KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ

ಸ್ವಾತಂತ್ರ್ಯದ ಅಮೃತ ಮಹೋತ್ಸವ

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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/JS/MGJ(Gen)/2024-25/ 612 Date: 27 JUL 2024

ಅಧಿಸೂಚನೆ

ವಿಷಯ: ಸರಕಾರದ ಆದೇಶ ದಿನಾಂಕ: 08.05.2024 ಅನುಸಾರ 2024–25ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಪದವಿಗಳಿಗೆ NEP ಅಡಿಯಲ್ಲಿ ಪ್ರೋಗ್ರಾಂ ವಿನ್ಯಾಸ (Curriculum Structure)ದಂತೆ ಪರಿಷ್ಕೃತ ಪಠ್ಯಕ್ರಮದ ಅನುಷ್ಠಾನ ಕುರಿತು.

ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಪ್ರಧಾನ ಕಾರ್ಯದರ್ಶಿಗಳು, ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 166 ಯುಎನ್ಇ 2023, ದಿ: 08.05.2024.
2. ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯಗಳ ಸಂ:2, 3, 4, 5, 6, 7, 8 & 9, ದಿ:16.07.2024.
3. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಅನುಮೊದನೆ ದಿನಾಂಕ: 27/07/2024

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ, ಉಲ್ಲೇಖ–01ರ ಸರಕಾರ ಆದೇಶಾನುಸಾರ 2024–25ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಈ ಕೆಳಗಿನ ಎಲ್ಲ ಸ್ನಾತಕ ಪದವಿಗಳ NEP ಅಡಿಯ ಪ್ರೋಗ್ರಾಂ ವಿನ್ಯಾಸ (Curriculum Structure)ದಂತೆ ಪರಿಷ್ಕೃತ ಪಠ್ಯಕ್ರಮ ರಚನೆ ಕುರಿತಾಗಿ ಸಂಬಂಧಿಸಿದ ಅಭ್ಯಾಸಸೂಚಿ ಮಂಡಳಿ ಹಾಗೂ ನಿಖಾಯಗಳ ಶಿಫಾರಸ್ಸನಂತೆ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೊದಿತ ಪದವಿಗಳ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನಲೋಡ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕ.ವಿ.ವಿ.ಯ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅ.ನಂ.	ಪದವಿ				ಸೆಮಿಸ್ಟರ್
1	1	B.A	8	BTTM	1 ರಿಂದ 6ನೇ ಸೆಮಿಸ್ಟರ್
	2	BSW	9	B.Sc	
	3	B.Sc. (H.M)	10	BCA	
	4	B.Com	11	B.Com (CS)	
	5	B.Com (E-Commerce Operation)	12	B.Com (Retail Operations)	
	6	B.Com (Banking Financial Services & Insurance)	13	B.Com (Logistics)	
	7	BBA	14	BBA (Logistics Management)	
2	1	B.Sc (Data Science)	2	B.Sc (Artificial Intellgence & Machinery Learning)	1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್
3	1	BASLP	3	BPA	1 ರಿಂದ 8ನೇ ಸೆಮಿಸ್ಟರ್
	2	BVA	4	B.Sc. Pulp & Paper	

ಕುಲಸಚಿವರು.

ಅಡಕ: ಮೇಲಿನಂತೆ

ಗೆ,
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:
1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು / ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು / ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ / . ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ನೊಡಲ್ ಅಧಿಕಾರಿಗಳು, ಯು.ಯು.ಸಿ.ಎಂ.ಎಸ್. ಘಟಕ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ಎನ್.ಇ.ಪಿ. ನೊಡಲ್ ಅಧಿಕಾರಿಗಳು, ಸಿ.ಡಿ.ಸಿ. ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

KARNATAKUNIVERSITY,DHARWAD

B.Sc.(Industrial Fish and Fisheries)
IFF

SYLLABUS

WithEffectfrom2024-25

DISCIPLINE SPECIFIC CORE COURSE (DSC) FOR SEM I -VI,

SKILLENHANCEMENTCOURSE(SEC)FOR SEMIV/V/VIand

ELECTIVE COURSES FOR SEM V AND VI

ASPERNE P(Revised):2024

KarnatakUniversity,Dharwad

B.Sc.Industrial Fish and Fisheries (IFF)

Effective from 2024-25

Sem.	Type ofCourse	Theory/ Practical	Course Code	CourseTitle	Instruction hour/ week	Totalhours / sem	DurationofExam	Marks			Credits
								Formative	Summative	Total	
I	DSC-1	Theory	C 1 IFF 1 T 1	BIOLOGY OF FIN FISH AND SHELL FISH	04hrs	60	03hrs	20	80	100	04
	DSC-2	Practical	C 1 IFF 1 P 1	COMMERCIAL IMPORTANT FIN AND SHELL FISHERIES	04hrs	56	03hrs	10	40	50	02
II	DSC-3	Theory	C 2 IFF 1 T 1	ORNAMENTAL FISHERIES AND ENTREPRENEURSHIP	04hrs	60	03hrs	20	80	100	04
	DSC-4	Practical	C 2 IFF 1 P 1	AQUARIUM AND ORNAMENTAL FISHERIES	04hrs	56	03hrs	10	40	50	02
III	DSC-5	Theory	C 3 IFF 1 T 1	CAPTURE FISHERIES AND INLAND FISHERIES	04hrs	60	03hrs	20	80	100	04
	DSC-6	Practical	C 3 IFF 1 P 1	GEARS AND CRAFTS OF INLAND AND MARINE FISHERIES	04hrs	56	03hrs	10	40	50	02
1V	DSC-7	Theory	C 4 IFF 1 T 1	FISHERIES TECHNOLOGY AND FISHERIES EXTENSION	04hrs	60	03hrs	20	80	100	04
	DSC-8	Practical	C 4 IFF 1 P 1	BY-PRODUCTS OF FISH, ITS PRODUCTION AND COMMERCIAL IMPORTANCE	04hrs	56	03hrs	10	40	50	02
*V	DSC-9A	Theory	C 5 IFF 2 T 1	PRINCIPLES AND PRACTICE OF AQUACULTURE	04hrs	60	03hrs	20	80	100	04
	DSC-10A	Practical	C 5 IFF 2 P 1	WATER AND SOIL PARAMETER ANALYSIS FOR FISH POND	04hrs	56	03hrs	10	40	50	02
	DSC-9B	Theory	C 5 IFF 2 T2	FRESHWATER AQUACULTURE AND MARICULTURE METHODS	04hrs	60	03hrs	20	80	100	04
	DSC-10B	Practical	C 5 IFF 2 P 2	BOTTOM SOIL AND WATER QUALITY MANAGEMENT OF FISH POND	04hrs	56	03hrs	10	40	50	02
*VI	DSC-11A	Theory-	C 6 IFF 2 T 1	FISH GENETICS, HATCHERY TECHNOLOGY, FISH MICROBIOLOGY AND ECOLOGY	04hrs	60	03hrs	20	80	100	04
	DSC-12A	Practical	C 6 IFF 2 P 1	PRIMARY PRODUCTIVITY OF POND AND INDUCED BREEDING IN FISH	04hrs	56	03hrs	10	40	50	02
	DSC-11B	Theory-	C 6 IFF 2 T 2	FISH BIOTECHNOLOGY, FISH BIOCHEMISTRY, FISH SEED PRODUCTION AND FISH ENVIRONMENTAL BIOLOGY	04hrs	60	03hrs	20	80	100	04
	DSC-12B	Practical	C 6 IFF 2 P 2	BIOCHEMICAL ASSESSMENT OF FISH AND POND PRODUCTIVITY	04hrs	56	03hrs	10	40	50	02
V	EC-1	Theory	C 5 IFF 5 T 1	INTRODUCTION TO FISHERIES SCIENCE	03hrs	45	03hrs	20	80	100	03
VI	EC-2	Theory	C 6 IFF 5 T 1	INLAND AND CAPTURE FISHERIES OF WORLD AND INDIA	03hrs	45	03hrs	20	80	100	03
IV/V/VI **	Skill	Practical	C 0 IFF 6 P 1	FISH POND PREPARATION, CULTURE, MANAGEMENT AND SEED PRODUCTION	04hrs	56	03hrs	10	40	50	02

*Student shall either DSC 9A and DSC10A or DSC 9B and DSC10B in 5^{th} semester. Similarly, DSC 11A and DSC12A or DSC 11B and DSC12B in 6^{th} semester.

** Student shall study Skill of this subject either in 4^{th} / 5^{th} / 6^{th} but not in all the semester.

Karnatak University, Dharwad
B.Sc. Industrial Fish and Fisheries (IFF)

Programme Specific Outcomes (PSO):

On completion of the 03 years Degree in Industrial Fish and Fisheries students will be able to:

- The ability to demonstrate sound understanding related to biology, breeding, genetics and nutrition of various cultivable organisms.
- Acquired sufficient skills and knowledge in aquaculture reproduction, hatchery management and applied genetics.
- Gained sufficient knowledge on applying the adaptive management strategies to protect the endemic freshwater and brackishwater fishery resources
- Ability to diagnose aquaculture related diseases and manage health and safety issues in aquaculture ventures.
- Employ scientific techniques, practical skills and management strategies aimed at improving culture resource management.
- Expertise in handling various instruments and technical aspects related to water/soil quality assessment thus resulting in solving issues in connection with quality management in culture systems.
- Skilled to analyse the quality assessment and post-harvest technology to manage live fish and fishery products.
- Exploit and utilize wisely fisheries resources using appropriate and innovative fishing methods
- Apply post-harvest practices that are compliant to international standards for food safety and quality
- Engage effectively in biochemical analyses which are relevant in culture industry.
- Demonstrate, solve and understand the major concepts in all the disciplines of fisheries.
- Understand practical skills so that they can understand and assess risks and work safely and competently in the laboratory.
- To apply standard methodology to the solutions of problems in fish and fisheries.
- Provide students with the ability to plan and carry out experiments independently and assess the significance of outcomes.
- Develop in students the ability to adapt and apply methodology to the solution of unfamiliar types of problems.
- Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of fisheries related subject.
- To build confidence in the candidate to be able to work on his own in industry and institution of higher education.
- To develop an independent and responsible work ethics.

B.Sc. Semester–I

DisciplineSpecificCourse(DSC)

Course Title:-BIOLOGY OF FIN FISH AND SHELL FISH

Course Code:C 1 IFF 1 T 1

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-1	**Theory**	**04**	**04**	**60hrs.**	**3hrs.**	**20**	**80**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO1: Understand the difference between teleost and elasmobranchs

CO 2: Understand anatomy of fish

CO 3: Understand different feeding habit of fish

CO 4: Understand different reproductive behavior of fish

CO 5: Understand overall fish and their body anatomy

CO 6: Understand overall fin fisheries and shell fisheries

Unit	Title:BIOLOGY OF FIN FISH AND SHELL FISH	60 hrs/sem
UnitI	Classification of super class Pisces and their characters. The differences between elasmobranches and teleost. Study of external morphology of typical elasmobranches and teleost. The structures used in taxonomic studies like skin, coloration, scales, mouth, jaws etc.,External characters of fishes – shape, head, mouth, eyes, barbles, operculum, fins, spines, trunk, tail, scales, lateral line.	15 hrs
UnitII	Commercially important orders, families, genera and species of elasmobranches and teleosts of Indian region and their identification. Identification of commercially important Fishes (fresh, marine and brackishwater), Prawn, Lobsters, Bivalves, Gastropods and Cephalopods of India.	15 hrs
UnitIII	Internal anatomy of fish; Alimentary canal and associated structures. Respiratory system, Gill, Swim bladder, Accessory respiratory organs. Heart and circulatory system. Nervous system and lateral line system, Sense organs. External characters of Prawn, Lobsters, Bivalve, Gastropods and Cephalopods (two examples from each)	15 hrs
UnitIV	Feeding habitat in various groups of marine and freshwater fishes. Natural food of herbivorous, omnivorous, and carnivorous fishes. Anatomical difference of herbivore,	15hrs

	omnivorous and carnivore fishes. Feeding habitat of Prawn, Crab, Lobsters, Bivalve and Cephalopods.Reproductive system in fishes: Reproductive behavior and parental care in fishes. Special behavior, aggregation and shoaling. Migration of fishes; anadromous and catadromous, potamodromous and oceanodromous migration.	

Recommended books:

1. Bal, D.V. and Veerabhadra Rao, K. Marine Fisheries, Tata MC Grawhill Publications, New Delhi.
2. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
3. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
4. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
5. Kaestner, A. Invertebrate Zoology. Vol. I – III, John Wiley & Sons, 1967.
6. Kurian, C.V. & V.O. Sabastian. Prawns and Prawn Fisheries of India. Hindustan Pub. Co., 1976.
7. Parker, J. & W.A. Haswell. The Textbook of Zoology. Vol. I. Invertebrates (eds. A.J. Marshall & W.D. Williams), ELBS & McMillan & Co., 1992.

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	05
InternalAssessmentTest2	05
Assignment	10
Total	**20Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester–I

DisciplineSpecificCourse(DSC)

Course Title:Commercial importantFin and shell fisheries (Practical)

Course Code:C 1 IFF 1 P 1

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-2	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**10**	**40**	**50**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO1: Understand morphometry of fish

CO 2: Study of different fin fishes of India

CO 3: Study of different fin fishes of India

CO 4: Anatomy of fish to understand organ arrangement

CO 5: Mounting of fish organs

CO6: Study different commercial important fish and shell fishes

List of the Expedients, each will have 4rs / Week (Minimum 12 experiments)

1. Study of external morphology and morphometry of a typical fresh water teleost fish. (Types of scales, fins and mouth type)
2. Study of external morphology and morphometry of a typical marine/ brackish water teleost fish. (Types of scales, fins and mouth type)
3. Taxonomic classification, identification, description and economic importance of fresh water fin fish of India.
4. Taxonomic classification, identification, description and economic importance of marine water fin fish of India.
5. Taxonomic classification, identification, description and economic importance of brackishwater water fin fish of India.
6. Taxonomic classification, identification, description and economic importance of fresh water shell fish of India.
7. Taxonomic classification, identification, description and economic importance of marine water shell fish of India.
8. Taxonomic classification, identification, description and economic importance of brackishwater water shell fish of India.
9. Study of anatomy of typical elasmobranches a reproductive system in shark.

10. Study of anatomy of typical teleosts analimentary canal in freshwater fish (any one fish).
11. Mounting of Scales and mounting of brain of shark/fishes.
12. Mounting of scales and Amphullae of Lorenzini in shark.

SCHEME OF PRACTICAL EXAMINATION

1. Mounting of Amphullae of Lorenzini/Scale/brain.	05 marks
2. Morphometry of the given fish.	10 marks
3. Identification 10X2	20 marks
4. Journal	05 marks
……..	
Total	**40 marks**

Instructions if any:

1Compulsory identification given fresh water fishes
2Compulsory identification given marine water fishes
3Compulsory identification given brackish water fishes
4Compulsory morphometry given on fresh water fishes
5Compulsory any one mounting given to students
6 Compulsory identification given shell fishes

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. Kaestner, A. Invertebrate Zoology. Vol. I – III, John Wiley & Sons, 1967.
5. Kurian, C.V. & V.O. Sabastian. Prawns and Prawn Fisheries of India. Hindustan Pub. Co., 1976.
6. Parker, J. & W.A. Haswell. The Textbook of Zoology. Vol. I. Invertebrates (eds. A.J. Marshall & W.D. Williams), ELBS & McMillan & Co., 1992.

B.Sc. Semester– II

DisciplineSpecificCourse(DSC)-

Course Title: -Ornamental Fisheries and Entrepreneurship

Course Code:**C 2 IFF 1 T 1**

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-3	**Theory**	**04**	**04**	**60hrs.**	**3hrs.**	**20**	**80**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO 1: To understand different ornamental fishes

CO 2: To understand ornamental fish breeding techniques

CO 3: to understand how to construction of aquarium

CO 4: To understand maintenance of aquarium

CO 5: To understand Ornamental Fisheries and Entrepreneurship

CO6:To understand marine ornamental organisms and fishes

Unit	Title: Ornamental Fisheries and Entrepreneurship	60 hrs/ sem
Unit I	Aquarium trade and entrepreneurship: Ornamental fisheries status of Global and India. Domestic aquarium trade, National and International ornamental fish trade. National and international agencies associated with ornamental fish entrepreneurships. Marketing and management of ornamental fish Growth of Fish; Absolute and relative growth. Isometric and allometric growth. Marking and tagging of fish for growth, length and weight relationship, ponderal index, relative factor, gonado somatic index.Reproduction; Sex difference, sexual maturity, classification of maturity stages, estimation of fecundity, ova-diameter frequency, fecundity in relation to length, weight, age and food supply.	15 hrs
UnitII	Spawning habits, factor affecting spawning, spawning seasons and spawning frequency. Embryonic and early development; Type of eggs, larvae. Metamorphosis of larvae, larval life and feeding habitats of fishes. Ornamental fishes:Common species of ornamental fish suitable for aquarium. Water equality for breeding tanks, selection and conditioning of fish. Freshwater ornamental species- livebearers, egg layers. Maturation, secondary sexual characters, breeding habits. Parental care, development of eggs.Breeding of ornamental fish; Egg scatters, egg depositors, mouth brooders, bubbles nest builders, livebearers etc.,Hatching, larval rearing and their feeds and feeding. Use of pigment for colour enhancement.	15 hrs
UnitIII	Marine ornamental fishes:Marine ornamental fishes, their habitat, collection from nature. Methods of collection. Transportation of live fish, use of sedatives. Others ornamental	15 hrs

	organisms like Sea anemone, Lobster, Shrimps, Octopus, and Starfish etc., used in the aquarium. Freshwater ornamental Plants: Rooted plants; Limnophila, Ditchmoss, Potamogeton, Cabomba, Ceretophyllum, Indian fern, Cryptocornye, Amazon sward plant, Hair grass, Sagitteria, and Vallisneria. Floating Plants; Duck weed, Pistia, Riccia and Salvinia. Multiplication or ornamental plants,nutrients and optimum environment conditions for their growth.	
UnitIV	Construction and maintenance of Aquarium: Construction of home aquarium, material used, wooden and metal frame, frameless tanks, sealants and gums. Design and construction of public freshwater and marine aquaria. Aerators and filters, pebbles, ornamental objects and other equipment used in the aquaria. Cleaning the aquarium, maintenance of water quality, control of snails. Nutritional requirement for aquarium fishes. Preparation of dry feeds, feeding methods. Maintenance of aquarium, Live food – brine shrimp, bloodworm, water flea, earthworm, infusoria, mosquito larvae, tubifex worm, other natural and artificial foods. Common disease of aquarium fishes, and their diagnostics and treatment.	15hrs

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu
5. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu
6. K V Jayshree, C S Tharadevi and N. Arumuugam, Home Aquarium and Ornamental Fish culture, Saras Publication, Nagercoil, Tamil Nadu
7. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu
8. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	05
InternalAssessmentTest2	05
Assignment	10
Total	**20Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester–II

DisciplineSpecificCourse(DSC)

Course Title:Aquarium and Ornamental fisheries (Practical)

Course Code:C 2 IFF 1 P 1

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-4	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**10**	**40**	**50**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO 1: To understand different ornamental fishes

CO 2: To understand different marine ornamental fishes

CO 3: to understand how to construction of aquarium

CO 4: To understand maintenance of aquarium

CO 5: To understand different disease, diagnose of aquarium fishes

CO6: To understand different marine ornamental fish organisms

List of the Expedients, each will have 4rs / Week (Minimum 12 experiments)

1. Anatomy of typical elasmobranches: Dissection of Cranial nervous system in shark/fish.
2. Anatomy of typical elasmobranches: Dissection of Arterial system in shark/fish.
3. Study of classification, Identification and Description of ornamental fresh water fishes.
4. Study of classification, Identification and Description of ornamental marine water fishes.
5. Study of classification, Identification and Description of ornamental marine water organisms.
6. Study of classification, Identification and Description of ornamental floating plants.
7. Study of classification, Identification and Description of ornamental submerged plants.
8. Study of classification, Identification and Description of ornamental merged plants.
9. Study of different filters and its working principles.
10. Study of different aerators and its working principles.
11. Study of different ornamental objects, aquarium construction materials and other accessories.
12. Construction and Maintenance of home aquarium.

SECHEME FOR PRACTICAL EXAMINATION

1. Dissection and display cranial/ arterial system in given fish----------		10 marks
2. Identification and describe of aquarium fish / plants / other materials	10X2	20 marks
3. Procedure for Construction of aquarium		05 marks
4. Journal		05 marks

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Total: 40 marks

Instructions if any:

1 Any one dissection is given for examination

2Compulsory identifications given from freshwater ornamental fishes

3 Compulsory identifications given from freshwater ornamental plants

4 Compulsory identifications given from marine ornamental organisms and other materials

5 Compulsory the procedure for construction

6Preference given for diagrams

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu
5. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu
6. K V Jayshree, C S Tharadevi and N. Arumuugam, Home Aquarium and Ornamental Fish culture, Saras Publication, Nagercoil, Tamil Nadu
7. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu
8. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

B.Sc. Semester–III

DisciplineSpecificCourse(DSC)

Course Title: - Capture Fisheries and Inland Fisheries

Course Code:**C 3 IFF 1 T 1**

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-5	**Theory**	**04**	**04**	**60hrs.**	**3hrs.**	**20**	**80**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO 1 :Knowledge regarding capture fisheries resource of world with statistics.

CO 2 : Students get information of Inland fisheries resource India.

CO 3 : Lake and estuarine fisheries resource of India.

CO 4 : Student will get complete information marine pelagic fisheries resources of India.

CO 5 : Information regarding demersal fisheries resource of Indian sub-continent.

CO 6 : Students will get complete capture and inland fisheries resource of India and world.

Unit	Title: Capture Fisheries and Inland Fisheries	60 hrs/ sem
UnitI	Capture Fisheries Resource: Importance of capture fisheries of the World and India. Present status, yield and estimate of potential capture fisheries of the world and India. National and International fisheries commissions. The Inland capture fisheries resource of world and India. Riverine fisheries resource of India. Fisheries of major and minor carps, catfishes and other groups. Problems and managements.	15 hrs
UnitII	Lake and Estuarine Fisheries: Lacustrine fisheries sources of India, fisheries potentials and problems of development and management. Estuarine fisheries resource of India; fishes of clupeoids, prawns, molluscs, mullets and other important groups. Fisheries of brackishwater lakes and backwaters. Coldwater fisheries resources of India; Fisheries of trout, Mahaseer and other Coldwater fish species. Development and management.	15 hrs

UnitIII	Capture fishers and fisheries of marine; Marine fisheries resources of India. Pelagic fisheries; Fisheries of Oil sardines, Lesser sardines, Anchovies, Clupeoids, Mackerels, Ribbon fisheries, Tunas, Seer fish, Carangids, Grouper and Cephalopods. Catch statistics of Indian marine fin fish fisheries of current year	15 hrs
UnitIV	Mid water and demersal fisheries of India; Fisheries of elasmobranches, Bombay duck, Catfishes, Silver bellies, Sciaenids, Pomfrets, Threadfins, Perches, Flatfish, Prawns, Lobsters, Crabs, Mussels, Oysters and Clams and their economic importance. Fishing regulatory and Laws of India and International. Catch statistics of Indian marine shell fisheries of current year	15hrs

Recommended books:

1. Marine Capture Fisheries: P. K. Singh (Author)
2. Coastal aquaculture and mariculture: Iqlas Ahmed, S. Felix
3. Inland Fisheries (2+1): N. Jayakumar
4. Limnology: A. T. Ramachandra Naik & P. Padmavathy
5. Marine Biology (2+1): A. Srinivasan & Dr. A. T. Ramachandra Naik
6. Marine fisheries: S. M. Shivaprakash & N. Jayaprakash
7. A Text Book of Fishery Science and Indian Fisheries: Dr C B L Srivastava (Author)
8. Fish and Fisheries: Pandey (Author)

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	05
InternalAssessmentTest2	05
Assignment	10
Total	**20Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester– III

DisciplineSpecificCourse(DSC)

Course Title:Gears and crafts of Inland and Marine fisheries (Practical)

Course Code:C 3 IFF 1 P 1

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-6	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**10**	**40**	**50**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO 1 : Student will get information about different gear of freshwater and marine fisheries sector.

CO 2 : Information about different indigenous craft used for fish catching.

CO 3 : To know working principle of different gear used in India and world.

CO 4 : Student will know the length and weight relationship of fish species for assessing stock in natural water body.

CO 5 : To know the length and frequency date in particular fish species for new fish add to same group that infer that stock assessment.

CO 6 : Study trip will give information regarding fish landing Centre and Fisheries Institute and different beach observation.

List of the Expedients, each will have 4rs / Week (Minimum 12 experiments)

1. Study of Freshwater fish gears and its working principles with diagrams.
2. Study of Freshwater fish crafts and its working principles with diagrams.
3. Study of Marine water fish gears and its working principles with diagrams.
4. Study of Marine water fish crafts and its working principles with diagrams.
5. Study of Brackishwater fish gears and its working principles with diagrams.
6. Study of Brackishwater fish crafts and its working principles with diagrams.
7. Study of electronic device used fishing and its working principles with diagrams.

8. Study of modern fishing gear and craft and its working with diagrams.

9. Study of different commercial important fin fish and shell fish of India (any ten).

10. Length and weight relationship in fishes.

11. Population structure and Length frequency data in fishes.

12. Compulsory Field Visit to marine fish landing center, beach, fishing gear and craft etc.,

SCEME OF PRACTICAL EXAMINATION

1.	Length and weight relationship in fishes	10 marks
2.	Population structure and frequency data	05 marks
3.	Identification of gears and crafts 5X2	10 marks
4.	Field visit Report (Compulsory study tour visit)	10 marks
5.	Journals	05 marks
		……..
	Total	**40 marks**

Instructions if any:

1 Compulsory any one fish species given for length and weight

2 Compulsory any one fish species given for length and frequency

3 Compulsory identifications equally from gear and craft given

4Compulsory study tour report will carry marks

5Marks will be based on calculation presentation for length and weight

6Marks will be based on calculation and graph presentation for length and frequency

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu
5. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu
6. K V Jayshree, C S Tharadevi and N. Arumuugam, Home Aquarium and Ornamental Fish culture, Saras Publication, Nagercoil, Tamil Nadu
7. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu
8. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

B.Sc. Semester–IV

DisciplineSpecificCourse(DSC)

Course Title: - FISHERIES TECHNOLOGY AND FISHERIES EXTENSION

Course Code:C 4 IFF 1 T 1

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-7	**Theory**	**04**	**04**	**60hrs.**	**3hrs.**	**20**	**80**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO 1 : Principles of fish preservation and different methods for fish preservation.

CO 2 : To know different fish by-products preparation and its uses.

CO 3 : Sea weed commercial uses and pearl production in India.

CO 4 : Fish catching methods and use of different gear used in India.

CO 5 : Fisheries cooperative society and fisheries extension in India.

CO6:To know the fish-basedvalue-added products and its importance.

Unit	Title: FISHERIES TECHNOLOGY AND FISHERIES EXTENSION	60 hrs/ sem
UnitI	Principles and importance of fish preservation – Sun drying, Salt curing, Pickling, Smoking, Chilling, Deep Freezing, Frying and Canning. Processing and preservation of fish products and byproducts. Paste products, Fish ball, Minced meat, Fish Protein Concentrate, Fish meal, Shark liver oil, Fish body oil, Liquid fish (fish ensilage), Shark fins and fin rays, Fish skin leather	15 hrs
UnitII	Ambergris, Fish cake, Fish salads, Fish wafers, Fish soup powder, Fish hydrolysate, Fish Sauce,Fish chutney, Fish paste, Fish cutlets, Fish glue, Isinglass, Chitin and Chitosan, Pearl essence, bêche-de-mer. Sea weeds – Study of different commercial important sea weed. Edible, Industrial and Pharmaceutical products and their uses. Handling, preservation and transportation of fresh fish and preserved fish, freezing preservation of fish, modern techniques employed in fish preservations. On board fish handling methods.	15 hrs

UnitIII	Sanitation in processing and quality control of fresh and processed fish and its fisheries products. Biochemical and microbiological degradation of fish. Fish catching methods fresh water, marine and brackishwater body of world and India; Indigenous and modern fishing gears and its working principles of India. Indigenous and modern fishing crafts and its working principles of India.Recent development in fishing gears and crafts in India. Indigenous fishing crafts of India. Mechanization of Indian fishing crafts, fishing vessels. Electronics in fishing industry. Sea fishing methods. Modern fishing gears and crafts used in fishing. Classification of fishing gears and crafts of world.	15 hrs
UnitIV	Pearl producing molluscans; Freshwater and marine pearl producing molluscans. Pearl formation. Pearl production states in India. Artificial pearl production technology and its technique. Study of biology of typical pearl producing oyster. Present status, scope and importance of pearl oyster industry in India. Fisherman Co-operative Societies; Roll of co-operative in fishery economy. Organization of fisherman Co-operative society. Roll of Co-operative Societies in fish production and marketing. Fisheries extension. Different Indian fisheries institutes.	15hrs

Recommended books:

1. Fish Products and By-products Technology: Dr. B.A. Shamasundar, Dr. Sukumar
2. Fisheries Extension Education (2+1): Dr. M. Nagoormeeran
3. Fishing and gear technology: B. Hanumanthappa & N. Neethiselvan
4. Fishing craft technology: S. Varadaraju & N. Neethiselvan
5. Canning and fish packaging technology: M.H.Bhandary & C.V.Raju & S.A.Shanmugam
6. Fish Farming and Fish Product: K. G. A. Rao (Author)
7. Post-Harvest Technology of Fish and Fish Products: K. K. Balachandran (Author)
8. Microbiology of Fish and Fishery Products: F & S Felix Parthiban (Author)

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	05
InternalAssessmentTest2	05
Assignment	10
Total	**20Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester–IV

DisciplineSpecificCourse(DSC)

Course Title: By-products of fish, its production and commercial importance **(Practical)**

Course Code: **C 4 IFF 1 P 1**

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-8	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**10**	**40**	**50**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO 1 : Student will know different fish by-products and their production and its economic importance.

CO 2 **:** To know the preparation of chitosan and its commercial importance.

CO 3 : To know the preparation of fish liver oil and fish body oil and its commercial importance.

CO 4 : Student will know the preparation of fish feed formulation and preparation methods.

CO 5 : Study tour will help the student get the knowledge of fish processing industry, plants and other fish feed industry.

CO 6 : Overall, the student will get knowledge of fish by-products its production and commercial importance.

List of the Expedients, each will have 4rs / Week (Minimum 12 experiments)

1. Study of Fish By-products, its production and their economic importance. (Fish wafers, Fish Soup powder, Fish Ensilage, Isinglass, Fish pickle, Shark fin and fin rays, fish glue, Fish sauce, Fish cake, Fish paste, fish ball, chitin) etc., (03 Practicals)
2. Study of Fish Protein Concentration, its preparation processand importance.
3. Study of Fish meal, its preparation process and importance.
4. Study of different fish preservation techniques (salting, sun drying, chilling, smoking and canning).
5. Study of Chitosan preparation process from prawn shells and importance.
6. Study of fish body oil, its preparation process andimportance.
7. Study of fish shark liver, its preparation process oil and importance.
8. Study of Fish Food formulation and pellet preparation process.

9. Study of pearl formation in pear oyster.

10. Compulsory visit to cold storages, Fisheries Institutes and processing plants and fish landing Centre and submission of study tour reports.

SCHEME OF PRACTICAL EXAMINATION

1. Identification, economic importance and edible importantance of fish by-product 16 marks
2. Procedure for preparation of Chitosan/Shark liver oil/fish meal and uses 05 marks
3. Fish feed preparation procedure04 marks
4. Study tour report10 marks
5. Journal 05 marks

…….

Total 40 marks

Instructions if any:

1 Compulsory identification given on fish by-products

2Compulsory any one preparation procedure is given

3Compulsory fish feed preparation is given

4Study tour report will carry marks

5Overall performances will carry marks

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. Kaestner, A. Invertebrate Zoology. Vol. I – III, John Wiley & Sons, 1967.
5. Kurian, C.V. & V.O. Sabastian. Prawns and Prawn Fisheries of India. Hindustan Pub. Co., 1976.
6. Parker, J. & W.A. Haswell. The Textbook of Zoology. Vol. I. Invertebrates (eds. A.J. Marshall & W.D. Williams), ELBS & McMillan & Co., 1992.

B.Sc. Semester–V

DisciplineSpecificCourse(DSC)

Student shall select DSC 9A & 10 A or 9B & 10 B for 06 credits only

Course Title: -Principles and practice of Aquaculture

Course Code:C 5 IFF 2 T 1

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-9A	**Theory**	**04**	**04**	**60hrs.**	**3hrs.**	**20**	**80**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO1: To understand the scope and significance of aquaculture

CO2: To understand types and practices of Aquaculture systems

CO3: To understand layout of fish culture pond and its preparation

CO4: Culture practice of prawn and breeding practices

CO5: Knowledge regarding fish pathology and its diagnostic methods

CO6: Knowledge regarding mariculture and its uses

Unit	Title: Principles and practice of Aquaculture	60 hrs/ sem
UnitI	Principles and practice of Aquaculture: Definition and history of Aquaculture; Scope and importance of aquaculture. Principles of site selection, Kinds of fish farm, Productivity of water, Soil and soil characteristics and other parameters. Different systems of aquaculture, monoculture, polyculture, integrated fish farming, pond culture, cage culture, pen culture, raft culture, extensive, semi-intensive and intensive fish culture, raceway culture, sewage fed fish culture. Factors for success of fish culture enterprises. Aquaculture diversification-Aquaponics, Bio floc culture, periphyton culture.	15 hrs
UnitII	Costal aquaculture; Marine fisheries resource of India, Brakishwater fisheries resource of India. Important species of Pennaeid prawns and life history of typical Prawn, hatchery production of seed, nursery rearing, transportation of Prawn seed, hatchery management. Breeding and culture of brakishwater fish - Milk fish, Mullets, Pearl spot, Sea bass etc. Mariculture of edible oysters, mussels, Clams, Sea urchin, Sea cucumber and culture of sea weeds. Fisheries Institutes of India	15 hrs
UnitIII	Present status of Aquaculture, Preparation of culture pond, Pre stocking management, Control of aquatic weeds, aquatic insects, weed fishes, predators, algal blooms and their control, liming and fertilization, manuring of nursery and rearing ponds. Criteria of	15 hrs

	selection of species for culture, seed procurement and stocking. Post stocking management, phased manuring, supplementary feeds and feeding. Fish Histology: Histological studies of most important internal organs of fish - gills, liver, Intestine, Kidney, Muscle	
UnitIV	Fish pathology: Significance of fish disease in relation to aquaculture practices. Principles of disease diagnosis and fish health management. Disease caused by crustaceans, parasites (Ergasilosis, Lerniae, Argulus, Isopodeparasite). Protozoan diseases, Fungal diseases, Viral diseases and Bacterial diseases of fishes, symptoms and their control methods.	15hrs

Recommended books:

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. Santhanam, et.al. A Manual of Freshwater Aquaculture.
4. Sustainable Aquaculture- Bardach.
5. Aquaculture- The farming and husbandary of freshwater & Marine organisms-John E. Bardach John H. Ryther, William O. McLarney
6. Aquaculture and Fisheries: N Arumugam
7. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu
8. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu
9. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu
10. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	05
InternalAssessmentTest2	05
Assignment	10
Total	**20Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester–V

DisciplineSpecificCourse(DSC)

Course Title:Water and soil parameter analysis for fish pond (Practical)

Course Code:C 5 IFF 2 P 1

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-10A	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**10**	**40**	**50**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO1: To get knowledge regarding the chemical compositions of natural waters, and explain how and why these compositions vary in different water samples.

CO 2: To enable students to understand the principles and the practical approaches and techniques required to effectively monitor in aquaculture pond

CO 3: Gained in depth knowledge on the pattern of soil cover in aquaculture ponds.

CO 4: Gained in depth knowledge on the how to control aquatic weed plants and aquatic insects in aquaculture ponds.

CO 5: Gained in depth knowledge on weed fishes and predatory fishes in aquaculture ponds.

CO6: To know the different aspects fish pond management

List of the Expedients, each will have 4rs / Week (Minimum 12 experiments)

1 Estimation of dissolved oxygen in given water samples: Tap, Pond and Sewage water

2 Estimation of free carbon dioxide in given water samples: Tap, Pond and Sewage water

3 Estimation of salinity in given water samples: Tap, Pond and Sewage water

4 Estimation of hardness in given water samples: Tap, Pond and Sewage water

5 Estimation of alkalinity in given water samples: Tap, Pond and Sewage water

6 Study of pH, ammonia, and nitrates of water

7 Study of Collection and preservation of soil and Analysis of soil particle size

8 Study of water holding capacity of soil and organic matter of soil

9 Estimation of soil pH in given soil sample: Black, Red soil and Sand

10 Study of aquatic insects and aquatic weed plants in aquaculture pond and its control measures

11 Study of aquatic weed fish and predatory fishes in aquaculture pond and its control measures

12 Compulsory Field visit to freshwater and marine fish seed hatchery and fisheries Institutes

SCHEME FOR PRACTICAL EXAMINATION

1. Water analysis –	10 marks
2. Soil parameter analysis.	05 marks
3. Identifications 5x2	10 marks
4. Journal	05 marks
5. Field Report and Viva	10 marks
	……
Total	40 marks

Instructions if any:

1. Compulsory any one water parameter

2. Compulsory estimation of soil pH

3. Identification from aquatic weed and aquatic insect

4. Identification from weed fishes and predatory fish

5. Field visit report carries marks

6. Journal with carries marks

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. Kaestner, A. Invertebrate Zoology. Vol. I – III, John Wiley & Sons, 1967.
5. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu
6. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu
7. K V Jayshree, C S Tharadevi and N. Arumuugam, Home Aquarium and Ornamental Fish culture, Saras Publication, Nagercoil, Tamil Nadu
8. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu
9. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

B.Sc. Semester–V

DisciplineSpecificCourse(DSC)-

Student shall select DSC 9B & 10 B or DSC 9A & 10 A for 06 credits only

Course Title: -Freshwater aquaculture and mariculture methods

Course Code:C 5 IFF 2 T2

Type ofCourse	Theory /Practical	Credits	Instructionhour perweek	TotalNo.ofLectures/Hours /Semester	Durationof Exam	FormativeAssessmentMarks	Summative assessment Marks	TotalMarks
DSC-9B	**Theory**	**04**	**04**	**60hrs.**	**3hrs.**	**20**	**80**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO1: To understand the techniques involved in aquaculture practices.

CO 2: To get a detailed information about marine aquaculture and hatchery management.

CO3: To provide a basic idea about the importance of disease in fishes.

CO4: To give basic idea for fish histology for better diagnostic in fish disease

CO5: To get detailed information mariculture of shell fishes

CO6: To understand layout of fish culture pond and its preparation

Unit	Title: Freshwater aquaculture and mariculture methods	60 hrs/ sem
UnitI	Freshwater aquaculture: Definition and history of Aquaculture; Scope and importance of aquaculture. Principles of site selection, Kinds of fish farm, Productivity of water, Soil and soil characteristics and other parameters. Different systems of aquaculture, monoculture, polyculture, integrated fish farming, pond culture, cage culture, pen culture, raft culture, extensive, semi-intensive and intensive fish culture, raceway culture, sewage fed fish culture. Factors for success of fish culture enterprises. Aquaculture diversification-Aquaponics, Biofloc culture, periphyton culture.	15 hrs
UnitII	Mariculture: Marine fisheries resource of India, Brakishwater fisheries resource of India. Important species of Pennaeid prawns and life history of typical Prawn, hatchery production of seed, nursery rearing, transportation of Prawn seed, hatchery management. Breeding and culture of brakishwater fish - Milk fish, Mullets, Pearl spot, Sea bass etc. Mariculture of edible oysters, mussels, Clams, Sea urchin, Sea cucumber and culture of sea weeds. Fisheries Institutes of India.	15 hrs

UnitIII	Fish disease and diagnostics: Significance of fish disease in relation to aquaculture practices. Principles of disease diagnosis and fish health management. Disease caused by crustaceans, parasites (Ergasilosis, Lerniae, Argulus, Isopodeparasite). Protozoan diseases, Fungal diseases, Viral diseases and Bacterial diseases of fishes, symptoms and their control methods. Fish Histology: Histological studies of most important internal organs of fish - gills, liver, Intestine, Kidney, Muscle	15 hrs
UnitIV	Breeding and culture of freshwater Prawns and their polyculture with finfish. Air breathing fish culture. Coldwater fishes and their culture. Present status of Aquaculture, Preparation of culture pond, Pre stocking management, Control of aquatic weeds, aquatic insects, weed fishes, predators, algal blooms and their control, liming and fertilization, manuring of nursery and rearing ponds. Criteria of selection of species for culture, seed procurement and stocking. Post stocking management, phased manuring, supplementary feeds and feeding.	15hrs

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu
5. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu
6. K V Jayshree, C S Tharadevi and N. Arumuugam, Home Aquarium and Ornamental Fish culture, Saras Publication, Nagercoil, Tamil Nadu
7. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu
8. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	05
InternalAssessmentTest2	05
Assignment	10
Total	**20Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester– V

DisciplineSpecificCourse(DSC)

Course Title:Bottom soil and water quality management of fish pond(Practical)

Course Code:C 5 IFF 2 P 2

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-10B	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**10**	**40**	**50**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO 1: Knowledge regarding the water parameters in fish culture practices.

CO 2: To understand different soil parameter which helps in fish culture pond practice.

CO 3: To understand the different aspects of fish culture and its management.

CO 4: Gained in depth knowledge on control aquatic weed plants and aquatic insects in aquaculture ponds.

CO 5: Gained in depth knowledge on control of weed fishes and predatory fishes in aquaculture ponds.

CO6:Student will gain knowledge in fish pond managements techniques.

List of the Expedients, each will have 4rs / Week (Minimum 12 experiments)

1 Estimation of dissolved oxygen in given water samples: Tap, Pond and Sewage water

2 Estimation of free carbon dioxide in given water samples: Tap, Pond and Sewage water

3 Estimation of salinity in given water samples: Tap, Pond and Sewage water

4 Estimation of hardness in given water samples: Tap, Pond and Sewage water

5 Estimation of alkalinity in given water samples: Tap, Pond and Sewage water

6 Study of pH, ammonia, and nitrates of water

7 Study of Collection and preservation of soil and Analysis of soil particle size

8 Study of water holding capacity of soil and organic matter of soil

9 Estimation of soil pH in given soil sample: Black, Red soil and Sand

10 Study of aquatic insects and aquatic weed plants in aquaculture pond and its control measures

11 Study of aquatic weed fish and predatory fishes in aquaculture pond and its control measures

12 Compulsory Field visit to freshwater and marine fish seed hatchery and fisheries Institutes

SCHEME FOR PRACTICAL EXAMINATION

1. Water analysis –	10 marks
2. Soil parameter analysis.	05 marks
3. Identifications 5x2	10 marks
4. Journal	05 marks
5. Field Report and Viva	10 marks
	……
Total	40 marks

Instructions if any:

1. Compulsory any one water parameter

2. Compulsory estimation of soil pH

3. Identification from aquatic weed and aquatic insect

4. Identification from weed fishes and predatory fish

5. Field visit report carries marks

6. Journal with carries marks

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. Kaestner, A. Invertebrate Zoology. Vol. I – III, John Wiley & Sons, 1967.
5. Kurian, C.V. & V.O. Sabastian. Prawns and Prawn Fisheries of India. Hindustan Pub. Co., 1976.
6. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu
7. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu
8. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu
9. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

B.Sc. Semester–VI

DisciplineSpecificCourse(DSC)

Student shall select DSC 11B & 12 B or DSC 11A & 12A for 06 credits only

Course Title:-: Fish genetics, hatchery technology, fish microbiology and ecology

Course Code:C 6 IFF 2 T 1

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-11A	**Theory**	**04**	**04**	**60hrs.**	**3hrs.**	**20**	**80**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO 1: Student will get knowledge in basic genetical principles in field of fishery

CO 2: To know different technic involved in fish breeding

CO 3: To gain knowledge molecular application fish breeding and aquaculture

CO 4: student will get knowledge regarding environmental biology related fisheries aspect.

CO 5: To gain the knowledge in field of pollution free environment for fishery production

CO6:To gain knowledge in microbiological importance of fisheries and their products

Unit	Title: Fish genetics, hatchery technology, fish microbiology and ecology	60 hrs/ sem
UnitI	Principal of Mendelian genetics, multiple alleles, interactions, Linkage and crossing over. Introductions to cytogenetics and its application. Sex determination and control mechanism and Inheritance. Different methods of breeding-Inbreeding, out breeding, cross breeding, selective breeding, random breeding. Application of genetics in fish farming. Hybridization and transgenic fish. Cryopreservation of gametes, gynogensis, androgensis, polyploidy, production of monosex and sterile fish and their significance in aquaculture. Sex reversal techniques. Principals of biochemical and molecular genetics and its applications in fisheries.	15 hrs
UnitII	Roll of gonadotrophin in fish breeding, Brood stock management, breeding of carps and other cultivable fishes, induced breeding. Ovulation agent used (fish pituitary glands, human chorionic gonadotrophin), pheromones and other new generation drugs. Hatchery technology, bund breeding, riverine seed collection, seed transportation, Different stages of fish seed (spawn, fry, fingerlings).	15 hrs
UnitIII	Diversity of microbial community – General characteristics of bacteria, fungi, viruses, algae and protozoans. Structure of fungi and yeast cell. Structure of virus. Classification of viruses. Autotrophic and heterotrophic microorganisms in aquatic environment. Health significant bacteria in fish culture ponds. Pathogenic microorganisms in fishes. Pathogenic organism encountered in fish products, fecal indicator organisms.Perishability of seafood – Microbial spoilage of fish and	15 hrs

	shellfish. Spoilage microflora. Intrinsic and extrinsic factors affecting spoilage. Microflora associated with body parts of fish. Microbiology scope and its importance in fisheries.	
UnitIV	Definition, scope and importance of ecology. Ecological habitats, abiotic and biotic factors. Primary productivity of water mass and fish production, tropic levels of fish in the food chain, predatory prey relationship, ecology of freshwater ponds, ecology of river, ecology of estuaries, brackishwater and sea. Bio-geocycle Cycles: Carbon cycle, Nitrogen cycle, oxygen cycle, Sulphur cycle and Phosphorous. Water and soil pollution, source and effects and control. Pesticide impact on aquatic organisms, thermal pollution, radioactivity, assessment and monitoring of water pollution. Water and soil pollution effect on fish culture pond and its management.	15hrs

Recommended books:

1.Fish Genetics and Breeding by T L S Samuel & S Felix Moses (Author)

2. Aquaculture: Introduction to Aquaculture For Small Farmers by Kenn Christenson (Author)

3. Hatchery Management and Induced Breeding of Carps and Cat Fishes" by MD Mustafizur Rahman

4. Breeding and Seed Production of Fin Fish and Shell Fish" by P C and Thomas

5. Environment And Ecology by Vaishali Anand (Author)

6. Deswal, S. and Deswal, A., 2003, Energy, ecology, Environment and Society, Dhanpat Rai&co ltd., Delhi.

7. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu

8. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu

9. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu

10. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	05
InternalAssessmentTest2	05
Assignment	10
Total	**20Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester–VI

DisciplineSpecificCourse(DSC)

Course Title:Primary productivity of pond and induced breeding in fish (Practical)

Course Code:C 6 IFF 2 P 1

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-12A	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**10**	**40**	**50**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO 1: Study will gain knowledge regarding collection, preservation and identification different planktons.

CO 2: To gain knowledge by doing primary productivity of fish pond in turn calculation net primary productivity

CO 3: Student will gain the knowledge in hypopysatation technique and induced breeding fishes.

CO 4: To gain knowledge in study different stages of life cycle of fish.

CO 5: Student will get knowledge regarding composite fish culture to increase productivity of fish pond.

CO6: To gain knowledge in fish breeding activity

List of the Expedients, each will have 4rs / Week (Minimum 12 experiments)

1 Study of collection and preservation planktons

2 Study of different types of freshwater and marine planktons (05 from each)

3 Study of different maturity stages of fish gonads gonadosomatic index in fish

4 Estimation of primary productivity (light and dark bottle) of given water sample: Pond water

5 Study of induced breeding in fishes and bund breeding in fish

6 Estimation the pituitary gland for set of brooder fishes (05 examples)

7 Study of composite fish culture

8 Study of different stages in fishes (spawn, fry, fingerlings)

9 Study of different microbiological instruments and working principles (any ten)

10 Study of pond as ecosystem with schematic diagram

11 Study of different types of bacterial staining methods (simple and gram staining)

12 Compulsory field visit to fisheries institutes, marine/brakishwatershrimp hatchery,sandy or rocky beaches, estuary, fish landing center and brackish water lakes, and back water

SCHEME PRACTICAL

1. Primary productivity	10 marks
2. Induced breeding problems	04 marks
3. Procedure for bacterial staining	05 marks
4. Identification (3X2)	06 marks
5. Study tour report	10 marks
6. Journal	05 marks
……..	
Total	**40 marks**

Instructions if any:

1.For primary productivity only estimation

2. plankton each from fresh and marine species

3. Compulsory induced breeding problem

4. Compulsory study tour visit report carry marks

5. Journal carry marks

6. Compulsory any one procedure give for bacterial staining

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. Kaestner, A. Invertebrate Zoology. Vol. I – III, John Wiley & Sons, 1967.
5. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu
6. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu
7. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu
8. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

B.Sc. Semester–VI

DisciplineSpecificCourse(DSC)

Student shall select DSC 11B & 12 B or DSC 11A & 12A for 06 credits only

Course Title: -:Fish biotechnology, fish biochemistry, fish seed production and fish environmental biology

Course Code:C 6 IFF 2 T 2

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-11B	**Theory**	**04**	**04**	**60hrs.**	**3hrs.**	**20**	**80**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO 1: Students will get knowledge in the field of application of biotechnology in fisheries

CO 2: To gain knowledge biochemical assessment of fisheries products

CO 3: To know the biochemical composition of fish from study of fish bio-chemistry

CO 4: To know different technic involved in induced breeding in fish

CO 5: student will get knowledge regarding environmental biology related fisheries aspect.

CO 6: To gain the knowledge in field of pollution free environment for fishery production

Unit	Title: Fish biotechnology, fish biochemistry, fish seed production and fish environmental biology	60 hrs/ sem
UnitI	Fish Biotechnology scope and its importance in fisheries, molecular techniques in stock characterization, Principles and applications of HPLC, Principles and application of PCR, Principles and applications of SDS page, Electrophoresis. Role of herbal therapy in fish health management. Application of molecular engineering and nucleic acid manipulation in fisheries. Recombinant DNA technology, Aquaculture biotechnology-Biotechnological tools for aquaculture, gene manipulation in fish, transgenic fish production, transgenic synthetic hormone for fish breeding. Application of tissue culture in seaweed and pearl production. Marine toxins. Industrial chemicals and pharmaceuticals from marine sources. Use of probiotics and antibiotics in aquaculture operations.	15 hrs
UnitII	Carbohydrates: Classification, properties of important monosaccharide, disaccharides, polysaccharides and function, Lipid classification, properties and functions, Protein classification, properties and functions, Enzymes, classification and application and functions, Vitamins dietary sources and functions. Bioenergetics (Kreb's cycle, glycolysis, electron transport system). Special reference to fish moisture, fish protein, fats, ash, contents, fish enzymes and non-protein nitrogen compounds like- Tri-methylamine oxide, urea, free alpha amino acids, and volatile bases.	15 hrs
UnitIII	Roll of gonadotrophin in fish breeding, Brood stock management, breeding of carps and other cultivable fishes, induced breeding. Ovulation agent used (fish pituitary glands, human chorionic gonadotrophin), pheromones and other new generation drugs. Hatchery technology, bund breeding, riverine seed collection, seed transportation, Different stages of fish seed (spawn, fry, fingerlings).	15 hrs

UnitIV	Definition, scope and importance of ecology. Ecological habitats, abiotic and biotic factors. Primary productivity of water mass and fish production, tropic levels of fish in the food chain, predatory prey relationship, ecology of freshwater ponds, ecology of river, ecology of estuaries, brackishwater and sea. Bio-geocycle Cycles: Carbon cycle, Nitrogen cycle, oxygen cycle, Sulphur cycle and Phosphorous. Water and soil pollution, source and effects and control. Pesticide impact on aquatic organisms, thermal pollution, radioactivity, assessment and monitoring of water pollution. Water and soil pollution effect on fish culture pond and its management.	15hrs

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. Kaestner, A. Invertebrate Zoology. Vol. I – III, John Wiley & Sons, 1967.
5. Kurian, C.V. & V.O. Sabastian. Prawns and Prawn Fisheries of India. Hindustan Pub. Co., 1976.
6. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu
7. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu
8. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu
9. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	05
InternalAssessmentTest2	05
Assignment	10
Total	**20Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester–VI

DisciplineSpecificCourse(DSC)

Course Title:Biochemical assessment of fish and pond productivity (Practical)

Course Code:**C 6 IFF 2 P 2**

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
DSC-12B	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**10**	**40**	**50**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO 1: Student will get knowledge regarding quantitative estimation of protein in fish

CO 2: Student will get knowledge regarding quantitative estimation of glycogen in fish

CO 3: To gain different working principles of biotechnological instruments and their working principles in application fisheries

CO 4: To gain different stating techniques for microorganisms to identifications

CO 5: Student will gain knowledge in field of microorganism culture from fisheries products

CO6: To gain the primary productivity of giver water body

List of the Expedients, each will have 4rs / Week (Minimum 12 experiments)

1 Study of preparation of percent, molarity, molality, and normality of solution

2 Study of assay of enzymatic activity of amylase

3 Estimation of quantitative analysis of protein (total, structural, soluble) in fish tissue by spectrophotometric method

4 Estimation of quantitative analysis of glucose and glycogen in fish tissue or blood by spectrophotometric method

5 Study of working principle and application of Electrophoresis in fisheries (SDS page)

6 Study of working principle and application of PCR in fisheries (shrimp disease)

7 Study of different biotechnological (any 10) instruments and its working principles

8 Study of different types of freshwater and marine planktons (05 from each)

9 Estimation of primary productivity (light and dark bottle) of given water sample: Pond water

10 Estimation the pituitary gland for set of brooder fishes (05 examples)

11 Study of composite fish culture

12 Compulsory field visit to fisheries institutes, marine/brakishwater shrimp hatchery, sandy or rocky beaches, estuary, fish landing center and brackish water lakes, and back water

SCHEME PRACTICAL

1. Primary productivity	10 mark
3. Estimation protein/glycogen in fish tissue	09 marks
4. Identification (3X2)	06 marks
5. Study tour report	10 marks
6. Journal	05 marks
……..	
Total	**40 marks**

Instructions if any:

1. For primary productivity only estimation

2. plankton each from fresh and marine species

3. Compulsory induced breeding problem

4. Compulsory study tour visit report carry marks

5. Journal carry marks

6. Compulsory any one procedure give for bacterial staining

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. Kaestner, A. Invertebrate Zoology. Vol. I – III, John Wiley & Sons, 1967.
5. Kurian, C.V. & V.O. Sabastian. Prawns and Prawn Fisheries of India. Hindustan Pub. Co., 1976.
6. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu
7. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu
8. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu
9. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

B.Sc. Semester– V

ElectiveCourse(EC)

It is for other combination students

Course Title: -Introduction to fisheries Science

Course Code:C 5 IFF 5 T 1

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
EC-1	**Theory**	**03**	**04**	**45hrs.**	**3hrs.**	**20**	**80**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO 1: to understand the different fin and shell fishes

CO 2: to understand external character of fishes

CO 3: to understand biochemical value of fish

CO 4: to understand different fishery byproduct

CO 5: to understand different ornamental fishes

CO6:to understand different aspects of fisheries science in daily life

Unit	Title: Introduction to fisheries Science	45 hrs/ sem
UnitI	Study of external morphology of typical finfish and shell fishes. The structures used in taxonomic studies like skin, colouration, scales, mouth, jaws etc., External characters of fishes – shape, head, mouth, eyes, barbles, operculum, fins, spines, trunk, tail, scales, lateral line. Study of external character of different fin fishes. External characters of Prawn, Lobsters, Bivalve, Gastropods and cephalopods (two examples from each)	15 hrs
UnitII	Fish by-products: Chitin and Chitosan, shark fins, Beche-de-mer, fish oils, fish meal, fish protein concentrate, fish glue, fish sauce, Isinglass, pearl essence, Ambergris, Fish cake, Fish cutlets, fish wafer, fish pickle, fish ensilage, fish hydroslate, fish salad, fish ball, shark fin and fin rays, shark liver oil. National fisheries institutes of India	15 hrs
UnitIII	Ornamental fishes: Common species of ornamental fish suitable for aquarium. Freshwater and marine ornamental species- livebearers, egg layers. Marine ornamental fishes. Marine different ornamental organisms. Maturation, secondary sexual characters, breeding habits. Parental care in aquarium fish, development of eggs in fishes. Common ornamental fish diseases and treatment. Nutritive values of fishes: Biochemical composition of fish meat (Protein, Fats, Carbohydrates).	15 hrs

Recommended books:

1. C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.
2. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970
3. Jhingran VG. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
4. Kaestner, A. Invertebrate Zoology. Vol. I – III, John Wiley & Sons, 1967.
5. Kurian, C.V. & V.O. Sabastian. Prawns and Prawn Fisheries of India. Hindustan Pub. Co., 1976.
6. N. Arumuugam. Aquaculture and fisheries, Saras Publication, Nagercoil, Tamil Nadu
7. N. Arumuugam. Aquaculture, Saras Publication, Nagercoil, Tamil Nadu
8. N. Arumuugam. Concept of Ecology, Saras Publication, Nagercoil, Tamil Nadu
9. Pande and Shukla. Fish and Fisheries, Rastogi Publications Shivaji Road, Meerut, Uttar Pradesh

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	05
InternalAssessmentTest2	05
Assignment	10
Total	**20Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester– VI

ElectiveCourse(EC)

Course Title: -Inland and Capture fisheries of world and India
Course Code:C 6 IFF 5 T 1

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
EC-2	**Theory**	**03**	**04**	**45hrs.**	**3hrs.**	**20**	**80**	**100**

Course Outcomes (COs):Attheend ofthecoursestudentswillbeableto:

CO 1: to understand different inland fishery source

CO 2: to understand different Coldwater fishes

CO 3: to understand different lake and estuarine fishes

CO 4: to understand different capture fishes

CO 5: to understand riverine fisheries

CO6: to understand fisheries potentials of world and India as source of food

Unit	Title: Inland and Capture fisheries of world and India	45 hrs/ sem
UnitI	Inland fisheries of India and world; Importance of fresh water fisheries. Present status, yield and estimate of potential inland fisheries in world and India. International fisheries commissions. The Inland capture fisheries resource of world and India. Riverine fisheries resource of India. Fisheries of major and minor carps, catfishes and other groups. Problems and managements. Coldwater fisheries resources; Fisheries of trout, Mahaseer and other coldwater fish species. Development and management.	15 hrs
UnitII	Lacoustrine fisheries sources of India and world, salt lakes and its fisheries resource. Thermal stratification of lake and pond. Potentials and problems of development and management of lake fisheries. Estuarine fisheries resource of India; fishes of clupeoids, prawns, molluscs, mullets and other important groups. Fisheries of brackishwater lakes and backwaters of India.	15 hrs
UnitIII	Pelagic fisheries of India; Fisheries of Oil sardines, Lesser sardines, Anchovies, Clupeoids, Mackerels, Ribbon fisheries, Tunas, Seer fish, Carangids and Cephalopods.Mid water and demersal fisheries of India; Fisheries of	15 hrs

	elasmobranches, Bombay duck, Catfishes, Silver bellies, Sciaenids, Pomfrets, Threadfins, Perches, Flatfish, Prawns, Lobsters, Crabs, Mussels, Oysters and Clams and their economic importance.	

Recommended books:

1. Marine Capture Fisheries: P. K. Singh (Author)
2. Coastal aquaculture and mariculture: Iqlas Ahmed, S. Felix
3. Inland Fisheries (2+1): N. Jayakumar
4. Limnology: A. T. Ramachandra Naik & P. Padmavathy
5. Marine Biology (2+1): A. Srinivasan & Dr. A. T. Ramachandra Naik
6. Marine fisheries: S. M. Shivaprakash & N. Jayaprakash
7. A Text Book of Fishery Science and Indian Fisheries: Dr C B L Srivastava (Author)
8. Fish and Fisheries: Pandey (Author)

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
InternalAssessmentTest1	05
InternalAssessmentTest2	05
Assignment	10
Total	**20Marks**
FormativeAssessmentasperguidelines.	

B.Sc. Semester–IV/ V/VI

Skill Enhancement Course(SEC)

Student shall study SEC in any one of the Semesters either in IV or V or VI semester

College shall decide to allot the students

Course Title: Fish Pond preparation, culture and management and seed production (**Practical)**

Course Code: **C 0 IFF 6 P 1**

Type ofCourse	Theory /Practical	Credits	Instructionhou rperweek	TotalNo.ofLectu res/Hours /Semester	Durationof Exam	FormativeA ssessmentM arks	Summative assessment Marks	TotalMa rks
SEC	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**10**	**40**	**50**

Course Outcomes (COs):Attheend ofthecourse,studentswillbeableto:

CO 1: Acquire knowledge on management of nursery and grow-out pond.

CO 2: Identify the major live feed organisms in the fish culture pond

CO 3: Design and explain working of hatchery; apply farm laboratory equipment use

CO 4: Discuss the control of aquatic weeds, insects and predatory fishes

CO 5: Hydrobiology of pond and examine growth of finfish and shellfish

CO6: Design fish culture pond and working principle.

List of the Expedients, each will have 4rs / Week (Minimum 12 experiments)

1. Study of Preparation and management of nursery, rearing and grow-out fish pond.
2. Study on effect of liming on hydrobiology of pond.
3. Study on effect of manuring and fertilization on hydrobiology of pond and growth of fin fish and shellfish.
4. Collection, identification, and control of aquatic weeds in fish pond
5. Study Hatchery and farm layout installation and operation of hatchery farm laboratory equipment.
6. Collection, identification and control of aquatic insects fish pond
7. Study of pre-stocking management and post-stocking management nursery and rearing pond of fishes
8. Study and identification of major live feeds –Phytoplankton, Zooplankton, Green algae, diatoms, microalgae,Rotifers, Daphnia, Moina, Artemia and Copepods, Blood worm, Earthworm
9. Study of preparation of fishery fish feed and their formulation by locally available food stuff
10. Collection, identification and control of predatory fishes.
11. Induced breeding in Fish and shrimps (demonstration) (injection method and eye stalk ablation method
12. Field visit to marine finfish and shrimp hatchery, fish culture ponds, feed mill, aquatic health laboratory and fish processing

SCHEME OF PRACTICAL EXAMINATION

1. Procedure for fish feed preparation. 05 marks
2. Identification (insect, weed fish, predatory fish, live feed and weed plants)(10X2)20 marks
3. Field report10 marks
4. Journal05 marks

……..

Total 40 marks

Instructions if any:

1. Identification have given from student collections/lab specimens
2. Field visit report carry marks
3. Journal carries marks
4. Collection of specimens from local pond
5. Collection of specimens are well preserved

Books recommended:

1.Aquaculture Principles and Practices, 2Nd Edition by PILLAY, John Wiley

2.A Text Book of Aquaculture Hardcover – by M. S. Reddy (Author)

3.Aquaculture Paperback –by N Arumugam (Author)

4.Aquaculture: Farming Aquatic Animals and Plants, 2Ed by John S Lucas and Paul C Southgate, John Wiley

5.TEXTBOOK OF AQUACULTUREAUTHOR: A. PATEL, S. N. PATHAK

6.Freshwater Aquaculture Paperback – by R. K. Rath (Author)

B.Sc. programme: 2024-25

GENERAL PATTERN OF **THEORY** QUESTION COURSE FOR DSC/ EC

(80 marks for semester end Examination with 3 hrs duration)

Part-A

1. Question number 1-10 carries 2 marks each. : 20 marks

Part-B

2. Question number 11- 18 carries 05Marks each. Answer any 06 questions : 30 marks

Part-C

3. Question number 19-22 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 80 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours Prescribed