emphasis is given to the cultivation of Diatoms, Rotifers, Artemia and Daphnia. Various techniques involved in their cultivation are discussed in detail.

Specific learning outcome:At the end of the session students will be able to

- Explain the importance of life feed in aquaculture
- Describe the culture techniques for diatoms, rotifer, Artemia and daphnia.
- Emphasis the need for green algae and spirulina as supplementary feed.

UNIT-I. Mass culture of Diatoms

Methods of culture, maintenance of pure culture of diatoms-different media used for culture-batch culture, continuous culture and mass culture.

UNIT-II. Culture of Rotifers

Methods of collection, maintenance and rearing of rotifers-mass culture-harvest, storage and feeding.

UNIT-III. Artemia culture

Different strains of Artemia-Artemia culture, cyst production, enrichment of Artemia cyst and larvae.-encapsulation of Artemia cyst, hatching, storage and feeding.

UNIT-IV. Mass culture of Daphnia

Construction and preparation of culture tanks-field collection and isolation-inoculation and water quality maintenance-harvesting and sampling.

UNIT-V. Culture of green algae and spirulina

Algae as natural food source- collection and isolation enrichment and establishing unialgal culture-parameters regulating algal growth-procurement of spirulina seed and standardization development of inoculam- culturing –separation and washing of biomass- drying of biomass.

References:

1. Santhanam, R., Ramanathan, M.Vekataramanujam.1997: A Manual of Methods in Plankton. Fisheries College, TNVAS.University, Tuticorin.
2. CIFE Publin.1993.Training manual on culture of live food organisms for aqua hatcheries. Central Institute of Fisheries education, Versova, Mumbai, India.
3. Muthu, M.S., 1983. Culture of Live feed organisms. Tech. paper 14.Summer Institute in Hatchery production of prawn seeds. CMFRI, Cochin.

Live feed production

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Explain the various methods in diatoms cultivation	PSO1
Unit II	Discuss the techniques for rotifers culture storage	PSO2
Unit III	Identify the different strains of Artemia, feeding and rearing techniques	PSO3
Unit IV	Explain the preparation and construction of daphnia culture tanks and water quality maintenance	PSO1
Unit V	Discuss the importance of green algae and spirulina as supplementary feed and culture procedure	PSO2

Blooms taxonomy for live feed production

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand	1			4	5
K3: Applying					
K4: Analyzing		2			
K5: Evaluating					
K6: Creating			3		

Mean: 3

The laboratory component includes exercises for identification of sexually matured fish and shrimp and their breeding techniques. In live feed production large scale cultivation of various organisms will be taught.

Specific learning outcome: At the end of the session students will be able to

- Analyze the sexual maturity in fish sample
 - Collect wild seeds from natural habit
 - Prepare culture media for live feed culture
 - Gain experience through visiting nearby aqua forms
- 1) Biological analysis of fish samples for maturity stages and fecundity.
 - 2) Standardization of commercial ovulating agents.
 - 3) Designing and estimation of area of construction for freshwater fish seed production.
 - 4) Wild seed collection from natural sources.
 - 5) Visiting aquaculture farms and finfish hatcheries.
 - 6) Collection, identification and isolation of live feed organisms.
 - 7) Preparation of culture media.
 - 8) Identifying different strains of Artemia and its culture.
 - 9) Collection of rotifers and rearing.
 - 10) Construction and preparation of Daphnia culture tanks.
 - 11) Mass culture of Cladocerans, copepods and rotifers.
 - 12) Culture of earthworms and chironomid larvae.
 - 13) Visit to Manimuthar and Bhavani sagar During breeding season
 - 14) Visit to Fresh water prawn farm

Reference:

1. Lavens,P. and Sorgeloss,P. 1996.Manual on production and use of live food for aquaculture. FAO.Fisheries Technical paper, 361,FAO,Rome.
2. Jingaran, V.G. 1982 Fish and Fisheries of India. Hindustan Publ. Corporation (India).

Lab 3

Fish seed production and live feed production

Upon completion of this course students will be able to	PSO'S
Analysing the stages of sexual maturity in fishes and the role of hormones	PSO5
Explain the procedure for wild seed collection and hatchery seed production	PSO2
Discuss various method of live feed organism cultivation	PSO2
Designing the infra structure for cultivating daphnia, copepods and chironomids	PSO3
Acquire information by visiting breeding ponds and hatcheries	PSO7

Blooms taxonomy for Fish seed production and live feed production

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand			3		
K3: Applying					
K4: Analyzing	1				5
K5: Evaluating		2			
K6: Creating				4	

Mean: 3

ENA 2402
(CaSkills)

Career Skills

(3h/wk) (2Cr)

The fourth sequential General English Course aims at empowering second year undergraduate students with communication & cognitive skills and personality traits necessary to empower their career skills. The course assumes importance in the context of students lacking career skills and strategies for successful profession.

Course Outcomes

Upon completion of this course, the student will be able to:

- i. speak and write in English,
- ii. practise interview skills,
- iii. explain cognitive skills,
- iv. produce thinking skills, and
- v. understand personal traits

Unit 1: Communication Skills - Active Listening & speaking, written & oral communication

Unit 2 : Interview Skills - Interview questions, job application, CV preparation, self-introduction, presentation skills, negotiation skills, conducting a meeting, agenda setting and recording minutes

Unit 3 : Cognitive Skills - Self- motivation, setting personal goals, problem solving, decision making and delegation skills

Unit 4 : Thinking Skills - Strategic thinking, organization, innovation, leadership skills

Unit 5 : Personal Traits Skills - Personal development & empowerment, confidence & rapport building, tact & diplomacy, emotional intelligence, self-esteem, humour and persuasion skills

Textbook

Sekar, J.J. (2015). Career Skills. Madurai: Department of English, The American College.

	K 1	K 2	K 3	K 4	K 5	K 6
CO 1						6
CO 2			3			
CO 3		2				
CO 4						6
CO 5		2				

Mean: 3.8

Course Outcomes

Upon completion of this course, the student will be able to:

- i. Understand the computer programming in problem solving.
- ii. Understand basic programming techniques.
- iii. Write simple programs using numeric and non-numeric data.

Unit I: Overview of C Middle level language – compilers versus interpreter – the form of a C program – compiling a C program

Unit II: Primitive Data types Operators: Data types – type conversions – operators – formatted input/output functions.

Unit III: Control statements If, if-else, switch, for, while, do..while, break and continue.

Unit IV: Aggregate Data Types Arrays – strings – functions – call by values – call by reference – passing arrays as arguments – local, global static and external variables.

Unit V: Structure and Union User defined data types – Structures - Union

Text book

Balagurusamy.E (2007). Programming in ANSI 'C', 4th edition, Tata McGrawHill.

COPING WITH SOCIAL AND ENVIRONMENTAL ISSUES

LSA 2204

2 hrs/Wk – 2 Credits

Objectives: *To make the students comprehend the social and environmental issues they face in the society. To teach them the necessity for understanding the issues and how to manage them for a better society. To kindle their mind about their responsibility to become a useful citizen to protect the society and the environment where they live.*

Unit -I Coping with Society

Family and Issues related to Marriage – Building relationships – Conflict management – Cultural alienation

Unit - II Coping with Human Resources

Time management – Money management – Skill management: Problem Solving Skills - Social skills - Health management

Unit - III Environmental Issues

Environment Vs Ecology – Pollution: Air, Water, Soil, Sound – Deforestation – Exploitation of natural resources – Environmental protection

Unit - IV Coping with Globalization

Globalization – Trends in Education, Employment, Consumerism – Merits and Demerits of Globalization

Unit - V Coping with Technology

Types of Technology – Technology in day today life - Social Media – Impacts of technology in modern society – Managing life with technology

Reference:

1. Alphonse, X. 2011, “We shall overcome” A Text book on Life coping skills”, ICRDCE Publication, Chennai

Course Outcome: At the end of this course the student will be able,

CO1: To relate the significance of relationships and need for coping with them

CO2: To demonstrate the skills of managing their time, money and health

CO3: To apply their knowledge in protecting their environment and preserve the resources

CO4: To assess the impact of globalization in our society and adjust their living conditions

CO5: To identify healthy ways to cope up with emerging technologies which affect the life

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering					X
K2: Understanding	X				
K3: Applying		X			
K4: Analyzing			X		
K5: Evaluating				X	
K6: Creating					

This theory course deals with the basic and applied aspects of feed production. Basic nutrient requirement of fish and their role in physiology. Various types of food preparation are discussed in detail. Commercial feed formulation and their energetic are discussed at the last section in the feeding methods and schedules, various techniques and tools are included.

Specific learning outcome: At the end of the session students will be able to

- Analyze the nutritional requirement for normal fish growth
- Explain the composition commercial feed ingredient
- Calculate the feeding ration to obtain a good FCR

UNIT-I. Nutritional requirement

Protein, carbohydrate and lipid requirement-amino acid, fatty acid and non protein sources- vitamins and minerals-food additives, immunostimulants, growth promoters and preservatives.

UNIT-II. Feed ingredients

Animal, plant and microbial origin, SCP, silages-nutritional factors, compound feed, pellets, scrambles and micro encapsulated feed.

UNIT-III. Fish feed Formulation and preparation

Feed formulation methods and square methods-On farm feed manufacture -commercial feed formulation-Food storage.

UNIT-V. Nutritional physiology and pathology

Digestion and nutrient flow-factors affecting digestibility- anti nutritional factors and anti metabolites- microbial toxins- nutritional deficiency and symptoms.

UNIT-V. Fish Energetic

Feeding practices-feeding methods and scheduling-ration size, feed performance and economics.

Reference:

1. Halver.J. and Hardy R.W. 2002. Fish nutrition. Academic press, London.
2. Lovell.R.T. 1998. Nutrition and feeding of fishes, Chapman & Hall, New York.
3. Houlihan,D., Boujard,T. and Jobling, M. 2001. Food intake in fish. Blackwell Science Ltd, London.
4. Aquaculture development and co-ordination programme fish feed technology ADCP/REP/ 80/11 FAO. ROME ADCP: 1980.

Fish feed technology

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Analyze the various nutritional requirement and uses for normal fish growth	PSO4
Unit II	Explain the different feed ingredients from animal, plants and microbial origin	PSO1
Unit III	Analyse the fish feed formulation, preparation and techniques involved in food storage	PSO3
Unit IV	Outline the process of digestion nutrient flow and nutrition deficiency	PSO3
Unit V	Describe the feeding practices and performance	PSO2

Blooms taxonomy for fish feed technology

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering		2			
K2: Understand	1				5
K3: Applying				4	
K4: Analyzing					
K5: Evaluating			3		
K6: Creating					

Mean: 3

The objective of this course is to motivate the learner on the preparation of various aquaculture products. Further the students will be trained in making the value added products like fish and prawn pickles and marinated products. In the last section other value added products like sea weed agar and carrageen and are discussed in detail.

Specific learning outcome: At the end of the session students will be able to

- Describe the various value added products from fish
- Prepare various fishery products with their recipes
- Explain various fishery by products

UNIT-I. Value Addition in sea food

Different stages of value added products from fish and shell fish-advantages of value addition – Export value – supply and demand – marketing strategies.

UNIT-II. Fish mince based products/coated fishery products

Fish mince and surimi production – different types of batter and breading -packaging and storing.

UNIT-III. Other Value added products

Preparation of fish/prawn pickles, fish wafers, fish protein hydrolysate, fish curry and mussel products and marinated products.

UNIT-IV. Fishery by-products

Fish meal, protein concentrate, shark fin rays, fish maws, fish liver oil, squalene, pearl essence, gelatin, beche-de-mer, fish silage, sea weed products like agar, alginic acid and carrageenan.

UNIT-V. Infectious microbes and quality assurance of fish food products

Sources and types of microbes in fish and fishery products-factor affecting microbial action in food- spoilage of fresh, semi processed and processed fish and fishery products- amrinr, scombroia and ciguatera toxins assessment of quality changes in fresh and iced fish – HACCP guideline for sea food industry.

Reference:

1. John.E.Bardach John H.Ryther,WilliamO.McLarney, 1972 Aquaculture-The Farming and Husbandry of Freshwater and Marine organisms. John Wiley& Sons, NY.
2. Srivastava.C.B.L. 1988 A Text book of Fishery science and Indian Fisheries. Kitab Mahal publications.

Post harvest technology

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Describe the different of value added products from fish and their economical values.	PSO2
Unit II	Outline fish mince base product and the preparation of storage techniques.	PSO2
Unit III	Explain the preparation of value added fish products and their uses.	PSO1
Unit IV	Analyze the different fishery by products and seaweed products with their uses.	PSO7
Unit V	Explain the factors involved in quality assurance of fish food products and quality guideline.	PSO1

Blooms taxonomy for Post harvest technology

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand					5
K3: Applying					
K4: Analyzing	1			4	
K5: Evaluating			3		
K6: Creating		2			

Mean: 3

The laboratory component includes exercises for formulation and preparation of fish feed and feeding schedule. It will help to find the growth rate of fish and to prepare the value added fishery products for commercial sales.

Specific learning outcome: At the end of the session students will be able to

- Formulate efficient fish feed
 - Identify the brooders maturity
 - Prepare different fishery recipes
 - Gain knowledge by visiting nearby aqua farm and fish product outlets
- 1) Formulation and Preparation of a balanced Fish feed.
 - 2) Estimation of FCR from feeding trails and preparation of feeding table.
 - 3) Estimation of growth parameters from feeding trails.
 - 4) Feeding schedule preparation.
 - 5) Identification of brooders maturity.
 - 6) Determination of moisture content in fish and fish products.
 - 7) Preparation of fishery byproducts.
 - 8) Fish pickling techniques.
 - 9) Value added fish product preparation like fish curry, cutlets and fish fingers.
 - 10) Preparation of Surimi.
 - 11) Visiting nearby fish products commercial outlets.

Reference:

1. Srivastava. C.B.L. 1985 Text book of Fishery science and Indian Fisheries. Kitab Mahal publications.

Lab 4

Fish feed technology and post harvest technology

Upon completion of this course students will be able to	PSO'S
Outline the formulation and preparation of fish feed	PSO3
Describe the procedures involved in feeding schedule and tails	PSO5
Analyse the sexual maturity of fish and moisture content in fishery products	PSO5
Explain the recipes for fishery by products	PSO6
Acquire information on preparation of value added fish products	PSO5

Blooms taxonomy for basic of aquaculture

Fish feed technology and post harvest technology

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand	1				
K3: Applying		2			
K4: Analyzing				4	5
K5: Evaluating			3		
K6: Creating					

Mean: 3

This course is designed to develop environmental awareness to the students. It deals with the natural resources, ecosystems and the impact of human activity on them. This course also imparts the biodiversity and its conservation. It also sensitizes the students on the environmental issues and abatement of pollution and gives suggestion for sustenance.

Course Outcomes

Upon completion of this course, the student will be able to:

- i. Discuss the terminology commonly used in environmental science and to identify renewable and non renewable resources and its proper usage and conservation
- ii. Explain the concept, structure, function of ecosystem and to analyze the interaction of organism at different ecosystem
- iii. Evaluate the adverse human impact on abiotic and biotic community and sustainable strategies to mitigate the impact
- iv. Create knowledge on biodiversity and its conservation and utilize advances in environmental science to resolve issues and anticipate implications.
- v. Assess the consequences of environmental disasters and its remedy

1. **Introduction to environmental studies:** Concept and Scope – importance of sustainability and sustainable development. The Atmosphere, the Hydrosphere, the Lithosphere and the Biosphere. Concept of Renewable and Non-renewable resources:
2. **Ecology and Ecosystems:** Concept of ecology and ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem; food chains, food webs; Basic concept of population and community ecology; ecological succession. Characteristic features of the following- Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (ponds, lakes, rivers, oceans)
3. **Environmental Pollution:** Pollution -Definition - Causes, effects and control measures of - Air pollution - Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards . Solid waste Management: Causes, effects and control measures. Role of an individual in prevention of pollution. Natural Disasters and their Management: floods, earthquake, cyclone and landslides.
4. **Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity. Biogeographical classification of India- values Biodiversity at global, National and local levels. India as a mega-diversity nation - Hot-spots of biodiversity. Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.. Conservation of biodiversity: In-situ and Ex-situ method of conservation.
5. **Social Issues and the Environment:** Water conservation- rain water harvesting, watershed management. Wasteland reclamation. Afforestation. Management and Wildlife conservation. Climate change - Greenhouse effect - global warming - acid rain, ozone

layer depletion. Environmental Laws : Environment Protection Act, 1986 ; The Water Act, 1974, The Air Act, 1981 and The Wildlife (Protection) Act, 1972 , Forest Conservation Act .Issues involved in enforcement of environmental legislation. Public awareness.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering	X			X	
K2: Understanding	X	X			
K3: Applying			X		
K4: Analyzing					
K5: Evaluating					X
K6: Creating				X	

To give an overview about the real concepts of entrepreneurship and to impart knowledge about the various sources for a small business and hence motivate the students to become a job providers.

Course Outcomes

Upon completion of this course, the student will be able to:

- i. Cite the meaning of entrepreneurship and identify the role of entrepreneurs.
- ii. Identify different types of entrepreneurs and the problems faced by them
- iii. Identify the various sources of small business and capable of starting a business by creating own business plan.
- iv. Identify the various institutes and their functions that support entrepreneurs
- v. Identify and utilize the various incentives available for small scale business.

1. **Entrepreneur:** Definition - Characteristics - Functions - Competencies - Entrepreneur vs Entrepreneurship - Role of Entrepreneur in Economic Development.
2. **Types of Entrepreneurs:** Innovative - Adaptive - Fabian - Drone; Entrepreneur vs Intrapreneur, Copreneur; Women entrepreneur - Types - Problems.
3. **Strating a small Business:** Steps; **Project Report:** Contents – Importance.
4. **Institutional Support to Entrepreneurs:** SIDCO - TCOs - DIC - TIIC - SIDBI - Commercial Banks.
5. **Incentives for Small Scale Business:** Subsidy - Tax Concessions - Assistance - Export Assistance - Technical Assistance.

Text Book

E. Gordan & K. Natarajan, Entrepreneurship Development, Himalaya Publishing House, 2017.

References

1. Holt, Entrepreneurship: New Venture Creation, Prentice-Hall, 2018.
2. R. V Badi & A. V Badi, Entrepreneurship, Vrinda Publication (p) Ltd, New Delhi 2010
3. K. Ramachandran, Entrepreneurship Development, Tata McGraw Hill, New Delhi, 2017.
4. Dr. Radha, Entrepreneurial Development, Prasanna and Co, Chennai. 2019

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering					
K2: Understanding	X				
K3: Applying					X
K4: Analyzing		X		X	
K5: Evaluating					
K6: Creating			X		

CSV 3401**Information Communication Technology (4hr/wk) (4Cr)**

This course aims at enabling the student to know the role of ICT resources in modern applications and presenting its environment. This course also makes a student familiar with Web environment and its applications in providing utilization and communication of Information.

Course outcomes:

At the end of the course the student will be able to:

- i. Explain the progress of information and communication technology and their role in modern world.
- ii. Identify the difference between Operating Systems and application software.
- iii. Examine different kinds of software and their working.
- iv. Utilize computer and similar electronic devices suitably for data processing.
- v. Use Internet safely and explore different kinds of information available on the Internet.

Unit I: Accessing the web –Introduction to the browser and browsing Accessing the web II – Introduction to the web familiarity with IOT environment – Connections and Connectors – Inputting in Indian Language – Font and Keyboard

Unit II: Creating with ICT – Handling Text – Handling Data – Handling Media – Operating Systems and its Requirement – Bringing together Hardware and Software

Unit III: Internet to access Information – Exploring Web resources – ICT in class room

Unit IV: Hardware and Software – Assistive Technologies – Working with Data I – Exploring spread sheet- Working with Data II – Exploring with spread sheet.

Unit V: E-mail and Web based Forums –Transacting through the web – Exploring E-commerce applications – Execution and peer evaluations –Evaluation and portable submission.

References

1. Brilliant Ideas for using ICT in the inclusive class room, II Edition, Sally McKeown, Angela McGlashon
2. Introducing Computing: A guide for teachers Edited by Lawrence Williams.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K1: Remembering		X			
K2: Understanding	X				
K3: Applying				X	X
K4: Analyzing			X		
K5: Evaluating					
K6: Creating					

VAQ 3401**Fish microbiology and biotechnology****4h/wk-4credits**

This theory course deals with the various areas of biotechnology in aquaculture include use of

Synthetic hormones, enzymes and vaccines. It covers spoilage of fresh fish, micro organisms and processed to sea foods microbiological safety concept of quality management.

Specific learning outcome: At the end of the course students will be able to

- Describe the scope of biotechnology in fisheries and fish feed.
- Understand the types of probiotics, bioactive compounds used in aquaculture
- Explain the role of microbes in fish food
- Gain the knowledge from principles of fish preservation and processing.

Unit I. Aquaculture biotechnology

Scope of biotechnology in fisheries – transgenic – principles and application in fisheries – feed biotechnology – single cell proteins –nutraceuticals.

Unit II. Probiotics and prebiotics

Types of probiotics and prebiotics with their use- immunostimulants used in aquaculture – bioremediation in aquaculture system – culture of primary cell and secondary culture – development of cell lines and their applications.

Unit III. Recombinant DNA

Proteins of commercial importance – enzymes – hormones –bioactive compounds – therapeutic proteins- bioremediations- treatment of waste water –vaccines in fishes.

Unit VI. Role of microbes in food

Microbes in nature and food – microbes in fish – parameters that affect microbial – psychrophiles, halophiles and thermophiles and their role in spoilage and food poisoning.

Unit V. Principles of fish preservation and processing.

Food pathogen, infection and in toxification – types of fish spoilage, microbes in processed and semi processed fisheries product – concept of quality ,management – TQM, GMP, HACCP and ISO.

References

1. Felix.s. 2007: molecular diagnostic biotechnology in aquaculture, Daya publ. house.
2. Nair. PR: 2008: Biotechnologyandgenetics in fisheries and aquaculture, Dominants publ.
3. Reddy. PUG,Ayyappan.S., Thampy.DM. and Gopalakrishnan 2005: Text book pf fish genetics and biotechnology ICAR.

4. Pandian TJ., Strussmann. CA. and marian., M.P 2005: fish genetics and aquaculture biotechnology .sciences.publ.
5. Robinson. R.K1985: microbiology of frozen food. Elsevier applied sciences publishers.
6. Devadasan. K., mukundan, MK., Antony P.D., and jose joseph 1997. Nutrients and bioactive substnsces in aquacutic organisms. Soft (I).
7. CIFT- training manual.2011: seafood quality assurance CIFT, Cochin.

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Outline the principles and application in biotechnology in aquaculture.	PSO2
Unit II	Analyse the types of probiotics and prebiotics with their application	PSO7
Unit III	Explain the role of recombinant DNA in enzymes and hormone synthesis in fishes and describe the bioremediation natural process.	PSO1
Unit IV	Describe the role of microbes in nature food and their role in spoilage and food poisoning	PSO2
Unit V	Discuss the types of food pathogen, food spoilage and concept of quality management	PSO2

Fish microbiology and biotechnology

Blooms taxonomy for Fish microbiology and biotechnology

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand			3	4	
K3: Applying					
K4: Analyzing	1	2			5
K5: Evaluating					
K6: Creating					

Mean: 3

VAQ 3403

Intensive and integrated fish farming

4h/wk-4credits

This course is reviewed the various integrated practices, integrated management and comprehensive use of aquaculture, agriculture and livestock, with an emphasis of aquaculture. In the last section deals with integrated multi topic aqua cultural system are discussed in detail.

Specific learning outcome: At the end of the course students will be able to

- Explain the status and future for intensive fish forming
- Describe the commercially important fishes, water quality maintenance and monosex seeds.
- Understand the agri based integrated, poultry and duck cum fish culture practices

Unit I. Intensive farming

Status and future for catfishes and tilapia in India –need and development for intensive farming- diseases and control measures.

Unit II. Cat fish and Tilapia

Commercially important fishes – intensifying catfish and tilapia culture –poly culture- water quality maintenance and feeding – sex reversal techniques for tilapia – mass culture of monosex seeds and hybrids in tilapia red tilapia production.

Unit III. Agribased integrated Integrated farming

Rice cum fish culture horticulture, mushroom and sericulture- cattle cum fish culture – waste water recycling- manuring – polyculture.

Unit IV. Poultry and Duck cum fish culture

Designing and construction of integrated fish ponds – monitoring water quality and recycling – feeding and monitoring- sampling and harvesting.

Unit V. Integrated multi – Topic aquaculture system (IMTA)

Selection of species- organic case studies- benefits- prospects.

References

1. Jhingran. UG. 1991: Fish and fisheries of India. Hindustan pibl.corp.
2. Sheperd. J. and Brommage. N.1990. Intensive fish farming B.S.P professional books.
3. Bardach. E.J. Rhyther, J.H and MC. / larney. W.O. 1972: Aquaculture. The farming and Husbandry of fresh water and marine organisms. John Wiley & sons.
4. Pillay TVR. 1990: aquaculture, principles and practices fishing news books.

5. Jayaram. K.C. 2006. Catfishes of india .narendra publ. house.

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Discuss the need, status and uses of intensive farming in India	PSO2
Unit II	Identify the commercially important fishes and their production techniques	PSO7
Unit III	Analyse the agri based integrated fish farming like mushroom culture and sericulture cum fish culture.	PSO7
Unit IV	Designing and construct integrated fish pond and techniques involves in sampling and harvesting.	PSO3
Unit V	Explain the integrated multi tropic agriculture system and its benefits	PSO1

Intensive integrated fish farming

Blooms taxonomy for basic of aquaculture

Intensive integrated fish farming

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand					5
K3: Applying					
K4: Analyzing			3		
K5: Evaluating	1				
K6: Creating		2		4	

Mean: 3

VAQ 3113

Lab-V

10h/wk-10credits.

Fish microbiology and biotechnology, Intensive and integrated fish farming

The laboratory component includes exercises for fish microbiology and biotechnology with their techniques.

Specific learning outcome: At the end of the course the students will be able to

- Identify the procedure for isolating and preparing chromosomes in fishes
 - Study of pathogenic microbes involved in fish spoilage
 - Gain knowledge by visiting nearby tilapia and catfish breeding form
 - Prepare feed for catfish and tilapia
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1. Isolation and quantification of DNA
 2. Preparation of chromosomes from embryo and young fish
 3. Ploidy determination by RBC measurements.
 4. Practical on gene bank sequence data bases.
 5. Study of microbes associated with fish.
 6. Isolation of pathogenic microbes like salmonella, listeria.
 7. Effects of chemicals and physicals preservations on fish spoilage.
 8. Study of aerators and air blowers.
 9. Visiting nearby hybrid tilapia and catfish breeding farm.
 10. Formulation of feeds for catfish and tilapia.

Suggested reading.

1. Gilbert .B. 1990: aquaculture vol II Ellis Harwood
2. Rath. P.K. 2000: fresh water aquaculture. Scientific publ.
3. Felix. S. 2007. Molecular diagnostic biotechnology in aquaculture. Daya publ. house.
4. Pandian. TJ., strussmam C.A and marian. M.P. 2005 fish genetics and aquaculture biotechnology. Science publ.

Lab- 5

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Outline the procedure isolating chromosomes and DNA	PSO5
Unit II	Access the DNA sequence by using bioinformatics centers	PSO4
Unit III	Study the types of pathogenic microbes involved in fish spoilage	PSO5
Unit IV	Analyzing the designs and working principles of aerators and blowers	PSO3
Unit V	Explain the procedure for commercial hybrid <i>Tilapia</i> and <i>Catfish</i> cultivation	PSO6

Fish microbiology and biotechnology, Intensive and integrated fish farming

Blooms taxonomy for

Fish microbiology and biotechnology, Intensive and integrated fish farming

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand	1		3		
K3: Applying					
K4: Analyzing		2		4	
K5: Evaluating					
K6: Creating					5

Mean: 3

YOUTH IN THE GLOBAL CONTEXT

VAL 3402

4hrs /4 credits

Objective: *To make the students understand the meaning and implications of globalization. To acquaint them about new challenges world is facing due to globalization. The good side and the sad side of globalization – To enlighten them about the need to learn family values and practice them to cope up with the newly arising challenges.*

Unit - I UNDERSTANDING KEY CONCEPTS OF GLOBALISATION

Free market Economy and Global Market Network - Communication and transport - Technology and Global Production System - Global Capital and investments - Culture of over consumption - Human needs - Over exploitation of resources

Unit – II EDUCATION IN GLOBALISED CONTEXT

Differential access to Education at the Primary, Secondary and Tertiary level- Problem of Quality Addressing deficiencies – need for communication and other Social skills - need for equitable and quality universal education

Unit - III GLOBALISATION AND EMPLOYMENT

New aspirations and the demands placed on youth - Changing structure of Employment and working norms related to time and remuneration - New Forms of insecurities - Cultural alienation -Youth and Consumerism - Distinguishing successful and meaningful life

Unit - IV YOUTH AND FAMILY VALUES

Mobility of Youth - Fragmentation of family structure - Issues relating to Marriage and Marital harmony; Addressing the growing rate of divorce and separation - Family related values

Unit - V GLOBALISATION AND OTHER SOCIO POLITICAL ISSUES

Poverty and Marginalization under Globalization – Terrorism - Rise of religious fundamentalism and Cultural Chauvinism – Corruption – Democracy - civil society issues – Social Values: Honesty, Hard Work, Trustworthiness

Books for refer

Study Materials will be provided.

Course outcomes: At the end of this course, the students will be able,

- CO1: To explain what is globalization and their important aspects
- CO2: To assess the conditions of education in their society
- CO3: To predict the new challenges arise in the society due to globalization
- CO4: To analyze the emerging trends in employment and cope up with them
- CO5: To apply the values in their lives amidst the changing scenario

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Bloom's Taxonomy	CO1	CO2	CO3	CO4	CO5
K1: Remembering			X		
K2: Understanding	X				
K3: Applying					X
K4: Analyzing				X	
K5: Evaluating		X			
K6: Creating					

The learner will gain the skills required for the corporate world that would enhance one's employability and to provide an exposure to the students regarding the soft skills required for the job market.

Course outcomes:

At the end of this course, the students will be able to:

- i. Cite the meaning and define soft skill and also to identify the different types of soft skills.
- ii. Identify different types of communication and overcome the barriers for effective communication.
- iii. Develop and exhibit a good body language and enhance their personality.
- iv. Exhibit a polite behaviour in society or among members of a particular profession or group and enrich their public speaking skill.
- v. Enhance their writing skill and face interviews without fear.

Unit I - Soft Skill: Definition - Importance of soft skills - Types of soft skills.

Unit II - Communication: Definition - Process - Types - Verbal, non-verbal - Uses - Barriers of effective communication.

Unit III - Inter Personal Relation Skills: Body Language and personality.

Unit IV- Etiquettes or Manners: Art of Public Speaking - Characteristics of a good speech - Planning to speak.

Unit V- Writing Skills: Importance - Types **Interview:** Types - Selection - Appraisal - Exit.

Text Book

Rajendra Pal & J. S. Korlahalli, Essentials of Business Communication, Sultan Chand & Sons, New Delhi, 2016.

References

N.S.Raghunathan&B.Santhanam, Business Communication, Margham Publications, Chennai, 3rd Edition 2018.

Reddy, Appannnaih& Raja Rao, Essentials of Business Communication, Himalaya Publishing House, Mumbai, 2017.

Rizvi, M. Ashraf - Effective Technical Communication, Tata McGraw Hill, 2011

Blundell J. A & Middle N. M. G.: Career – English for the Business and Commercial World, Oxford University Press, 2009

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K 1: Remembering					
K 2: Understanding	X				
K 3: Applying		X	X		
K 4: Analysing				X	
K 5: Evaluating					X
K 6: Creating					

Database management system

(4h/wk) (4Cr)

This course is intended to familiarize the students with the concept and significance of database maintenance and management. Moreover, the course would orient the students about the various aspects involved need for systematic retention of database involved in their respective vocations.

Course outcomes

At the end of the course the student will be able to:

- i. Identify the database approach and the database applications
- ii. Apply relational expressions for queries.
- iii. Examine the database design by normalization.
- iv. Build a table and manipulate the data using SQL Commands.
- v. Summarize the transactions, its properties and the concurrency controls.

Unit I: Databases and database users: Introduction – Characteristics of the database approach – Advantages of using the DBMS approach – A brief history of Database Applications.

Unit II: Database System Concepts and Architecture – Data Models, Schemas and Instances.

Unit III: Database Languages and Interfaces: The Database System Environment – Centralized and Client / Server Architecture for DBMSs – Classification of Database Management System.

Unit IV: Relational Model Concepts: Relational model Constraints and Relational Database Schemas, Update Operation, Transaction and dealing with Constraints violations.

Unit V: Database Recovery Concepts - Caching(Buffering) of Disk blocks – Write-ahead Logging, Steal / No-Steal and Force / No-Force - Checkpoints in the System Log and Fuzzy Check pointing – Transaction rollback

References

1. “Database Management System” – Raghu Ramakrishnan and Johannes Gehrke – 3rd edition, McGraw-Hill, 2003.
2. “DBMS a Practical Approach”, E.R. Ragiv Chopra, S Chand Publications.

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	CO1	CO2	CO3	CO4	CO5
K 1: Remembering	X				
K 2: Understanding					X
K 3: Applying		X		X	
K 4: Analysing			X		
K 5: Evaluating					

K 6: Creating					
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VAQ 3402

Mariculture

4h/wk-4credits

This course is designed to introduce the culture of marine organism both plants and animals in an aquatic medium. Learn to form fish crustaceans and shellfish in salt water and also explain the use and production and aquatic algae.

Specific learning outcome: At the end of the course students will be able to

- Outline the different mariculture practices and their demand
- Explain the procedure commercial production of finfish, crustaceans and molluscs
- Describe the techniques involved in seaweed culture, agar, algin and carrageen species cultivation.
- Learn to plan and manage the mariculture practices.

Unit I. Mariculture products and demand

Different farming system- cage and pen culture, types, site selection, construction and specification-factors affecting mariculture in India.

Unit II. Cultivable fin fishes

Biology, seed collection, nursery rearing culture technique- problem and prospects, seabars, milkfish, mullets, pearlspot, seabreams, rabbit fish, grappers, cobia and salmon.

Unit III. Culture of marine molluscs and echinoderm

Present status and scope- species cultured (mussels, oysters, pearl oyster, scallops, cockles and sea cucumber) – distribution, biology and practices – farming methods.

Unit IV. Culture of crustaceans

Shrimp farming- pond construction preparation and managements- harvesting and handling- production of soft shell crabs and mud crab fattening- lobster and crayfish culture.

Unit V. Sea weed culture

Commercially important seaweed species methods of culture- farming of agar, algin, carrageen species emerging trends and integration with other farming system.

References

1. Bardach. E.J. Rhyther JH & MC larney wo 1972. Aquaculture the farming and husbandry of fresh water and marine organisms John Wiley & sons.
2. ICAR 2006. Handbook of fisheries and aquaculture ICAR. Pillay TUR & Kutty MN 2005. aquaculture: principles and practices 2nd edition. Blackwell.

Mariculture

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Describe the need and demand for mariculture products and factors affecting it.	PSO2
Unit II	Analyse the culture practice in finfishes and shell fishes through mariculture.	PSO7
Unit III	Outline procedure for marine mollusks and echinoderm cultivation	PSO2
Unit IV	Explain the procedure for construction preparation management in marine crustacean culture.	PSO1
Unit V	Discuss the involved in it sea weed culture methods and techniques.	PSO2

Blooms taxonomy for Mariculture

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand				4	
K3: Applying			3		
K4: Analyzing		2			
K5: Evaluating	1				5
K6: Creating					

Mean : 3

This course is designed to introduce the defense mechanism and immune system and inflammation response to disease. The second section deals with the parasitic and mycotic diseases. The third section deals with infection bacterial and viral diseases. The last section deals with the health management techniques and seed certification.

Specific learning outcome: At the end of the course students will be able to

- Describe the immune mechanism involved against infectious diseases
- Explain the character, diagnosis, prevention and treatment for parasitic, mycotic, bacterial and viral infection.
- Analyse the diagnosis of nutritional deficiency diseases and the health management techniques.

Unit I: Defence mechanism

Specific and non specific mechanisms in fish and shell fish- Immune cells, immune system- Innate, acquired and inflammation response to diseases

Unit II: Parasitic and mycotic diseases

General characterizes- Epizootiology - Diagnosis, Prevention and treatment

Unit III: Infections bacterial and viral diseases

Symptoms and diagnosis- prevention and treatment- EHNV, KHV, SVCV, VNNV- white spot and Taura syndrome

Unit IV: Non – infectious diseases

Nutritional diseases- Environmental parameters and their effect on fish health diseases in hatchery- Vaccines and adjuvant –administration and mode of action

Unit V: Health management techniques

Microbial, hematological, histopathological, immunological techniques – diseases surveillance and reporting – Diseases control and management – Fish health and quarantine system – Seed certification.

References

1. Andrews C. Excell. A. Carrington N. 1988: The manual of fish health. Salamander books.
2. Sindermann CJ. 1990 Principal Diseases of marine fish and shell fish. Vol I, II, 2nd Ed. Academic press.
3. Felix. S. Raji John. K Prince Jwyaseelen MJ. And Sundaraj V. 2001: Fish diseases diagnosis and health management. Fisheries College and Research Institute, T.N

4. Veterinary and animal sciences university. Thoothukudi.

Aquatic animals and health management

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Discuss the immune mechanism against infectious diseases in fish and shell fishes	PSO2
Unit II	Outline the general characterizes parasitic, and mycotic diseases along with prevention and treatment method	PSO3
Unit III	Explain the diagnostic patterns for various bacterial and viral diseases, prevention and treatment.	PSO1
Unit IV	Identify causes and diagnosis of the non infectious diseases and environmental factors that influence.	PSO7
Unit V	Describe the health management techniques and diseases surveillance.	PSO2

Blooms taxonomy for Aquatic animals and health management

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand			3		
K3: Applying		2		4	
K4: Analyzing					
K5: Evaluating	1				5
K6: Creating					

Mean : 3

Mariculture and Aquatic animals and health management

The laboratory component includes exercise for using microscope sampling preparation of media and culture of pathogenic bacteria. Histopathological studies, assessment of seed quality prophylactic and quarantine measures are studied.

Specific learning outcome: At the end of the course students will be able to

- Analyze the infected part of fish by using histopathological studies
 - Estimate the dose of chemicals and drugs for treating common diseases
 - Identification of cultivatable seaweeds, marine finfish and shellfish
 - Gain knowledge through visiting coastal aquarium and assessing the seed quality.c
1. Analysing infected parts of fish by using microscope
 2. Histopathological studies on infected fish
 3. Determination of dosages of chemicals and drugs for treating common diseases
 4. Identification of cultivatable marine fin fishes and shell fishes
 5. Identification of cultivatable sea weeds
 6. Designing of different farming system - cages, pens, raffles.
 7. Visiting coastal aquarium
 8. Assessment of seed quality – stress test
 9. Taxonomy and identification of fish parasites
 10. Sampling, preparation of media and culture of pathogenic bacteria
 11. Prophylactic and quarantine measures

References

1. Shankar KM & Mohan CU 2002. Fish and shell fish health management UNESCO publ.
2. Woo PTK & Bruno DW (Eds) 1999. Fish diseases and disorders. Vol III. Viral, bacterial and fungal infection CABI.

Lab -6

Mariculture and aquatic animals health management

Unit	Upon completion of this course students will be able to	PSO'S
Unit I	Analyzing infected area of fish by using diagnostic tests	PSO2
Unit II	Identify the character of various sea weeds, fin fishes and shell fishes	PSO1
Unit III	Design the structure of cages, pens and raffles	PSO7
Unit IV	Assess the character of good seeds by observation	PSO2
Unit V	Explain the procedure for sampling and culture for pathogenic microbes	PSO5

Blooms taxonomy for basic of aquaculture

Mariculture and aquatic animals health management

Blooms Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	Co1	Co2	Co3	Co4	Co5
K1: Remembering					
K2: Understand					5
K3: Applying				4	
K4: Analyzing	1				
K5: Evaluating		2			
K6: Creating			3		

Mean: 3