



Karmaveer Bhaurao Patil University, Satara

**Syllabus for
B. Sc. II Fishery Science**

**Under
Faculty of Science and Technology
(As per NEP 2020)**

With effect from Academic Year 2025-2026

GENERAL OBJECTIVES OF THE COURSE:

1. To impart the knowledge is the basic aim of education. The students are expected to acquire the knowledge of animal science, natural phenomenon, manipulation of nature and environment by man.
2. Understanding the scientific terms, concepts, facts, phenomenon and their interrelationships.
3. Applications of the knowledge
4. To develop skills in practical work, experiments and laboratory materials, instruments
5. To develop interest in the subject and scientific hobbies
6. To develop scientific attitude which is the major objective, this makes the students open minded, critical observations, curiosity, thinking etc.
7. Abilities to apply scientific methods, collection of scientific data, problem solving, organize science exhibitions, clubs etc.
8. Appreciation of the subject, contribution of the scientists, scientific methods, scientific programmes.

PROGRAMME OUTCOMES

1. The students will graduate with proficiency in the subject of their choice.
2. The students will be eligible to continue higher studies in abroad.
3. The students will be eligible to pursue higher position in industries.
4. The students will be eligible for jobs in government organization.
5. Possess a strong foundation of knowledge in their chosen field of study.
6. Develop a scientific mindset, becoming open-minded, critical, and curious, which will support their entry into research and innovation.
7. Be skilled in practical work, experiments, and the use of laboratory materials.
8. Be eligible to pursue higher studies in their field, both in India and abroad.
9. Qualify to appear for examinations for jobs in government organizations.
10. Meet the minimum eligibility requirements for various science-related job opportunities.
11. Be prepared to establish their own entrepreneurial ventures.
12. Enhance critical thinking, develop a scientific attitude, solve problems, improve practical skills, boost communication abilities, and strengthen social interactions.

PROGRAMME SPECIFIC OUTCOMES

After completing the B.Sc. (Fishery Science) program, students will:

1. Be able to explain, describe, discuss, and ask questions about various aspects of fisheries.
2. Design and conduct experiments related to Fish sciences.
3. Critically analyze the interactions between living and non-living entities in their surroundings.
4. Apply knowledge of fisheries to develop sustainable solutions for both society and industry.
5. Utilize their understanding of fishery sciences to become self-reliant, either by securing a job, establishing an agricultural setup, or launching a fishery-based entrepreneurial venture.
6. Design and manage projects related to fishery sciences.
7. Gain valuable skills in Fishery-based industries through internships.
8. Enhance research skills through research internships and in-house projects.
9. Present research findings at conferences and in research journals for publication.

10. Critically assess their role in contributing to environmental sustainability goals as responsible citizens.

1. TITLE: **Fisheries**

2. YEAR OF IMPLEMENTATION: **2025-2026**

3. DURATION: **01 year**

4. PATTERN: **Semester Examination**

5. MEDIUM OF INSTRUCTION: **English**

6. STRUCTURE OF THE COURSE: **As per B.Sc. II NEP 2.0**

7. EVALUATION STRUCTURE

Semester III (5.0)

Course	Course Category	Course Code	Internal Evaluation			ESE	Total Marks	Credits
			CCE- I	CCE- II	CCE- III			
Major	T	BFT 231	10	10	10	30	50	02
	T	BFT 232	10	10	10	30	50	02
	P	BFP 233	20			30	50	02
Minor	T	BFT 234	10	10	10	30	50	02
	T	BFT 235	10	10	10	30	50	02
	P	BFP 236	20			30	50	02
OE	P	BFPOE III	20			30	50	02
VSC	P	BFPVSC I	20			30	50	02
SEC	P	BFTSEC 1	20			30	50	02
AEC I	T	BFTAEC I	10	10	10	30	50	02
IKS II	T	BFTIKS II	10	10	10	30	50	02
Total							550	22

Semester IV

Course	Course Category	Course Code	Internal Evaluation			ESE	Total Marks	Credits
			CCE-I	CCE- II	CCE- III			
Major	T	BFT 241	10	10	10	30	50	02
	T	BFT 242	10	10	10	30	50	02
	P	BFP 243	20			30	50	02
Minor	T	BFT 244	10	10	10	30	50	02
	T	BFT 245	10	10	10	30	50	02
	P	BFP 246	20			30	50	02
OE	P	BFPOE IV	20			30	50	02
VSC	P	BFPVSC II	20			30	50	02
SEC	P	BFPSEC 2	20			30	50	02
AEC II	T	BFTAEC 2	10	10	10	30	50	02
VEC II	T	BFTVEC 2	10	10	10	30	50	02

8.STRUCTURE OF COURSE:

As Per NEP 2020 (2.0)

Class	Level	Sem	Subject-1 Major		Subject-2 Minor		OE	VSC	SEC	AEC	VEC	IKS-II	Total
B.SC-II	5.0		T	P	T	P	P	P	P	T	T	T	
		III	4 (2 Theory papers)	2 (1 Practical paper)	4	2	2	2	2	2	-	2	22
		IV	4 (2 Theory papers)	2 (1 Practical paper)	4	2	2	2	2	2	2	-	22

9. Course Title :

Third Semester

Nature of the Course	Course Code	Name of the course	Credit
Theory (Major)	BFT231	Finfish Biology I	2
	BFT232	Marine Fisheries	2
Practical (Major)	BFP233	Practical Course III	2
Theory (Minor)	BFT234	Limnology	2
	BFT235	Fundamentals of Aquaculture	2
Practical (Minor)	BFP236	Practical III	2
AEC	BFPAEC I	English Department	2
OE III	BFTOE III	Other Department	2
IKS II	BFTIKS II	Fundamentals of Ayurveda	2
VSC	BFPVSC I	Freshwater Aquaculture Production	2
SEC Practical	BFTSEC I	Fish Seed Production	2
		Total Credits	22

Fourth Semester

Nature of the Course	Course Code	Name of the course	Credit
Theory (Major)	BFT241	Finfish Biology II	2
	BFT242	Inland Fisheries	2
Practical (Major)	BFP243	Practical Course IV	2
Theory (Minor)	BFT244	Freshwater Aquaculture	2
	BFT245	Soil and Water Quality Management in Aquaculture	2
Practical (Minor)	BFP246	Practical IV	2
AEC	BFPAEC II	English Department	2
OE IV	BFTOE IV	Other Department	2
VEC II	BFPVEC II	Environmental Studies (From Other department)	2
VSC	BFPVSC II	Ornamental fish breeding	2
SEC	BFPSEC II (Practical)	Fish Hatchery manager	2
Total Credits			22

9. OTHER FACILITIES:

A) LIBRARY:

Reference books, Textbooks, journals and Periodicals are available in Institute and Departmental Library. (Separate reference lists are attached along with the respective course syllabus)

B) EQUIPMENT:

a) Computer, LCD projector, visualizer, smart board

b) Laboratory Equipment:

1. Microscope with a digital camera
2. Hot Air Oven
3. Digital weighing balance
4. Incubator
5. pH meter
6. Refrigerator
7. Microtome
8. Autoclave
9. Water analysis Kit



Karmaveer Bhaurao Patil University, Satara

**Syllabus for
B. Sc. II Fishery Science
Semester III**

**Under
Faculty of Science and Technology
(As per NEP 2020)**

With effect from Academic Year 2025-2026



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Zoology

Programme: B.Sc. Fishery Science

Semester - III

Type : Major

Marks: 20/30

Credits : 2

From: A. Y. 2025-26

Name of the Course: Finfish Biology I (BFT231)

Course Objectives:, Students should be able to...

- 1) identify & classification marine water fin fish.
- 2) learn morphological and structural adaptations of fish for survival in aquatic environments.
- 3) explain functional systems of finfish, including their digestive, respiratory, circulatory, nervous, and reproductive systems.
- 4) describe Photoreceptor organs, Olfactory organs.

Course Outcomes: Students will be able to...

- 1) explain of the growth patterns and life cycles of different finfish species.
- 2) demonstrate digestive, respiratory systems from dissected Scoliodon.
- 3) discuss the structure and function of various parts of the fish to their survival in aquatic environments.
- 4) compare different photoreceptor organs.

Module	Title and Contents	Hrs
Module -1:	Scoliodon 1.1 Introduction and Classification of Scoliodon 1.2 Morphology of Scoliodon 1.3 Skin- structure and its function 1.4 Axial and Appendicular skeleton	08
Module -2:	Digestive system of Scoliodon 2.1 Alimentary canal. 2.2 Associated glands of digestive system. a. Liver, b. Pancreas, c. Gall bladder, d. Physiology of digestion Respiratory system of Scoliodon 2.3 Structure of gills 2.4. Physiology of respiration	08
Module -3:	Circulatory system of Scoliodon 3.1 Structure & function of heart 3.2 Physiology of heart 3.3 Arterial and Venous system	07
Module -4:	Nervous system of Scoliodon – 4.1 Structure and function of brain and spinal cord 4.2 Photoreceptor organs 4.3 Olfactory organs – Structure and functions.	07

Urinogenital System of Scoliodon 4.4 Male and Female reproductive system	
Reference Books:- - Chandran, S., and R. Kumar, eds. Fisheries Biology, Aquaculture and Post-Harvest Management: Volume 01. New Delhi: Brillion Publishing, 2024. - Chhapgar, B. F. Common Fishes of India. New Delhi: National Book Trust, 1987. - Diwan, A., S. N. Harke, and A. Panche, eds. Microbiome of Finfish and Shellfish. Boca Raton: CRC Press, 2024. Felix, S., N. Karthik, and S. Shamini. Anatomy and Biology of Finfish: Theory Manual. New Delhi: Satish Serial Publishing House, 2024. - Guraya, S. S. The Cell and Molecular Biology of Fish Oogenesis. New Delhi: Oxford & IBH Publishing, 1986. - Jhingran, V. G. Fish and Fisheries of India. 2nd ed. New Delhi: Hindustan Publishing Corporation, 1982. - Pandian, T. J. Sexuality in Fishes. Boca Raton: CRC Press, 2010. - Prakash, P. Biology of Commercially Important Fin Fishes and Shell Fishes. New Delhi: Daya Publishing House, 2021. - Shah, T. K., M. Sharma, M. A. Rather, A. Sahu, and A. Kumar, eds. Advances in Fish Genetics and Pathology. Boca Raton: CRC Press, forthcoming 2025	
Evaluation Pattern: 20/30	
Total Marks: 50	
Internal Continuous Evaluation: - CCE- 1 10 M - CCE- 2 10 M - CCE- 3 10 M	End Semester Examination: - Question -1 10 M - Question -2 20 M - Question -3 20 M

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Zoology	
	Programme: B.Sc.Fishery Science	Semester - III
	Type : Major	Marks: 20/30
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Marine Fisheries (BFT232)		
Course Objectives: Students should be able to... 1) understand of the structure, function, and dynamics of marine ecosystems 2) examine ecological interactions between marine organisms, such as predator-prey relationships, competition, and symbiosis, and their impact on marine communities and biodiversity. 3) analyse the effects of biotic and abiotic factors on marine ecosystems. 4) evaluate human impacts on marine environments and explore conservation strategies for sustainable management of marine.		
Course Outcomes: Students will be able to... 1) discuss of physicochemical parameters of marine habitat. 2) explain how marine organisms interact within ecosystems, focusing on processes like predation, competition, and symbiosis. 3) demonstrate the ability to apply ecological knowledge by analyzing how factors like temperature, salinity, and light influence marine ecosystems. 4) assess human-induced impacts on marine environments and propose conservation strategies for the sustainable management of these ecosystems.		
Module	Title and Contents	Hrs
Module -1:	Marine ecology 1.1 Zonation of marine environment 1.2 Physical parameters of sea: tides, waves, light, temperature, currents, density & pressure. 1.3 Chemical parameters of sea: salinity, dissolved oxygen, pH and nutrients. 1.4 Oceanographic instruments: a. Grabs b. Dredges c. Secchi disc d. Water sampler e. reversing and non-reversing thermometers f. Plankton net g. SONAR communication system h. Fish Finder`	08
Module -2:	General account of – 2.1 Major group of Plankton: a. Phytoplankton b. Zooplankton 2.2 Sea weeds. 2.3 Marine animal associations: Commensalism b. Symbiosis c. Parasitism	08
Module -3:	3.1. Intertidal ecology: a. Rocky shore b. Muddy shore c. Sandy shore 3.2. Sub- tidal ecology: a. Mud bank b. Coral reefs	06
Module -4:	Marine buffered ecosystem: A. Estuary 4.1 Definition of Brackish water and estuary 4.2 Physico-chemical parameters of estuary	08

	4.3 Types of estuary 4.4 Biota of estuaries -Permanent and migratory 4.5 Adaptations of estuarine organisms B. Mangroves 4.6 Habitat and its growth 4.7 Adaptations to the mangrove environment	
Reference Books: 1) Alcock, Alfred William. A Naturalist in Indian Seas: Or, Four Years with the Royal Indian Marine Survey Ship "Investigator." London: John Murray, 1902. 2) Apte, Deepak. Field Guide to the Marine Life of India. Goa: WWF-India, 2016. 3) Chhapgar, B. F. Seashore Life of India. New Delhi: Oxford University Press, 1991. 4) Khajure, N. V., and R. T. Rathod. Marine Biology and Ecology. Delhi: Narendra Publishing House, 2021. 5) Mitra, Abhijit, and Sufia Zaman. Basics of Marine and Estuarine Ecology. New Delhi: Springer, 2016. 6) Modassir, Yasmin. Conservation and Sustainable Management of Molluscan Resources along Goa Coast, Central West Coast of India. In Recent Advances in Environmental Sciences, edited by K. G. Hiremath, 96–104. New Delhi: Discovery Publishing House, 2002. 7) Nair, N. Balakrishnan. A Textbook of Marine Ecology. London: Macmillan, 1971. 8) Pandey, Prem Chand, and Dinabandhu Sahoo, eds. Advances in Marine and Antarctic Science. New Delhi: APH Publishing, 2002. 9) Pandian, T. J. Sexuality in Fishes. Enfield, NH: Science Publishers, 2010. 10) Venkataraman, Krishnamoorthy, and Chandrakasan Sivaperuman, eds. Marine Faunal Diversity in India: Taxonomy, Ecology and Conservation. London: Elsevier, 2014.		
Evaluation Pattern: 20/30		
Total Marks: 50		
Internal Continuous Evaluation: • CCE- 1 10 M • CCE- 2 10 M • CCE-3 10 M	End Semester Examination: • Question -1 10 M • Question -2 20 M • Question -3 20 M	

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	Board of Studies in Zoology	
	Programme: B.Sc.Fishery Science	Semester - III
	Type : Major Practical	Marks: 20/30
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Practical III (BFP 233)		
Course Objectives: Students should be able to... 1) understand Fish Anatomy and Morphology. 2) develop skills in identifying different finfish species based on external and internal anatomical features, and using taxonomic classification methods. 3) assess growth patterns and study the development of finfish, including the effects of environmental factors on their growth. 4) differentiate between male and female reproductive system of Scoliodon		
Course Outcomes: Students will be able to... 1) identify and classify any given fish. 2) analyze field data, including measurements of temperature, salinity, and nutrient levels, to assess the health of marine ecosystems. 3) apply classification techniques to identify different finfish species based on their morphological characteristics and taxonomic classification. 4) evaluate the importance of sustainable fishing practices and fish conservation efforts, considering ecological, economic, and social factors.		
Module	Title and Contents	Hrs
1. -	Classification, general characteristics of Scoliodon	60
2.	Demonstration of Scoliodon -Digestive system	
3.	Demonstration of Scoliodon -Brain	
4.	Demonstration of Scoliodon -Heart	
5.	Demonstration of Scoliodon -Male reproductive system	
6.	Demonstration of Scoliodon – Female reproductive system.	
7.	Study of Photoreceptor organs	
8.	Study of Olfactory organs – Structure and Function	
9.	Structure of gills	
10.	Study of Oceanographic instruments: Grabs b. Dredges c. Secchi disc	
11.	Study of Oceanographic instruments: a. Water samplers b. Reversing and non-reversing thermometers c. Plankton collecting net	
12.	Analysis of phytoplankton sample	
13.	Analysis of zooplankton sample	
14.	Estimation of Dissolved oxygen from given water Sample	
15.	Estimation of Dissolved CO ₂ from given water Sample	
16.	Estimation of Chlorides from given water Sample	

17.	Estimation of Carbonates from given water Sample	
18.	Determination of pH by pH meter	
19.	Study types of sea weeds	
20.	Visit to sandy shore / Field visit	
Reference Books:- 1) Felix, S., N. Karthik, and S. Shamini. Anatomy and Biology of Finfish: Theory Manual. New Delhi: Satish Serial Publishing House, 2024. 2) Guraya, S. S. The Cell and Molecular Biology of Fish Oogenesis. New Delhi: Oxford & IBH Publishing, 1986. 3) Jhingran, V. G. Fish and Fisheries of India. 2nd ed. New Delhi: Hindustan Publishing Corporation, 1982. 4) Khajure, N. V., and R. T. Rathod. Marine Biology and Ecology. Delhi: Narendra Publishing House, 2021. 5) Mitra, Abhijit, and Sufia Zaman. Basics of Marine and Estuarine Ecology. New Delhi: Springer, 2016. 6) Modassir, Yasmin. Conservation and Sustainable Management of Molluscan Resources along Goa Coast, Central West Coast of India. In Recent Advances in Environmental Sciences, edited by K. G. Hiremath, 96–104. New Delhi: Discovery Publishing House, 2002. 7) Nair, N. Balakrishnan. A Textbook of Marine Ecology. London: Macmillan, 1971. 8) Pandey, Prem Chand, and Dinabandhu Sahoo, eds. Advances in Marine and Antarctic Science. New Delhi: APH Publishing, 2002. 9) Pandian, T. J. Sexuality in Fishes. Boca Raton: CRC Press, 2010. 10) Prakash, P. Biology of Commercially Important Fin Fishes and Shell Fishes. New Delhi: Daya Publishing House, 2021. 11) Shah, T. K., M. Sharma, M. A. Rather, A. Sahu, and A. Kumar, eds. Advances in Fish Genetics and Pathology. Boca Raton: CRC Press, forthcoming 2025.		
Evaluation Pattern:		
Total Marks:50		
Internal Continuous Evaluation: 20 M (student performance, attendance, journal record and viva)		End Semester Examination: • Question -1 • Question -2 • Question -3

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	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Zoology	
	Programme: B.Sc, Fishery Science	Semester- III
	Type : Minor	Marks: 50
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Limnology (BFT234)		
Course Objectives: Students should be able to... 1) identify different types of freshwater ecosystems, understand their functions, and describe their physical, chemical, and biological characteristics. 2) understand of how energy, nutrients, and organisms flow through freshwater ecosystems, and how ecological processes like primary production, decomposition, and nutrient cycling work. 3) learn the effects of human activities on freshwater ecosystems, including eutrophication, habitat destruction, and climate change, and identify mitigation strategies. 4) introduce the various research methods used in limnological studies, including sampling techniques, laboratory analysis, data interpretation, and the use of technology in freshwater research.		
Course Outcomes: Students will be able to... 1) analyse global inland fisheries status and trends effectively. 2) demonstrate knowledge of Inland fish resources and conservation strategies. 3) apply understanding of fishing methods to diverse inland environments. 4) evaluate and propose conservation measures for sustainable fisheries management.		
Module	Title and Contents	Hrs
Module -1:	Concepts in Limnology 1.1 Definition and Aspects 1.2. Identification and Distribution: a.Lentic habitats b.Lotic habitats	08
Module -2:	Physico-chemical Factor : 2.1 Temperature and Light: Thermal stratification thermal classification of lakes; Factors affecting light penetration in natural waters 2.2. Dissolved oxygen: Sources, Depletion and Replenishment 2.3. Symptoms of oxygen depletion problems and control mechanisms in fish ponds. 2.4. Carbon dioxide: Sources, Depletion and Replenishment 2.5. Role of Bio-geochemical cycles and account of nutrients	08
Module -3:	Composition, Classification and Distribution patterns 3.1.Plankton 3.2. Benthos 3.3. Nekton 3.4 Aquatic Plants	06

Module -4:	Productivity and Eutrophication 4.1 Productivity: Concept of productivity; methods for the estimation of primary, secondary and tertiary productivity; Classification of lakes based on productivity; indices of productivity in lakes 4.2. Turbidity: Causes, consequences and control. 4.3. Eutrophication: Causes, consequences and control mechanisms. 4.4. Bio-manipulation Concept: Zooplankton as a tool in lake management.	08
Reference Books:- 1. Aggarwal, S. C. Limnology. New Delhi: A.P.H. Publishing Corporation, 1999. 2. Edmunds, L.N. 1984 / latest edition- Cell Cycle Clock, Marcel Dekker, New York. 3. Edmunds, L.N. 1987/ latest edition. Cellular & Molecular Basis of Biological Clocks Springer – Verlag Berlin. 4. Kumar, Arvind, ed. Fundamentals of Limnology. Delhi: APH Publishing, 2005. 5. Manilal, K. S. Limnological Studies in Kerala. Kozhikode: University of Calicut Press, 1998. 6. Modassir, Yasmin. "Conservation and Sustainable Management of Molluscan Resources along Goa Coast, Central West Coast of India." In Recent Advances in Environmental Sciences, edited by K. G. Hiremath, 96–104. New Delhi: Discovery Publishing House, 2002. 6. Munshi, Jayshree Datta, and Jyotiswarup Datta Munshi. Fundamentals of Limnology. New Delhi: Astral International Pvt. Ltd., 2016. 7. Shrivastava, Pradeep, and Arun Kumar Namdeo. Limnology of Certain Tropical Wetlands and Their Conservation: An Approach of Restoration and Conservation: Indian Wetlands. Saarbrücken: LAP LAMBERT Academic Publishing, 2014. 8. Singh, H. R., ed. Advances in Limnology. Delhi: Narendra Publishing House, 2005. 9. Venkataraman, G. S. Algal Biofertilizers and Rice Cultivation. New Delhi: Today & Tomorrow's Printers & Publishers, 1972. 10. Wetzel RG. <i>Limnology</i> , W.B. Sanders Company, Philadelphia.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation: • CCE- 1 10 M • CCE- 2 10 M • CCE-3 10 M	End Semester Examination: • Question -1 10 M • Question -2 20 M • Question -3 20 M	

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	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Zoology	
	Programme: B.Sc,Fishery Science	Semester- III
	Type : Minor	Marks:20/30
	Credits : 2	Credits : 2
Name of the Course: Fundamentals of Aquaculture (BFT235)		
Course Objectives: Students should be able to... 1) learn knowledge required to manage aquatic organisms in controlled environments. 2) identify different types aquatic habitat. 3) recall fundamental concepts and terminology related to aquaculture, such as different aquaculture systems, species, and water quality parameters. 4) assess the economic aspects of aquaculture considering factors like cost analysis, budgeting, and profitability.		
Course Outcomes: Students will be able to... 1) understand history & types of aquaculture & difference between Culture & capture fisheries. 2) describe pre-requisite of site selection and ideal layout of fish farm. 3) enlist the physico-chemical parameters of water bodies and criteria for selection of major species of fish for aquaculture. 4) evaluate physico-chemical condition of water body.		
Module	Title and Contents	Hrs
Module -1:	Basics of aquaculture – 1.1 Scope and definition, 1.2 History of aquaculture 1.3 Principles underlying the practices of aquaculture. 1.4 Aquaculture Vs Agriculture	06
Module -2:	Types of fish ponds 2.1 Source of water for fish pond – Spring, Rain water, Flood water, Well water and Water course ponds. 2.2 Classification of ponds based upon functions – Hatchery, Nursery, Rearing, Stocking and Quarantine ponds. 2.3 Criteria for the selection of species for culture.	08
Module -3:	Construction of Fish Pond 3.1 Important factors in construction of – site selection, topography, nature of soil, water resources – quantity and quality of water, sources of pollution. 3.2 Design and construction of pond – layout of farm, size of farm, shape and depth of pond, dike design. 3.3 Pond bottom preparation, inlet, outlet, aerators 3.4 Method of construction.	08
Module -4:	Pond Management 4.1 Liming – Effect of liming 4.2 Need of fertilizers and manures in culture ponds 4.3 Physico-Chemical Parameter of soil and water – Temperature, depth, turbidity light water currents, pH, Dissolved oxygen, Co ₂ , Hardness, 4.4 Eradication of predator and weed fish.	08
Reference Books:- 1) Bhosale, M. M., R. R. Mugale, and G. K. Dutta. Basic Principles and Practices in Aquaculture. Delhi: Narendra Publishing House, 2023. 2)Felix, S., and C. Judith Betsy. Principles of Aquaculture. Delhi: Narendra Publishing House, 2019. 3)Khune, C. J., Rajendra V. Tijare, S. R. Sitre, and S. B. Zade. Principles of Aquaculture. Mumbai: Himalaya Publishing House, 2017. 4) Kumar, Arvind, ed. Fundamentals of Limnology. Delhi: APH Publishing, 2005.		

- 5) Manilal, K. S. Limnological Studies in Kerala. Kozhikode: University of Calicut Press, 1998.
- 6) Mitra, Abhijit, and Sufia Zaman. Basics of Marine and Estuarine Ecology. New Delhi: Springer, 2016.
- 7) Modassir, Yasmin. "Conservation and Sustainable Management of Molluscan Resources along Goa Coast, Central West Coast of India." In Recent Advances in Environmental Sciences, edited by K. G. Hiremath, 96–104. New Delhi: Discovery Publishing House, 2002.
- 8) Sunshi, Jayshree Datta, and Jyotishwarup Datta Munshi. Fundamentals of Limnology. New Delhi: Astral International Pvt. Ltd., 2016.
- 9) Pandian, T. J. Fish Genetics and Aquaculture Biotechnology. Enfield, NH: Science Publishers, 2005.
- 10) Pillay, T. V. R., and M. N. Kutty. Aquaculture: Principles and Practices. New Delhi: Wiley India Pvt Ltd, 2011

Evaluation Pattern: 20/ 30	
Total Marks: 50	
Internal Continuous Evaluation: • CCE- 1 10 M • CCE- 2 10 M • CCE- 3 10 M	End Semester Examination: • Question -1 10 M • Question -2 20 M • Question -3 20 M



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Zoology

Programme: B.Sc. Fishery Science

Semester- III

Type : Minor Practical

Marks: 20/30

Credits : 2

From: A. Y. 2025-26

Name of the Course: Practical III (BFP236)

Course Objectives: Students should be able to...

- 1) learn various equipment's used in soil and water analysis.
- 2) understand various phytoplankton, zooplankton and benthos
- 3) determine different physicochemical parameters of soil sample.
- 4) capable of conducting fieldwork and laboratory analysis, using appropriate techniques and equipment to collect and analyze data from freshwater environments

Course Outcomes: Students will be able to...

- 1) demonstrate various equipment's used in soil and water analysis
- 2) analyse different physicochemical parameters of water sample
- 3) explain various phytoplankton, zooplankton and benthos
- 4) determine different physicochemical parameters of soil sample.

Module	Title and Contents	Hrs
1.	Determination of total dissolved solids of water sample.	60
2.	Estimation of dissolved oxygen of water sample.	
3.	Estimation of free carbon dioxide of pond water sample.	
4.	Estimation of total alkalinity of water sample.	
5.	Estimation of hardness of water sample.	
6.	Identification of large aquatic plants.	
7.	Collection and identification of phytoplankton.	
8.	Collection and identification of zooplankton.	
9.	Estimation of primary productivity of pond water sample.	
10.	Study of Cultivable importance of fish.	
11.	Predatory freshwater fishes.	
12.	Layout and designing of fresh water pond.	
13.	Predaceous freshwater insects.	
14.	Study of Sampling procedure and growth assessment	
15.	Study of Lime and fertilizer requirement	
16.	Determine carrying capacity of pond and stocking density.	
17.	Determine carrying capacity of pond and stocking density.	
18.	Control of predators in fish pond	
19.	Control of weeds in fish pond	

20.	Visit to fish farm.	
Reference Books:- 1) American Public Health Association. Standard Methods for the Examination of Water and Wastewater. 23rd ed. Washington, D.C.: American Public Health Association. 2017. 2) Bellinger, Edward G., and David C. Sige. Freshwater Algae: Identification, Enumeration, and Use as Bioindicators. 2nd ed. 2015. 3) Boyd, Claude E. Bottom Soils, Sediment, and Pond Aquaculture. New York: Chapman and Hall. 1995. 4) Boyd, Claude E. Water Quality Management for Pond Fish Culture. New York: Elsevier Publications. 1999. 5) Chakrabarti, N. M. Biology, Culture, and Production of Indian Major Carps. New Delhi: Narendra Publishing House. 1998. 6) Cole, G. L. Textbook of Limnology. C.V. Mosley Co. 1954. 7) Jhingran, V. G. Fish and Fisheries of India. New Delhi: Hindustan Publishing Corporation. 1982. 8) Kormondy, Edward J. Concepts of Ecology. New Delhi: Prentice Hall of India Pvt. Ltd. 1996. 9) Landau, Mathew. Introduction to Aquaculture. New Delhi: Daya Publishing House. 1995. 10) Marine Products Export Development Authority (MPEDA). Handbook on Shrimp Farming. Kochi, India. 1991. 11) Nair, Balakrishnan, and D. M. Thampy. A Textbook of Marine Ecology. New Delhi: McMillan Co. of India Ltd. 1980. 12) Odum, Eugene P. Fundamentals of Ecology. 3rd ed. Dehradun: Natraj Publishers. 1996. 13) Pillai, N. K. Introduction to Planktonology. Mumbai: Himalaya Publishing House. 1986. 14) Pillai, N. K. Marine Biology and Ecology. New Delhi: Daya Publishing House. 1993. 15) Pillay, T. V. R. Aquaculture: Principles and Practices. Blackwell Scientific Publications: Fishing News Books. 1993. 16) Pillay, T.V.R., and M.N. Kutty. Aquaculture: Principles and Practices. 2nd ed. 2005. 17) Santhanam, R. A Manual of Fresh Water Ecology: An Aspect of Fishery Environment. New Delhi: Daya Publishing House. 1993. 18) Santhanam, R., and A. Srinivasan. A Manual of Marine Zooplankton. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd. 1994.		
Evaluation Pattern:		
Total Marks:50		
Internal Continuous Evaluation: 20 M (student performance, attendance, journal record and viva)		End Semester Examination: • Question -1 • Question -2 • Question -3

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Zoology	
	Programme: B. Sc. Fishery Science	Semester- III
	Type : VSC	Marks: 20/30
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Freshwater Aquaculture Production (BFPVSC 1)		
Course Objectives: Students should be able to... 1) identify different species of freshwater fish and aquatic organisms suitable for aquaculture. 2) explain the basic concepts of aquaculture, such as breeding, feeding, water management, and disease control. 3) understand appropriate aquaculture techniques for stocking, growing, and harvesting freshwater organisms. 4) learn the impact of environmental factors (e.g., water quality, temperature, pH) on the growth and health of aquaculture species.		
Course Outcomes: Students will be able to... 1) demonstrate various equipment's used in soil and water analysis. 2) analyse different physicochemical parameters of water sample. 3) differentiates various phytoplankton, zooplankton and benthos. 4) determine different physicochemical parameters of soil sample.		
Module	Title and Contents	Hrs
1.	Importance of Cultivable fin fishes.	60
2.	Economic Importance of Fishes	
3.	Layout and Design of freshwater farm	
4.	Layout and Design of fish and prawn hatcheries.	
5.	Study of aquatic plants.	
6.	Estimation of soil organic carbon.	
7.	Practices on post stocking management	
8.	Testing of soil for water holding capacity	
9.	Estimation and calculation of production cost of fish farm.	
10.	Estimation and calculation of production cost of prawn farm.	
11.	Study of different types of filters.	
12.	Determination of temperature, pH and turbidity.	
13.	Determination of TDS	
14.	Estimation of alkalinity.	
15.	Estimation of hardness.	
16.	Estimation of dissolved oxygen.	
17.	Estimation of free carbon dioxide.	
18.	Estimation of nitrogen in soil.	
19.	Submission of Case study	
20.	Visit to farm and hatchery	

\Reference Books:- 1) Ahmad, S. H., and A. K. Singh. Freshwater Aquaculture. 2014. 2) Bandyopadhyay, Biplab Kumar. Freshwater Aquaculture: A Functional Approach. 2019. 3) Bandyopadhyay, Biplab Kumar. Freshwater Aquaculture: A Functional Approach. 2022. 4) Chakrabarti, N. M. Biology, Culture and Production of Indian Major Carps. Narendra Publishing House, New Delhi. 1998. 5) Jhingran, V. G. Fish and Fisheries of India. Hindustan Publishing Corporation, New Delhi. 1982. 6) Pillay, T. V. R. Aquaculture: Principles and Practices. Fishing News Books. Black Well Scientific Publications. 1993. 7) Rath, Rajendra Kumar. Freshwater Aquaculture. 2018. 8) Singh, N. P., and B. Santhosh, eds. Handbook on Freshwater Aquaculture. 2015. 9) Tripathi, S. N., and M. S. Lakra. Aquaculture in India. 2018.	
Evaluation Pattern:	
Total Marks:50	
Internal Continuous Evaluation: 20 M (student performance, attendance, journal record and viva)	End Semester Examination: • Question -1 • Question -2 • Question -3

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Zoology	
	Programme: B.Sc,	Semester- III
	Type : IKS	Marks : 20/30
	Credits : 2	Credits : 2
Name of the Course: Fundamentals of Ayurveda(BFTIKS 2)		
Course Objectives: Students should be able to... 1) recall concept of Ayurveda. 2) list of types of Ayurveda 3) describe Concept of Kriya Sharir 4) identify mutual relationship between Triguna, Tridosha & Panchmahabhut		
Course Outcomes: Students will be able to... 1) memorize the Concept of Ayurveda. 2) discuss Principles and Significance of Ayurveda 3) classify Concept of nutrition in Ayurveda 4) implement preventive approaches in real life.		
Module	Title and Contents	Hrs
Module -1:	Basics of Ayurveda 1.1 Definition and Components of Ayu 1.2 Definition and aim of Health Science 1.3 Types of Ayu (Hitayu, Ahitayu, Sukhay and Dukhaya) 1.4 Brief introduction of Ayurveda Samhitas 1.5 Principles of Ayurveda	08
Module -2:	Ayurved Itihas and Prayogika Siddhant 2.1 Post independent Development of Healths: Education 2.2 Globalisation of Indian Health Science 2.3 Tridosh Siddhant 2.4 Panchabhautik Siddhant 2.5 Manastatva and its Chikitsa Siddhant.	08
Module -3:	Kriya Sharir 3.1 Definition of Sharir 3.2 Definition of Kriya 3.3 Description of Sharir Dosha and Manasa Dosha. 3.4 Mutual relationship between Triguna, Tridosha & Panchmahabhuta.	08
Module -4:	Indriya Shaarira 4.1 Definition of indriya, indriya artha and indriya adhisthan, their number and importance. 4.2 Description of gyanendria, karmendriya and ubhayendriya (manas).	06
Reference Books:- 1)Dr. Shubha and Dr. Ravi Rao. A Text Book of Padartha Vijnana Evam Ayurveda Itihas; Chaukhambha Orientalia, Varanasi. 2016. 2) Dr. Vidyalashmi K. and Dr. Shrikanth P.H. Padartha Vijnana Evam Ayurveda Itihasa; Chaukhambha Orientalia, Varanasi.2019		

- 3) Dr. Giridhar M. Kanthi. A Text Book of Ayurvedic human anatomy (Sharir Rachana Vigyan). 2018.
- 4) Dr.Subhash Ranade, Dr. R.R. Deshpande and Dr. Swati Chaubhe. A Text Book of Kriya Sharira. 2017.
- 5) Girindranath Bhisagacarya. History of Indian Medicine: From Earliest Times to the Present. 2003.
- 6) Vaidya Bhagwan Dash. Basic Principles of Ayurveda. 1994.

Web Links:

1. http://ccras.nic.in/sites/default/files/ebooks/24052018_CCRAS_Cardiac_disorders.pdf

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation:

- CCE- 1 10 M
- CCE- 2 10 M
- CCE-3 10 M

End Semester Examination:

- Question -1 10 M
- Question -2 20 M
- Question -3 20 M



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Zoology

Programme: B.Sc,

Semester- III

Type : SEC-I Practical

Marks: 50

Credits : 2

From: A. Y. 2025-26

Name of the Course: Skill Enhancement Course (BFPSEC-I): Fish Seed Production

Course Objectives: Students should be able to...

- 1) understand the fish seed structure.
- 2) remember suitable physico-chemical condition to growing seeds.
- 3) learn the developing stages of fish from seed to adult
- 4) correlate knowledge of proper handling and transportation of seed

Course Outcomes: Students will be able to...

- 1) explain physico-chemical parameters of water
- 2) Prepare of pituitary extract.
- 3) discuss methods of transportation and maintenance of fish seed
- 4) explain acclimatization of fish

Module	Title and Contents	Hrs
1.	Identification of commercially important fish and shellfish species for seed rearing	60
2.	Selection of healthy brood fish based on maturity, health, and species.	
3.	Sex identification and maturity stage determination.	
4.	Preparation of pond as per requirement of the respective stages of seed to be grown i.e. spawn, to fry, Fry to fingerling (Post larvae to juvenile in freshwater prawn)	
5.	Removal of aquatic weeds, insects and predatory fishes.	
6.	Estimation of plankton density and composition in fish pond	
7.	Handling the mature brooders and brood stalk management.	
8.	Study of Chinese circular hatchery design and functioning.	
9.	Maintenance and disinfection of breeding tanks and hatchery equipment.	
10.	Estimation of water quality parameters (temperature, DO, pH, alkalinity).	
11.	Collection and preservation of pituitary gland extract (PGE).	
12.	Preparation and administration of hormonal doses (pituitary extract, Ovaprim, HCG, etc.).	
13.	Collection and preservation of fish eggs.	
14.	Study and observation of embryonic development stages under microscope.	
15.	Handling and transfer of hatchlings to nursery ponds.	
16.	Estimation of survival and growth rate of fry.	
17.	Feed preparation for fry and fingerlings (live feed and formulated feed).	
18.	Identification of common fish diseases and parasites.	
19.	Estimation of seed production efficiency and economics.	

20.	Visit to government and private fish hatcheries/ fish fam.	
Reference Books:- 1) Basavaraja, N. Freshwater Fish Seed Resources in India. 2007. 2) Betsy, C. Judith, and L. Stephen Sampath Kumar. Biotechnological Applications in Fish Seed Production. 2017. 3) Jhingran, V. G., and R. S. V. Pullin. A Hatchery Manual for the Common, Chinese, and Indian Major Carps. 1985. 4) Karal Marx, K., J. K. Sundaray, and M. Muthu Abishag. Broodstock Management and Fish Seed Production. 2020. 5) Karal Marx, K. Broodstock Management and Quality Fish Seed Production in Freshwater Fishes. 2019. 6) Nandeesh, M. C. Fish Seed Production and Hatchery Management. 1990. 7) Pandian, T. J. Fish Genetics and Aquaculture Biotechnology. 2005. 8) Pandian, T. J. Sexuality in Fishes. 2010. 9) Srivastava, Uma Kant, D. K. Desai, G. S. Gupta, V. K. Gupta, and M. Raghavachari. Inland Fish Marketing in India (Fish Seed Production and Marketing). 2001. 10) Tripathi, S. N., and M. S. Lakra. Aquaculture in India. 2018.		
Evaluation Pattern:		
Total Marks: 50		
Internal Evaluation (20 marks): • Journal: 10 Marks - Students Performance: 05 Marks - Viva: 05 Marks		End Semester Examination: • Question -1 • Question -2 • Question -3



Karmaveer Bhaurao Patil University, Satara

Syllabus for
B. Sc. II Fishery Science
Semester IV

Under
Faculty of Science and Technology
(As per NEP 2020)

With effect from Academic Year 2025-2026

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Zoology	
	Programme: B.Sc, Fishery Science	Semester- IV
	Type : Major	Marks :20/30
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Finfish Biology II (BFT 241)		
Course Objectives: Students should be able to... 1) identify & classification freshwater fin fish. 2) learn digestive, respiratory systems from dissected Labeo. 3) demonstrate of circulatory, reproductive, nervous systems from dissected Labeo. 4) study Photoreceptor organs, Olfactory organs.		
Course Outcomes: Students will be able to... 1) understand structure and function of heart of Labeo. 2) differentiate between male and female reproductive system of Labeo. 3) analysis of gut contents to determine feeding habits. 4) describe the photoreceptor and olfactory organs of Labeo.		
Module	Title and Contents	Hrs
Module -1:	Labeo: 1.1 Introduction and Classification 1.2 Morphology of Labeo 1.3 Skin structure and its function 1.4 Endoskeleton- Axial and Appendicular skeleton	08
Module -2:	Digestive system of Labeo 2.1 Alimentary canal. 2.2 Associated glands of digestive system. a. Liver b. Pancreas c. Gall bladder d. Physiology of digestion Respiratory system of Labeo 2.3 Structure of gills 2.4 Physiology of respiration 2.5 Swim bladder in Labeo	08
Module -3:	Circulatory system of Labeo 3.1 Structure & Function of heart 3.2 Physiology of heart 3.2 Arterial and Venous system	06
Module -4:	Nervous system of Labeo 4.1 Structure and function of brain and spinal cord 4.2 Photoreceptor organs 4.3 Olfactory organs – Structure and functions. Urinogenital system of Labeo- 4.4 Male and female reproductive system 4.5 Spawning habits and structure of eggs.	08
Reference Books:- 1) Bardach, J. E., J. H. Ryther, and W. O. McLarney. Aquaculture. 1972. 2) Belsare, D. K. Tropical Fish Farming. Karad, Maharashtra: Environmental Publications. 1993. 3) Dhami, P. S., and J. K. Dhami. Chordate Zoology. 2007. 4) Jhingran, V. G. Fish and Fisheries of India. Delhi: Hindustan Publishing Corporation. 1982. 5) Khanna, S. S. An Introduction to Fishes. Allahabad: Central Book Depot. 1994. 6) Kotpal, R. L. Vertebrate Zoology. 2004.		

7) Pandey, A. K., and G. S. Sandhu, eds. Encyclopaedia of Fishes and Fisheries of India. Vol. IV. New Delhi: Anmol Publications. 2000. 8) Shrivastav, C. B. A Textbook of Fishery Science and Indian Fisheries. New Delhi: Kitab Mahal. 2008. 9) Young, J. Z. Vertebrate Zoology. 1981.	
Evaluation Pattern:	
Total Marks: 50	
Internal Continuous Evaluation: • CCE- 1 10 M • CCE- 2 10 M • CCE-3 10 M	End Semester Examination: • Question -1 10 M • Question -2 20 M • Question -3 20 M

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Zoology	
	Programme: B.Sc, Fishery Science	Semester- IV
	Type : Major	Marks :20/30
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Inland Fisheries (BFT 242)		
Course Objectives: Students should be able to... 1)introduced to different types of fresh water habitats with reference to food chain, food web and primary productivity. 2)learn about activities in Inland riverine, reservoir, lacustrine capture fisheries. 3)study phytoplankton, Zooplankton, benthos, Nektons etc. 4)understand different estuarine, cold-water fisheries.		
Course Outcomes: Students will be able to... 1) describe the different inland water system. 2) explain different capture fisheries. 3) discuss names of phytoplankton, Zooplankton, nekton, benthos in water system. 4) compare estuarine, cold-water fisheries.		
Module	Title and Contents	Hrs
Module -1:	Inland water bodies: 1.1 Nature and types of Inland water- a. Lakes b. Rivers c. Streams d. swamps e. marshes f. Reservoirs	08
Module -2:	Capture Fisheries with respect to 2.1 Riverine fisheries. 2.2 Reservoir fisheries. 2.3 Lacustrine fisheries	08
Module -3:	Estuary, Cold water fisheries and other 3.1 Estuarine fisheries: Introduction. Estuarine fishery resources of India and their management. 3.2 Cold water fisheries of India. Management of cold-water fishery. 3.3 Fisheries of Non fish organisms 3.4 Hill stream fishes	08
Module -4:	Fishing Crafts and gears of Inland water bodies in India 4.1 Major Fishing crafts- Rafts, Catamaran, Dug-out canoes, plank-built boat, mechanized boats 4.2 Common inland fishing gears- Hooks and lines Drag net, gill net, cast net, purse net etc.	06
Reference Books:- 1) Jhingran. V G. Fish and Fisheries of India, Hindustan Publishers. 1991 2) Jobling, M. Environmental biology of fishes, Chapman and Ha Joachim W. Hertrampf. 1995. 3) Khanna S. S and H. R. Singh: A text book of fish biology and fisheries, Narendra Publishing House, New Delhi. 2003 4) Khanna S. S and Kapoor N.: An Introduction to fishes. Surjeet Publications. Central Book Depot, Allahabad. 2019 5) King, M. Fisheries Biology, Assessment and Management. Fish News Book, Blackwell Science, Inc. Cambridge, MA. 1995. 6) Lagler, K.P. Berdach, J.C. Miller, R.R and Passon M., D.R. Ichthyology. John Wiley and sons inc. New York.1977. 7) Matty, A.J. Fish endocrinology (Croom Helm, Ltd. U.S.A. 267 p 23. 1985. 8) Mcvey J.P.Handbook of Mariculture, CRC press, Florida 1983. 9) Norman J. R: A. of Fishes. Earnest Benn. Ltd. London. Second Edition. 1963. 10) Pandey A. K and Sandhu G. S: Encyclopedia of fishes and fisheries of India Vol. I and IV, Amol Publication, New Delhi. 2014.		

Evaluation Pattern:	
Total Marks: 50	
Internal Continuous Evaluation: • CCE- 1 10 M • CCE- 2 10 M • CCE-3 10 M	End Semester Examination: • Question -1 10 M • Question -2 20 M • Question -3 20 M



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

Board of Studies in Zoology

Programme: B.Sc, Fishery Science

Semester- IV

Type : Major Practical

Marks :20/30

Credits : 2

From: A. Y. 2025-26

Name of the Course: Practical IV (BFP 243)

Course Objectives: Students should be able to...

- 1) learn of fresh water fin fish.
- 2) demonstrate of different systems from dissected Labeo.
- 3) describe Brain of Labeo.
- 4) differentiate between male and female reproductive system of Labeo.

Course Outcomes: Students will be able to...

- 1) classify given fish
- 2) explain adaptations in fish.
- 3) sketch different systems of fish.
- 4) distinguish between male and female reproductive system of fish.

Module	Title and Contents	Hrs
1.	Classification, general characteristics of Labeo	60
2.	Demonstration of Labeo -Digestive system	
3.	Demonstration of Labeo -Brain	
4.	Demonstration of Labeo -Heart	
5.	Demonstration of Labeo -Male reproductive system	
6.	Demonstration of Labeo – female reproductive system.	
7.	Study of Photoreceptor organs	
8.	Study of Olfactory organs – Structure and Function	
9.	Demonstration of Labeo - Excretory System	
10.	Demonstration of Labeo- Respiratory System	
11.	Study of Fishing crafts- Rafts, Catamaran, Dug-out canoes, plank built boat, mechanized boats	
12.	Study of common inland fishing gears- Drag net, gill net, cast net, purse net, hooks and lines.	
13.	Study of Non fish organisms	
14.	Study of Major carps (Any Three)	
15.	Study of Catfishes (Any Three)	
16.	Study of Other carps (Any Three)	
17.	Collection and identification of aquatic insects from freshwater bodies.	
18.	Collection and identification of aquatic plants from different freshwater bodies.	
19.	Determination of Phytoplankton and Zooplankton	
20.	Studies on map – Study of local Water body	

Reference Books:- 1) Bal, D. V., and K. Veerabhadra Rao. Marine Fisheries. New Delhi: Tata McGraw Hill Publications. 1991. 2) Bardach, J. E., J. H. Ryther, and W. O. McLarney. Aquaculture. 1972. 3) Belsare, D. K. Tropical Fish Farming. Karad, Maharashtra: Environmental Publications. 1993. 4) Dhami, P. S., and J. K. Dhami. Chordate Zoology. 2007. 5) Jhingran, V. G. Fish and Fisheries of India. 2nd ed. Delhi: Hindustan Publishing Corporation. 1983. 6) Jhingran, V. G. Fish and Fisheries of India. Delhi: Hindustan Publication Corporation. 1982. 7) Khanna, S. S. An Introduction to Fishes. Allahabad: Central Book Depot. 1994. 8) Kotpal, R. L. Vertebrate Zoology. 2004. 9) Pandey, A. K., and G. S. Sandhu. Encyclopaedia of Fishes and Fisheries of India. Vol. IV. New Delhi: Anmol Publications. 2000. 10) Picker, W. E. Methods for Assessment of Fish Production in Fresh Waters. Oxford: Blackwell Scientific Publications. 1970. 11) Shrivastav, C. B. A Textbook of Fishery Science and Indian Fisheries. Patna: Kitab Mahal Agencies. 2008. 12) Srivastava, C. B. L. A Textbook of Fishery Science and Indian Fisheries. Patna: Kitab Mahal Agencies. 2008. 13) Srivastava, U. K., et al. Freshwater Aquaculture in India. New Delhi: Oxford and IBH Publishing Co. 1980. 14) Young, J. Z. Vertebrate Zoology. 1981.	
Evaluation Pattern:	
Total Marks: 50	
Internal Continuous Evaluation: 20 M (student performance, attendance, journal record and viva)	End Semester Examination: • Question -1 • Question -2 • Question -3

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology		
	Yashavantrao Chavan Institute of Science, Satara		
	Board of Studies in Zoology		
	Programme: B.Sc, Fishery Science	Semester- IV	
	Type : Minor	Marks :20/30	
	Credits : 2	From: A. Y. 2025-26	
Name of the Course: Freshwater Aquaculture (BFT 244)			
Course Objectives: Students should be able to... 1) differentiate between aquaculture systems based on water type, economics, design, species, and climate. 2) recall site selection, pond construction, and the effects of physical, chemical, and biological factors on intensive fish farming. 3) proficiently manage fish ponds, including pre-stocking tasks like preparation, pest control, liming, and fertilization, as well as stocking, feeding, and harvesting. 4) understand composite and integrated fish farming principles, stocking densities, and the integration with other agricultural practices.			
Course Outcomes: Students will be able to... 1) identify and classify various types of aquaculture practices based on different criteria such as water type, economic considerations, design, species, and climatic conditions. 2) analyze the importance, objectives, and scope of aquaculture in the context of various environmental factors, economic considerations, and societal needs. 3) explain the principles and techniques involved in intensive fish farming to optimize fish production. 4) demonstrate an understanding of composite fish farming and integrated fish farming systems, including their principles, objectives, and applications.			
Module	Title and Contents	Hrs	
Module -1:	Aquaculture: 1.1 Introduction to Aquaculture 1.2 Need for Aquaculture 1.3 Global and Indian share of freshwater aquaculture in total aquaculture 1.4 Major species of freshwater aquaculture – Global level and Indian level- Production trends and prospects 1.5 Freshwater aquaculture resources – ponds – tanks-lakes – reservoirs.	08	
Module -2:	2.1 Different fresh water Aquaculture systems – i.Monoculture, ii.Polyculture, iii.Intensive, Semi-intensive and Extensive culture iv.Monosex culture system. v.Integrated culture	06	
Module -3:	3.1 Selection criteria of quality seeds — Acclimatization of seeds, transportation technique of fish seeds 3.2 Cultivable Indian major carps, Exotic carps, Minor carps and culture of air breathing fish species.	08	
Module -4:	Sewage fed fish culture 1.1 Historical perspective and evolution of sewage-fed aquaculture 1.2 Benefits and challenges of sewage-fed fish culture 1.3 Suitable fish species for sewage-fed ponds (e.g., tilapia, catfish) 1.4 Nutritional benefits and potential risks of sewage-fed fish 1.5 Economic of sewage	08	

Reference Books:-	
1) Bandyopadhyay, Biplab Kumar. Freshwater Aquaculture: A Functional Approach. 2019.	
2) Bandyopadhyay, Biplab Kumar. Freshwater Aquaculture: A Functional Approach. 2022.	
3)Chakrabarti, N. M. 1998. Biology, Culture and Production of Indian Major Carps. Narendra Publishing House, New Delhi.	
4) Jhingran, V. G. Fish and Fisheries of India. Hindustan Publishing Corporation, New Delhi. 1982.	
5) Pillay, T. V. R. Aquaculture: Principles and Practices. Fishing News Books. Black Well Scientific Publications. 1993.	
6) Rath, Rajendra Kumar. Freshwater Aquaculture. 2018.	
7) Singh, N. P., and B. Santhosh, eds. Handbook on Freshwater Aquaculture. 2015.	
8) Tripathi, S. N., and M. S. Lakra. Aquaculture in India. 2018.	
Evaluation Pattern: 20/30	
Total Marks: 50	
Internal Continuous Evaluation: • CCE- 1 10 M • CCE- 2 10 M • CCE-3 10 M	End Semester Examination: • Question -1 10 M • Question -2 20 M • Question -3 20 M

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology		
	Yashavantrao Chavan Institute of Science, Satara		
	Board of Studies in Zoology		
	Programme: B.Sc, Fishery Science		Semester- IV
	Type : Minor		Marks :20/30
	Credits : 2		From: A. Y. 2025-26
	Name of the Course: Soil and Water Quality Management in Aquaculture (BFT 245)		
Course Objectives: Students should be able to... 1) understand the Aquatic microorganisms and their role in carbon, nitrogen, phosphorus and Sulphur cycles. 2) learn the methodologies for assessments of physical and chemical properties of soil and water. 3) identify and evaluate Ecological changes taking place after fertilizing. 4) student should learn the aquatic weed management.			
Course Outcomes: Students will be able to... 1) perform water filtration devices. 2) use the fertilizers, biofertilizers, manures and their applications. 3) evaluate and propose treated sewage for pond fertilization. 4) analyze physical and chemical soil and water parameter.			
Module	Title and Contents	Hrs	
Module -1:	Soil interaction 1.1 Physical properties of soil 1.2. Chemical properties of soil 1.3. Microorganisms 1.4. Macro-organism	06	
Module -2:	Fertilizers and manures 2.1. Kinds of fertilizers, biofertilizers, manures and their applications. 2.2. Use of treated sewage for pond fertilization, 2.3. Ecological changes taking place after fertilizing. 2.4. Post fertilization	08	
Module -3:	Water interaction 3.1. Physical properties of water 3.2. Chemical properties of water 3.3. Microorganisms 3.4. Macro-organism.	08	
Module -4:	Soil and water quality management 4.1. Waste water treatment-Sewage and soil 4.2 Water filtration devices aeration, chlorination, Ozonization and UV radiation. 4.3. Aquatic weed management. 4.4. Water quality management in hatcheries, 4.5 Productivity and eutrophication of water resources	08	
Reference Books:- 1) Dholakia, Bakul H., and Uma K. Srivastava. Freshwater Aquaculture in India. New Delhi: Oxford & IBH Publishing Company, 1993. 2) Goswami, Dilip Kumar, and S. C. Mukhopadhyay. Aquaculture Management. New Delhi: Narendra Publishing House, 2009. 3) Jhingran, V. G. Fish and Fisheries of India. New Delhi: Hindustan Publishing Corporation, 1982. 4) Misra, Sib Ranjan. Inland Fisheries in India: Issues and Concerns. New Delhi: Concept Publishing Company, 2006. 5) Pandian, T. J. Fish Genetics and Aquaculture Biotechnology. Enfield, NH: Science Publishers, 2005. 6) Saha, Ratan Kumar. Soil and Water Quality Management for Sustainable Aquaculture. New Delhi: Narendra Publishing House, 2010. 7) Sakhare. Vishwas B. Inland Fisheries. New Delhi: Dava Publishing House, 2012.			

- 8) Singh, N. P., and B. B. Santhosh. Handbook on Freshwater Aquaculture. New Delhi: Narendra Publishing House, 2015.
- 9) Norman J. R: A. of Fishes. Earnest Benn. Ltd. London. Second Edition. 1963.
- 10) Pandey A. K and Sandhu G. S: Encyclopedia of fishes and fisheries of India Vol. I and IV, Amol Publication, New Delhi. 2014.

Evaluation Pattern: 20/30

Total Marks: 50

Internal Continuous Evaluation:

- CCE- 1 10 M
- CCE- 2 10 M
- CCE-3 10 M

End Semester Examination:

- Question -1 10 M
- Question -2 20 M
- Question -3 20 M

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Zoology	
	Programme: B.Sc, Fishery Science	Semester- IV
	Type : Minor Practical	Marks : 20/30
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Practical IV (BFP 246)		
Course Objectives: Students should be able to... 1) familiarize students with freshwater and brackish water fish species, including their identification, classification, and special features, along with phytoplankton and zooplankton. 2) provide practical skills in pond layout, design, and construction suitable for fish farming. 3) enable understanding and application of intensive fish farming techniques, including site selection, pre-stocking pond management, stocking of fish seed, feeding, and harvesting. 4) introduce concepts of integrated fish farming, allowing students to design and implement sustainable fish farms incorporating multiple components for increased productivity.		
Course Outcomes: Students will be able to... 1) demonstrate various equipment's used in soil and water analysis. 2) analyze different physicochemical parameters of water sample. 3) identify various phytoplankton, zooplankton and benthos. 4) determine different physicochemical parameters of soil sample.		
Module	Title and Contents	Hrs
1.	Identification, Classification of Fresh Water Fishes- Indigenous (IMC- Rohu, Catla, Mrigal).	60
2.	Identification, Classification, and special feature of exotic carps (Silver Carp, Grass Carp, Tilapia, Common Carp).	
3.	Identification, Classification, and special feature of Minor carps.	
4.	Identification, Classification, and special feature of air breathing fish species.	
5.	Design and Layout for construction of different types of ponds.	
6.	To study types of aquatic weed	
7.	To study predatory fishes. (any three)	
8.	To study Weed fishes. (any three)	
9.	To study aquatic insects.	
10.	To Preparation of formulated feed.	
11.	Determination of temperature, turbidity and transparency of water sample.	
12.	Determination of total dissolved solids of water sample.	
13.	Estimation of dissolved oxygen of water sample.	
14.	Estimation of free carbon dioxide of pond water sample.	
15.	Estimation of total alkalinity of water sample.	
16.	Estimation of hardness of water sample.	
17.	Study of aquatic plants.	
18.	Collection and identification of zooplankton.	
19.	Collection and identification of phytoplankton.	

20.	Estimation of primary productivity of pond water sample.	
Reference Books:- 1) Ahilan, B. Textbook of Freshwater Aquaculture. New Delhi: Daya Publishing House, 2010. 2) Bandyopadhyay, Biplab Kumar. Freshwater Aquaculture: A Functional Approach. Boca Raton: CRC Press, 2022. 3) Chhapgar, B. F. Seashore Life of India. New Delhi: Oxford University Press, 1991. 4) Dholakia, Bakul H., and Uma K. Srivastava. Freshwater Aquaculture in India. New Delhi: Oxford & IBH Publishing Company, 1993. 5) Jhingran, V. G. Fish and Fisheries of India. New Delhi: Hindustan Publishing Corporation, 1982. 6) Nandeesh, M. C. Fish Seed Production and Hatchery Management. Mangalore: Asian Fisheries Society, Indian Branch, 1990. 7) Pandian, T. J. Fish Genetics and Aquaculture Biotechnology. Enfield, NH: Science Publishers, 2005. 8) Singh, A. K., and S. H. Ahmad. Freshwater Aquaculture. New Delhi: Daya Publishing House, 2014.		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation: 20 M (student performance, attendance, journal record and viva)		End Semester Examination: • Question -1 • Question -2 • Question -3

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology		
	Yashavantrao Chavan Institute of Science, Satara		
	Board of Studies in Zoology		
	Programme: B.Sc, Fishery Science	Semester- IV	
	Type : VSC	Marks :20/30	
	Credits : 2	From: A. Y. 2025-26	
Name of the Course: Ornamental fish breeding (BFTVSC 2)			
Course Objectives: Students should be able to 1) know the fundamentals of aquarium fish industry. 2) understand the biological features of aquarium fishes. 3) know the food and feeding habits of aquarium fishes. 4) aware about transportation of fishes.			
Course Outcomes: Students will be able to... 1) construct an aquarium. 2) manage the fish diseases. 3) prepare the proper dosage of different kinds of natural and synthetic fish feed. 4) properly handle and maintain the aquarium fish			
Module	Title and Contents		Hrs
1.	Identify and describe an aquarium fishes. (any five).		60
2.	Study of breeding in live bearer		
3.	Study of Parental care in fishes.		
4.	Identify and describe the aquarium accessories with their use and maintains		
5.	Identify and describe food and its Types		
6.	Identify and describe aquarium plants.		
7.	Study physico-chemical conditions of aquarium		
8.	Fabrication and Setting of aquarium.		
9.	Maintenance of an aquarium.		
10.	Cultivation of some common live food		
11.	Aquarium fish diseases		
12.	Study Breeding habits of aquarium fishes		
13.	Exotic and Endemic species of aquarium fishes		
14.	Packaging and Transportation		
15.	Preparation of artificial feed		
16.	Common characters and sexual dimorphism of Fresh water		
17.	Status and Significance of Ornamental Fish Trade		
18.	Prepare aquarium construction Budget		
19.	Submission of own prepared aquarium		
20.	Visit to Aquarium Shop		
Reference Books:- 1) Bhosale, Mangesh M., and S. Felix. Native North-Eastern Ornamental Fish Breeding Techniques. New Delhi: Astral International, 2021.			

- 2) Chhapgar, B. F. Seashore Life of India. New Delhi: Oxford University Press, 1991. 41
- 3) Dholakia, Anshuman D. Ornamental Fish Culture and Aquarium Management. New Delhi: Daya Publishing House, 2016.
- 4) Jhingran, V. G. Fish and Fisheries of India. New Delhi: Hindustan Publishing Corporation, 1982.
- 5) Misra, Sib Ranjan. Inland Fisheries in India: Issues and Concerns. New Delhi: Concept Publishing Company, 2006.
- 6) Nandeesha, M. C. Fish Seed Production and Hatchery Management. Mangalore: Asian Fisheries Society, Indian Branch, 1990.
- 7) Pandian, T. J. Fish Genetics and Aquaculture Biotechnology. Enfield, NH: Science Publishers, 2005.
- 8) Sinha, Archana, and Pramod Kumar Pandey. Breeding and Culture of Freshwater Ornamental Fish. New Delhi: New India Publishing Agency, 2021.
- 9) Sinha, V. R. P., and H. C. Srivastava. Culture of Fish in Rice Fields. Rome: Food and Agriculture Organization of the United Nations, 1991.
- 10) Tripathi, S. D., and S. D. Sharma. Advances in Indian Aquaculture. New Delhi: Narendra Publishing House, 1998.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation: 20 M (student performance, attendance, journal record and viva)	End Semester Examination: • Question -1 • Question -2 • Question -3
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	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Zoology	
	Programme: B.Sc, Fishery Science	Semester- IV
	Type : SEC	Marks :20/30
	Credits : 2	From: A. Y. 2025-26
Name of the Course: SEC II (BFPSEC 2) Fish Hatchery Manager		
Course Objectives: Students should be able to... 1) understand the fish brood stock management 2) remember brackish water and marine water cultured fish 3) know the freshwater and brackish water cultured fish 4) correlate knowledge of proper handling and transportation of seed		
Course Outcomes: Students will be able to... 1) explain physico-chemical parameters of water. 2) discuss preparation of pond. 3) describe methods of management of hatchery. 4) compare and analyze prey and predators found in hatcheries.		
Module	Title and Contents	Hrs
1.	Study of freshwater cultured fishes.	60
2.	Study of brackish water cultured fishes.	
3.	Study of marine cultured fishes.	
4.	Study of selection of brood stock of finfishes and shell fishes	
5.	Study of brood stock nutritional requirements	
6.	Methods of brood stock transportation	
7.	Study of broodstock conditioning and maintenance of health and hygiene of brooders	
8.	Study of induced breeding in cultured fishes	
9.	Preparation of pond	
10.	Liming and fertilization of pond	
11.	Estimation of dissolved oxygen	
12.	Estimation of free CO ₂	
13.	Estimation of hardness	
14.	Estimation of alkalinity	
15.	Plankton sampling, identification & culture	
16.	Study of feed preparation & feeding trials	
17.	Record keeping, survival calculation & performance analysis in hatchery	
18.	Disease identification & basic treatment	
19.	Preparation of hatchery budget	
20.	Visit to fish hatchery/ fish farm to study monitoring of hatchery operations.	
Reference Books:- 1) Banday, M. T., and Sheikh Adil. Poultry Production and Hatchery Management. New Delhi: Narendra Publishing House, 2019.		

2) Banday, M. T., Sheikh Adil, and Manzoor A. Wani. Hatchery Management: An Overview. New Delhi: Satish Serial Publishing House, 2025. 3) Gupta, S. D., and B. C. Mohapatra. Text Book of Breeding and Hatchery Management of Carps. New Delhi: Narendra Publishing House, 2008. 4) Jadhav, N. V. Practical Manual for Commercial Poultry Production and Hatchery Management. New Delhi: Astral International Pvt. Ltd., 2014. 5) Jhingran, V. G., and R. S. V. Pullin. A Hatchery Manual for the Common, Chinese, and Indian Major Carps. Manila: Asian Development Bank, 1985. 6) Khan, Md Idrish Raja. Hands-on Fish Seed Production and Hatchery Management: A Field Based Learning. Saarbrücken: LAP Lambert Academic Publishing, 2019. 7) Mohapatra, B. C., D. K. Verma, N. Sarangi, P. Routray, S. D. Gupta, and S. K. Sahoo. Text Book of Breeding and Hatchery Management of Carps. New Delhi: Narendra Publishing House, 2008. 8) Nandeesh, M. C. Fish Seed Production and Hatchery Management. Mangalore: Asian Fisheries Society, Indian Branch, 1990. 9) Sinha, V. R. P., and H. C. Srivastava. Culture of Fish in Rice Fields. Rome: Food and Agriculture Organization of the United Nations, 1991. 10) Tripathi, S. D., and S. D. Sharma. Advances in Indian Aquaculture. New Delhi: Narendra Publishing House, 1998.	
Evaluation Pattern:	
Total Marks: 50	
Internal Evaluation (20 marks): - Journal: 10 Marks - Students Performance: 05 Marks - Viva: 05 Marks	End Semester Examination: - Question -1 Experiment-1 10 M - Question -2 Experiment-2 10 M - Question -3 Experiment-3 10 M

	Karmaveer Bhaurao Patil University, Satara (A State Public University Est. u/s 3(6) of MPUA 2016) Faculty of Science and Technology	
	Yashavantrao Chavan Institute of Science, Satara	
	Board of Studies in Zoology	
	Programme: B.Sc, Fishery Science	Semester- IV
	Type : VEC	Marks :20/30
	Credits : 2	From: A. Y. 2025-26
Name of the Course: Environmental Studies in Fisheries Science (BFTVEC 2)		
Course Objectives: Students should be able to... 1) understand the basic concepts of environmental science and ecology. 2) study aquatic ecosystems and their significance in fisheries. 3) learn about environmental pollution and its effects on fish and aquatic organisms 4) develop awareness of climate change, environmental management, and sustainable aquaculture practices.		
Course Outcomes: Students will be able to... 1) explain the causes of environmental issues 2) discuss concepts related to environmental laws and ethics. 3) describe the sustainable development goals. 4) compare and analyze the importance of fishery sciences in meeting the sustainable development goals.		
Module	Title and Contents	Hrs
Module -1:	Environmental issues 1.1: Pollution (Air, Water and Land) 1.2: Fresh-water overuse 1.3: Natural disasters 1.4: Fuel and Energy shortage due to overuse 1.5: Increase in wasteland 1.6: Biodiversity loss 1.7: Global warming and climate change (Causes and intensity of the problem) 1.8: Role of Fisheries in creation of environmental issues. 1.9: Eutrophication	07
Module -2:	Environmental laws and ethics 2.1: Environmental Protection Act 2.2: Wildlife Protection Act 2.3: Water (Prevention and Control of Pollution) Act 2.4: Forest Conservation Act 2.5: Prevention and control pollution Act (Air, Water and Land) from unsustainable to sustainable development 2.6: Responsibilities of an Environmentally aware citizen	08
Module -3:	Sustainable Development Goals 3.1: Introduction to Sustainable Development 3.2: Environmental Threats 3.3: Introduction to 17 global sustainable goals 3.4: Ocean acidification and Sea-level rise 3.5 Sustainable fisheries management	08
Module -4:	Environmental Management 4.1 Waste management in aquaculture 4.2 Recirculating Aquaculture Systems (RAS) 4.3 Biosecurity 4.4 Bioremediation 4.5 Circular economy in fisheries	07

Reference Books :-

- 1) Sharucha, Erach. Textbook of Environmental Studies for Undergraduate Courses. 3rd ed. Hyderabad: Universities Press. 2021.
- 2) Basu, Mahua, and S. Xavier. Fundamentals of Environmental Studies. Cambridge: Cambridge University Press. 2017.
- 3) Shastri, S. C. *Environmental Laws*. 7th ed. Lucknow: Eastern Book Company Pvt. Ltd. 2022.
- 4) Singh, Y. K. *Environmental Science*. New Delhi: New Age International Publishers. 2006.
- 5) Tripathi, S. C. *Environmental Law*. Allahabad: Central Law Publications. 2019.

Evaluation Pattern:**Total Marks: 50****Internal Continuous Evaluation:**

- CCE- 1 10 M
- CCE- 2 10 M
- CCE-3 10 M

End Semester Examination:

- Question -1 10 M
- Question -2 20 M
- Question -3 20 M