

**Rayat Shikshan Sanstha's
Yashwantrao Chavan Institute of Science, Satara
(Autonomous)
Lead College of Karmaveer Bhaurao Patil University,
Satara
Reaccredited by NAAC with 'A+' Grade**

**Syllabus For
Bachelor of Science**

**Fisheries
Syllabus to be implemented w.e. f. June 2023
(As per NEP 2020)**

Syllabus for B.Sc. I Fisheries

PREAMBLE:

This syllabus is framed to give sound knowledge with understanding of Fisheries to undergraduate students at first year of four years of B.Sc. degree course. Students learn Fisheries as a separate subject from B.Sc. I. The goal of the syllabus is to make the study of Fisheries popular, interesting and encouraging to the students for higher studies including research. The new and updated syllabus is based on a basic and applied approach with Vigor and depth. The syllabus meets the needs of industries and research. The syllabus is prepared after long discussion with number of faculty members of the subject and experts from industries and research fields. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

• PROGRAMME OBJECTIVES:

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. To create a skilled work force to match the requirements of the industries and research.
3. To develop scientific attitude is the major objective so as to make students open minded, critical and curious.
4. To develop skill in practical work, experiments and laboratory materials and equipment along with the collection and interpretation of scientific data to contribute to science.

• 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

Rayat Shikshan Sanstha's
Yashavantrao Chavan Institute of Science, Satara (Autonomous)
Lead College of Karmveer Bhaurao Patil University
Department of Zoology and Fisheries
Class – B.Sc. I Fisheries

Structure of Course:

Level 4.5, Semester I

	Course Title	Theory			Practical's		
		Course Code	Credits	Lectures Per Week	Course Code	Credits	Lectures Per Week
Major Paper	Fish Taxonomy and Identification	BZFT-111	2	4	BZFT-113	4	4
	Fish Anatomy and Physiology	BZFT-112	2				
Minor Paper	Aquarium Fish Keeping	BZFT-114	2	4	BZFT-116	4	
	Fishing Craft and Gear Technology	BZFT-115	2				
OE/GE	Basics Of Fish Culture	BFT-117	2	4	BZFT-119	2	
	Fish Farming of Indian Major Carps	BFT-118	2				
IKS	Fundamentals of Ayurveda	BZFT-101	2	2	-	-	-

Level 4.5, Semester II

	Course Title	Theory			Practicals		
		Course Code	Credits	Lectures Per Week	Couse Code	Credits	Lectures Per Week
Major Paper	Aquatic Ecology	BZFT-121	2	4	BZFT-123	4	4
	Aquaculture	BZFT-122	2				
Minor Papers	Fish Behaviour	BZFT-124	2	4	BZFT-126	4	
	Fish By-Products	BZFT-125	2				
OE/GE	Ornamental Fish Farming	BZFT-127	2	2	BZFT-129	2	
	Ornamental Fish Breeding and Management	BZFT-128	2	2			
SEC	Aquarium Management		1	1		1	

Semester – I**Major Course****Course – I: BZFT- 111 Fish Taxonomy and Identification****Course Objectives: Students Should be able to...**

1. classify fin fish and shell fish.
2. compare different types of fins, their functions and morphometric characters in fishes.
3. identify structure, types and function of skin and scales in fishes.
4. distinguishing types of locomotion and migration of fish.

Credits (Total Credits 2)	Semester – I Course – I: BZFT- 111 Fish Taxonomy and Identification	No. of hours per unit
Unit – I	Scope, Importance of fisheries and general characters of fishes 1. Introduction, definition, scope and importance of fishery science. 2. Classification of fish and shell fishes up to class level 3. External characters of Teleost and Elasmobranch 4. Difference between Teleost and Elasmobranch fishes.	(08)
Unit – II	Fins, age and growth 1. Different types of fins and their functions. 2. Age and Growth: a. Methods of determination of age; Methods for studying growth b. Length-Weight relationship and Condition factor.	(06)
Unit – III	Fish identification technique 1. Fish identification techniques. a. Study of morphometric characters in fishes. b. Study of meristic characters in fishes	(08)
Unit – IV	Skin, Scales and Colouration in fishes 1. Structure and functions of skin in fishes. 2. Study of different types of scales in fishes. 3. Colouration in fishes – Source of colour, colour changes in fishes, significance of colour changes.	(08)

Course Outcomes: Students will be able to...

1. discuss Teleost and Elasmobranch fishes
2. sketch structure of fins.
3. distinguish between the types of scales.
4. compare age and growth of fish.

Reference Books:

1. Sharma, A. and Jyoti M. K. (2016). Fishes: Aid to collection and identification. Daya Publishing House, New Delhi 1st. ed.
2. Kar. Devashish (2013). Essentials of Fish Biology, dominant publishers and distributors(p) Ltd, Delhi.
3. Kar. Devashish (2012). Taxonomy, APH Publishing Corporation, Ansari Road, Darya Ganj, New Delhi
4. Biswas K. P. (2011). Marine prawns and shrimps. Daya Publishing House, New Delhi.
5. Dholakia, A. D. (2011). Identification of marine and fresh water mollusc shells. Daya Publishing House, New Delhi
6. Dholakia, A. D. (2010). Identification of prawns/shrimps and their culture. Daya Publishing House, New Delhi.
7. Sandhu, G. S. (2005). A Text book of Fish and Fisheries. Daya Publishing House, New Delhi.
8. Khanna. S. S. and Singh. H. R. (2005). A Textbook of Fish Biology and Fisheries, Narendra Publishing House, Delhi.
9. Parihar, R. P. (2004). A Text book of Fish Biology and Indian Fisheries. Central Publishing House, Allahabad
10. Norman, J. R. (2002). A history of fishes: a complete known account of fishes. Asiatic publishing house, Delhi.
11. Jayram, K. C. (2002). The fresh water fishes of India, A hand book. Zoological Survey of India.
12. Yadav, B. N. (2002). Fish and Fisheries, 2nd revised and enlarged edn. Daya Publishing House, Delhi .
13. Lagler, K. F. (1981). Fresh Water Fishery Biology. (2nd edition). W. M. C. Brown Company Publishers, Dubugur, IOWA.

Course - II: BZFT-112 Fish Anatomy and Physiology**Course Objectives: Students Should be able to...**

1. recall the composition and digestion of fish food.
2. identify physiology of respiration & excretion.
3. differentiate sex organs, sex hormones & modes of reproduction in different types of fishes.
4. compare sense organs in fishes.

Credits (Total Credits 2)	Semester – I Course - II : BZFT-112 Fish Anatomy and Physiology	No. of hours per unit
Unit – I	Food and feeding behaviour: 1. Protein, carbohydrate, fat, vitamins and minerals in fish nutrition 2. Different types of mouth in fish. 3. Role of digestive enzymes in the digestion. 4. Digestion and assimilation of nutrients Energy and nutrient status of food, 5. Influence of temperature on metabolism.	(08)
Unit – II	Respiration, circulation and excretory physiology: 1. Gas exchange across the gills, 2. Oxygen consumption 3. Osmoregulation in fresh water, brackish water and marine fishes. 4. Excretion: ultrafiltration, reabsorption, secretion and formation of urine. ammonia excretion and carbon dioxide output 5. Blood Composition, haemoglobin and circulation.	(08)
Unit – III	Reproductive physiology: 1. Organs and hormones associated with reproduction 2. Sex hormones, Maturation inducing hormones, 3. Modes of reproduction in fishes	(06)
Unit - IV	Nervous System- Teleost& Elasmobranch Central Nervous system (Brain and Spinal cord) Sense Organs: 1. Touch, taste, temperature and salinity. 2. Sense of smell, hearing and sight. Lateral line and neuromast organs. 3. Stress related physiological changes.	(08)

Course Outcomes: Students will be able to ...

1. describe the composition & digestion of food.
2. explain respiration, excretion and circulation process in fishes.
3. discuss sex organs and sex hormones in fishes.
4. compare nervous system, sense organs and endocrine glands in Teleost and Elasmobranch.

Reference Books:

1. Khanna S. S and Kapoor N. (2019): An Introduction to fishes. Surjeet Publications. Central Book Depot, Allahabad.
2. Pandey A. K and Sandhu G.S (2014): Encyclopedia of fishes and fisheries of India Vol. I and IV, Amol Publication, New Delhi.
3. Khanna S. S and H. R. Singh (2003): A text book of fish biology and fisheries, Narendra Publishing House, New Delhi.
4. Jobling, M. (1995). Environmental biology of fishes, Chapman and Ha Joachim W. Hertrampf.
5. King, M.,(1995). Fisheries Biology, Assessment and Management. Fish News Book, Blackwell Science, Inc. Cambridge, MA.
6. Jhingran. V G. (1991). Fish and Fisheries of India, Hindustan Publishers.
7. Lagler, K.P. Berdach, J.C. Miller, R.R and Passion M., D.R.(1977). Ichthyology. John Wiley and sons inc. Newyork.
8. Matty, A.J. (1985). Fish endocrinology (Croom Helm, Ltd. U.S.A. 267 p 23.
9. Mcvey J.P., (1983): Handbook of Mariculture, CRC press, Florida
10. Norman J. R: A. (1963) of Fishes. Earnest Benn. Ltd. London. Second Edition

B. Sc. I Semester I**BZFP-113 -Practical Course I****Course Objectives: Students should be able to...**

1. classification of freshwater& marine water fin fish.
2. memorized freshwater& marine water shell fish.
3. label different types of fins & scales in fish.
4. demonstrate of different systems from dissected bony fish.

Credits (Total Credits 2)	Semester-I BZFP-113- Practical Course I (Based on BZFT-111 and BZFT -112)	No. of hours per Practical
1	Identification and classification of fresh water fishes- <i>Catla catla</i> , <i>Labeo rohita</i> , <i>Cirrhina mrigala</i> , <i>Clarius batrachus</i> , Eel fish	4
2	Identification and classification of marine water fish- Scoliodon, Harpadon, Hippocampus, Pristis, Exocoetus	4
3	Identification and classification of other aquatic animals- Palaemon, Penaeus, Mytilus, Pila, Sepia, Pearl oyster	4
4	Study of Morphometric measurements of Chondrichthyes fishes.	4
5	Study of Morphometric measurements of Osteichthyes fishes	4
6	Study of different types of fins – Paired and Unpaired fins	4
7	Temporary mounting of scales- Placoid, Cycloid and Ctenoid Scales	4
8	To Study colouration in Fishes	4
9.	Demonstration-Any locally available bony fish a) Digestive system. b) Respiratory system- Gills and accessory respiratory organs.	4

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10.	Demonstration-Any locally available bony fish c) Heart, Afferent and Efferent Branchial Vessels. d) Brain	4
11.	Demonstration-Any locally available bony fish e) Sexual Dimorphism in fishes f) Male and Female Reproductive System	4
12.	Study of different types of mouth in fishes.	4
13.	To study Length-Weight relationship in fishes.	4
14.	Survey on Fish morphometry	4
15.	Project: Visit to fish market/ visit to fish seed	4

Course Outcomes: Students will be able to...

1. classify any given fish
2. estimate morphometric measurement of given fish.
3. sketch different systems of fish.
4. distinguish between different types of mouth.

Reference Books:

1. Khanna S. S (2019). An Introduction to fishes. Central Book Depot, Allahabad
2. Pandey A. K and Sandhu G.S (2014). Encyclopedia of fishes and fisheries of India Vol. I and IV, Amol Publication, New Delhi
3. Walker P and Subasinghe RP. (Eds.). (2005). Principal Diseases of Marine Fish and Shell fish. Vols. I, II. 2nd Ed. Academic Press.
4. Shankar KM and Mohan CV. (2002). Fish and Shellfish Health Management. UNESCO Publ.
5. Khanna S. S and H. R. Singh (2003). A text book of fish biology and fisheries, Narendra Publishing House, New Delhi
6. Tandon KK and Johal MS (1996). Age and Growth in Indian Fresh Water Fishes. Narendra Publishing House, New Delhi.
7. Sargent, J. Henderson, R. J. and Tocher, D. R., (1989). The lipids. in Fish Nutrition, pp 153-218. Edited by J.E. Halver, Academic Press, Inc.
8. Norman J. R: A.(1965): History of Fishes. Earnest Benn. Ltd. London.

B.Sc. I Semester I**Minor Course****Course - I: BZFT-114 Aquarium Fish Keeping****Course Objectives: Students Should able to...**

1. learn the basic principles of an aquarium.
2. describe the themes and steps needed to set-up and maintain an aquarium.
3. execute maintenance of fish aquarium.
4. develop ideas for handling, care, packing and transportation of fishes

Credits (Total Credits 2)	SEMESTER-I Course I - BZFT-114: Aquarium Fish Keeping	No. of hours per unit
Unit – I	Aquarium design and Construction: Introduction to aquarium. Design and construction of home and public aquaria (freshwater and marine).	(08)
Unit – II	Aquarium accessories Aerators, filters (different types) and lighting. Water quality requirements.	(08)
Unit – III	Aquarium Management: Setting up of aquarium – under gravel filter, pebbles, plants, drift wood, ornamental objects and selection of fishes.	(06)
Unit - IV	Aquarium maintenance and water quality management Handling, care, packing and transportation of fishes - Use of anaesthetics.	(08)

Course Outcomes: Students will be able to...

1. comprehend the key skills needed to set up an aquarium
2. identify and differentiate the different aquarium/ornamental fishes.
3. formulate fish food that provides with complete nutritional benefits.

4. analyse the required budget to set up a well-maintained home aquarium.

Reference Books:

1. Alderton, D.(2019). Encyclopedia Of Aquarium And Pond Fish. Dk Publishers, Uk.
2. Bailey M., and Sanford, G., (2017). Aquarium Fish- A Definitive Guide To Identify And Keeping Freshwater And Marine Fishes. Smithmark Publishers, Usa.
3. Hall, C.B. (2005). Ponds And Fish Culture - Agrobios - Jodhpur - India.
4. Alappat, H.J. and A. Biju Kumar (1996). Aquarium Fishes (A Colourful Profile). B.R. Publ., Delhi.
5. Biju Kumar, A. and Alappat, H.J., (1996). A Complete Guide To Aquarium Keeping. Books For All, Delhi.
6. Yadav. (1995). Fish and Fisheries, Daya Publ. Co., New Delhi - India
7. Jingran V.G. (1991): Fish and Fisheries In India - Hindustan Publ. Co. New Delhi - India.

B.Sc. I Semester I**Course - II : BZFT-115- Fishing Craft and Gear Technology**

Course Objectives: Students should be able...

1. remember history and development of fishing craft
2. discuss modern tools of research and development for optimizing production and productivity from fisheries to get good quality of fishes.
3. explain different types of gears in India.
4. explain advanced technology in crafts and gears

Credits (Total Credits 2)	Semester – I Course II : BZFT-115- Fishing Craft and Gear Technology	No. of hours per unit
Unit – I	Fishing craft technology 1.1 History and development of fishing craft 1.2 Factors influencing in fishing craft development 1.3 Classification of fishing craft 1.4 Traditional fishing crafts of India 1.5 Mechanization of fishing craft 1.6 Field visit to boat building yard	(08)
Unit – II	Fishing Craft 2.1 Raft 2.2 Catamaran 2.3 Dugout canoe 2.4 Trawler	(08)
Unit – III	Fishing Gears technology 3.1 History and development of fishing gears 3.2 Evolution of fishing gears 3.3 Classification of fishing gears of world and India 3.4 Fishing Gears of India 3.5 Selection of fishing gear	(06)
Unit - IV	Fishing Gears 4.1 Floats and sinkers	(08)

4.2 Drag net	
4.3 Cast net	
4.4 Gill net	
4.5 Rampani net	
4.5 Trawl net	

Course Outcomes: Students will be able to ...

1. know the maintenance of Fishing crafts and gears.
2. identify different types of Fishing gears.
3. differentiates Fishing gears in India and world.
4. develop maintenance skill of craft and gears.

Reference Books:

1. Latha Shenoy (2023). Fishing Gear and Craft Technologies for Sustainable Fishing. Om Publications.
2. Kalaiarasan, M. (2019). Text Book on Fishing Gear Technology. Narendra Publications.
3. Sreekrishna Y & Shenoy L. (2001). Fishing Gear and Craft Technology. ICAR.
4. Sanisbury J.C. (1996). Commercial Fishing Methods-An Introduction to Vessels and Gear. Fishing News Books.
5. Baranov FI. (1977). Selected Works on Fishing Gear. Keterpress Enterprises.Israel.
6. Baranov F. I. (1969). Selected Works on Fishing Gear. Vol.I. Commercial Fishing Techniques. Israel Programme for Scientific Translations,Jerusalem.

SEMESTER – I**Practical Course- I (BZFP-116)**

Objectives: Students Should be able to...

1. discuss different ornamental fish species having a sound commercial value.
2. explain small scale business of aquaria.
3. explain model of craft and Gears
4. differentiates techniques of fish breeding

Credits (Total Credits 2)	SEMESTER – I BZFP-116 : Practical Course I (Based on BZFT 114 and BZFT 115)	No. of hours per Practical
1	To study Construction of Fish aquarium	4
2	To study the Aquarium Accessories	4
3	Setting and Maintenance of an aquarium	4
4	Study of physico- Chemical parameters	4
5	Study of ornamental Egg layer fishes	4
6	Study of Live bearer fishes	4
7	Study of crafts and gears	4
8	Study of maintenance of fishing crafts and gears	4
9	Study of Fishing Crafts and Gears Accessories.	4
10	Study of sinkers and floaters	4
11	Study of Crafts used in River	4
12	Study of Crafts used in Oceans	4
13	Survey of fishing gear and craft.	4
14	Visit to any Fish Aquarium/ sea shore/public aquarium	4
15	Survey of aquarium shop keepers/ornamental fish traders	4

Course Outcomes: Students will be able to...

1. maintain aquarium, water quality and avoidance of diseases in aquarium
2. describe the idea of how the fishing craft has been developed from the ancient time, different types of powers used for propulsion of fishing craft, limitations of indigenous craft and advantages of mechanized craft.
3. estimate physico-chemical parameters of aquarium.
4. prepare survey report

Reference Books:

1. Dr. Sanjib Saha (2022): Concept of Aquarium Fish Keeping (New CBCS Syllabus (General & Honours Course) Techno World.
2. Dholakia, A.D., (2009). Ornamental fish Culture & Aquarium Management. Daya Publishing House, Delhi, 313
3. Khanna S. S. and Singh H. R. (2003). Text book of Fish Biology and Fisheries, Narendra Publishing House, Delhi
4. Subramaniam, H. (1995). Ship Stability. Volumes 1, 2 & 3. Vijaya Publications Ltd. Mumbai.
5. Antony Hind, J. (1982). Stability and Trim of Fishing Vessels. Food and Agriculture Organization of the United Nations. Published by Fishing News Books Ltd, England.
6. Favre, H., (1977). Dictionary of the Freshwater Aquarium. Wardlock Ltd., London, 160pp.
7. Hilmar Kristjonsonn (Ed.) Vol 1 (1962), Vol 2 (1964) Vol. 3 (1971). Modern Fishing Gears of the World 3. Fishing News Books Ltd. England.

B.Sc. I Semester – I

Open Elective (OE) Course Name: Fish Farming

Course - I: BZFT – 117 Basics of Fish Culture

Course Objectives: Students will be able to...

1. know the basic knowledge about fishes
2. study culture pond preparation
3. know types of fish culture
4. learn management of fish culture

Credits (Total Credits 2)	Semester – I OE Course – I Course - I: BZFT – 117 Basics of Fish Culture	No. of hours per unit
Unit – I	Basic knowledge about fishes 1.1 An introduction to fisheries sciences 1.2 General characteristics of fishes 1.3 Nutritional value of fish 1.4 History of fish farming 1.5 Scope and Status of fish farming in India	(08)
Unit – II	Culture pond preparation 2.1 Site selection for a fish farm 2.2 Types of fish ponds- Nursery, Rearing and Stocking pond 2.3 Important factors in the construction of an ideal fish pond – site selection, topography, nature of the soil, water resources	(08)
Unit – III	Fish Culture Practices 3.1 Types of fish culture- 3.2. Composite fish culture 3.3 Integrated fish farming	(08)

	3.4 General introduction to Intensive, Semi-intensive and Extensive Fish culture	
Unit – IV	Management of fish culture 4.1 Pre-stocking management of fish farms 4.2 Post stocking management of fish farms 4.3 Types of fish feed and nutritional requirements of fishes	(06)

Course Outcomes: Students should be able to...

1. understand basic knowledge about fishes
2. plan culture pond preparation
3. understands types of fish culture
4. design management of fish culture

Reference Books:

1. Srivastava, C. B. L., Suresh C. Goel, U. S. Srivastava Kyle, H. (2006) The biology of fishes, idgewick and Jackson.
2. Pandey, K. and Shukla, J. P (2005). Fish and Fisheries (4th edition) Rastogi Publications.
3. Rath R. K. (2001). Fresh Water Aquaculture (2Nd Ed.). Scientific Publishers.
4. Talwar P.K. and Jhingran, V.G. (1992). Inland fishes of India and adjacent countries, vol. I and II, Oxford (1992)
5. Khanna S. S, and Marshal, N.B. (1976) The life of fishes, Universe

OE Course - II BZFT – 118 : Fish Farming Of Indian Major Carps**Course Objectives: Students will be able to...**

1. study carp culture
2. learn pond management
3. get knowledge about brood stock management
4. study grow out fish farming

Credits (Total Credits 2)	Semester – I OE Course– II BZFT – 118 : Fish Farming of Indian Major Carps	No. Of Hours Per Unit
Unit – I	Carp culture 1.1 Morphological characteristics of Indian major carps 1.2 Criteria of selection of cultured fish species 1.3 Food and feeding habits of carps 1.4 Breeding habits of carps	(08)
Unit – II	Pond management 2.1 Types of fish ponds-nursery, rearing and stocking pond 2.2 Harvesting and Transportation of fishes 2.3 Role of F.F.D.A. in providing financial assistance to carp fish farmers	(08)
Unit – III	Brood stock maintenance 3.1 Spawning of Indian Major Carps 3.2 Injection methods 3.3 Rearing of fry to fingerlings	(08)
Unit – IV	Grow out carp farming 4.1 Stocking density 4.2 Cultural practices 4.3 Health management 4.4 Water quality management 4.5 Harvest	(06)

Course Outcomes: Students should be able to,

1. select the carp culture species
2. differentiate types of fish ponds
3. get knowledge about brood stock management
4. relate stocking density & water management

Reference Books:

1. Srivastava, C.B.L.(2006). A Text Book of Fishery science and Indian Fisheries. Kitab Mahal Publishers
2. Pandey, K. & Shukla, J. P. (2005). Fish and Fisheries. Rastogi publication, Meerut.
3. Khanna. S. S. & Singh. H. R. (2005). A Textbook of Fish Biology and Fisheries, Narendra Publishing House, Delhi
4. Jhingran, V. G. (2007). Fish and Fisheries of India. Hindustan Publishing Corporation (India), Delhi
5. Rath, R.K. (2000). Freshwater Aquaculture
6. Agarwal, S.C. (2007). A handbook of fish farming
7. Ayyappan, S (2010). Handbook of Fisheries and Aquaculture
8. Pillay, T.V.R (1993). Aquaculture Principles and Practice

B.Sc. I Semester – I

BZFP – 119 Practical Course - I

Course Objectives: Students will be able to,

1. study museum specimen of Indian major carps
2. learns physical parameters of pond
3. learn chemical parameters of pond
4. study weed & predatory fish

Credits (Total Credits 2)	SEMESTER – I BZFP – 119 - Practical Course- I (Practical based on BZFP 117 and BZFP 118)	No. of hours per Practical
1	Museum survey of Indian major carps	2
2	Determination of physical parameters of pond water i) Temperature ii) Turbidity	2
3	Determination of chemical parameters of pond water i) Dissolved oxygen	2
4	ii) Free carbon dioxide	2
5	iii) Hardness	2
6	iv) Alkalinity	2
7	iv) pH	2
8	Collection of fish food organisms i) Phytoplanktons	2
9	ii) Zooplanktons	2
10	Feed formulation using locally available feed ingredients	2
11	Types of fishing gears	2
12	Control of weeds in fish pond	2

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13	Control of predators in fish pond	2
14	Visit to local fish ponds and farms	2
15.	Visit to local fish Market	2

Course Outcomes: Students should be able to...

1. identify museum specimen of Indian major carps
2. estimate physical parameters of pond
3. determine chemical parameters of pond
4. make out difference between weed & predatory fish

Reference Book

1. Srivastava C.B.C.(2008). Fish Biology. Narendra Pub. House.
2. Michael King (1995). Fisheries Biology, Assessment and Management Fishing News Publishers
3. Khanna S.S. (1993). An Introduction to Fishes By Central Book Depot, Allahabad
4. Jhingran V.G. (1991). Fish and Fisheries in India – By– Hindustan Pub. Corporation – New Delhi.
5. Chandy M. (1989). Fishes. National Book Trust India. 183 Pages
6. Samtharam R. (1990). Fishery Science – Daya Publishing House.
7. Beaven C.R. (1990). Hand Book of Fresh Water Fishes of India. By Narendra Pub. House.
8. Michael, P. (1990). Ecological Methods for Field and Laboratory Investigation. Tata McGraw-Hill Education Publishing Co. Ltd., New Delhi.
9. Pillay T. V. R. (1988). Aquaculture, Principles and Practices By Fishing New Books.

IKS -Indian Knowledge System (Indian Health Science)**Paper Title: Fundamentals of Ayurveda (BZFT- 101)****Credit:-02****Hours:-30****Course Objective:** Student should be able to...

1. recall concept of Ayu.
2. list of types of Ayu
3. describe Concept of Kriya Sharir
4. identify mutual relationship between Triguna, Tridosha & Panchmahabhuta

Credits (Total Credits 2)	Fundamentals of Ayurveda (BFT-101)	No. of hours per unit
Unit – I	Basics of Ayurveda <ul style="list-style-type: none"> • Definition and Components of Ayu • Definition and aim of Ayurveda • Types of Ayu (Hitayu, Ahitayu, Sukhay and Dukhaya) • Brief introduction of Ayurveda Samhitas • Principles of Ayurveda 	(06)
Unit – II	Ayurved Itihas and Prayogika Siddhant <ul style="list-style-type: none"> • Post independent Development of Ayurveda: Education • Globalisation of Ayurved • Tridosh Siddhant • Panchabhautik Siddhant • Manastatva and its Chikitsa Siddhant. 	(08)
Unit – III	Kriya Sharir <ul style="list-style-type: none"> • Definition of Sharir • Definition of Kriya • Description of Sharir Dosha and Manasa Dosha. • Mutual relationship between Triguna, Tridosha & Panchmahabhuta. 	(08)
Unit – IV	Indriya Shaarira <ul style="list-style-type: none"> • Definition of indriya, indriya artha and indriya adhistan, their number and importance. • Description of gyanendria, karmendriya and ubhayendriya (manas). 	(08)

Course outcomes: Student 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

Reference Books:

1. Dr. Shubha and Dr. Ravi Rao (2016): A Text Book of Padartha Vijnana Evam Ayurveda Itihas; Chaukhambha Orientalia, Varanasi
2. Dr. Vidyalashmi K. and Dr. Shrikanth P.H. (2019): Padartha Vijnana Evam Ayurveda Itihasa; Chaukhambha Orientalia, Varanasi
3. Dr. Giridhar M. Kanthi (2018): A Text Book of Ayurvedic human anatomy (Sharir Rachana Vigyan).
4. Dr.Subhash Ranade, Dr. R.R. Deshpande and Dr. Swati Chaubhe (2017): A Text Book of Kriya Sharira.
5. Vaidya Bhagwan Dash (1994): Basic Principles of Ayurveda.
6. Girindranath Bhisagacarya (2003): History of Indian Medicine: From Earliest Times to the Present.

Web Links:

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

SEMESTER – II**Course - III: BZFT- 121 Aquatic Ecology****Course Objectives: Students Should be able to...**

1. state aquatic ecosystem.
2. remember physico–Chemical characteristics of water
3. compare different trophic levels of food chain.
4. examine aquatic pollution.

Credits (Total Credits 2)	SEMESTER – II Course – III BZFT- 121 Aquatic Ecology	No. of hours per unit/credits
Unit - I	Aquatic Ecosystem: 1.Diversity and composition of aquatic ecosystems (fresh water, marine and estuarine). 2.Ecological differences between lentic and lotic environments. 3.Aquatic environment, Flora and fauna: Components of aquatic systems, 4. Animal associations: Symbiosis, commensalisms, parasitism, prey-predator relationship, host parasite relationship.	(08)
Unit – II	Physico-Chemical Characteristics 1.Physical Characteristics of Water: Light, Salinity Tides and Currents, 2.Chemical Characteristics of Water: pH, dissolved oxygen, free carbon dioxide, hardness, alkalinity, conductivity, suspended and dissolved solids.	(08)
Unit – III	Trophic Dynamics 1.Trophic Dynamics in aquatic ecosystem: Food chains, pyramids , nutrient cycles and energy flow 2.Trophic relationship in lentic and lotic biotopes. 3.Basic concepts of primary productivity	(08)
Unit - IV	Aquatic Pollution: 1Aquatic pollution and its types (biological, chemical, thermal and industrial), Eutrophication: Causative factors, consequences and control. 2.Impact of water pollution on aquatic communities and its control measures. 3.Bio-indicator species	(06)

Course Outcomes: Students will be able to...

1. differentiate between lentic & lotic ecosystems.
2. categorize physico–Chemical Characteristics of Water.
3. interpret on impacts of water pollution.
4. demonstrate bio-indicator species

Reference Books:

1. Das.B and Kar. Devashish (2012). Basic Limnology and Fish Biodiversity, Manglam publishers and Distributors, Delhi
2. Sakhare, V. B. (2011). Limnology: current perspectives. Daya Publishing House, Delhi.
3. Vijaykumar K. and vasanthkumar, B. (2010). Aquatic ecosystem and its management. Daya Publishing House, Delhi.
4. Kosygin, L (2009). Wetlands of North east India. Akansha publishing house, New Delhi
5. Sakhare, V. B. (2007). Reservoir Fisheries and Limnology. Daya Publishing House, Delhi.
6. Kar. Devashish;(2007). Fundamentals of Limnology and Aquaculture Biotechnology, Daya Publishing House, Delhi.
7. Kumar Arvind. (2008). Aquatic environment and toxicology. Daya Publishing House, Delhi.
8. Alex, M. and Theresa, A. (1998). Environmental Management of Aquaculture (Fish edition), Chapman & Hall, London.
9. Basheer, A. (1989). Marine Biology: Some Aspects of Marine Ecology and Marine Fisheries. Daya Publishing House, Delhi.
10. Boyd, C. E. and Tucker, C. S. (1998). Pond Aquaculture Water Quality Management. Kluwer Academic Publishers.
11. Santhanam R, Velayatham and Jegathersan P.G. (1990). A Manual of Fresh Water Ecology. Daya Publishing House, Delhi.
12. Schowerbel, J. and Hemmings, B. (1991). Hand Book of Limnology. Scientific Publishers, Jodhpur.

Unit - IV	Ornamental fishes and aquarium maintenance 1. Different varieties of exotic and indigenous fishes. 2. Principles of a balanced aquarium. 3. Water quality management. Aquarium plants and their propagation methods. 4. Aquarium fish feeds-Dry, wet and live feeds. 5. World trade of ornamental fish and export potential.	(06)
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Course Outcomes: Students will be able to...

1. recall 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. differentiate types of ornamental fish.

Reference Books:

1. Kumar, A. and Bandyopadhyay, P. (2008). Aquaculture and Fisheries. Daya Publishing House, Delhi.
2. Pandey, N. and Malik, D. S. (2008). Integrated Fish Farming. Daya Publishing House, Delhi.
3. Jhingran, V. G. (2007). Fish and Fisheries of India. Hindustan Publishing Corporation (India) New Delhi
4. Ahmed, S. H. (1998). Advance in Fisheries and Fish production. Narendra Publishing House, Allahabad.
5. Desilva, S. and Andensan, T. A. (1995). Fish Nutrition in Aquaculture. Chapman & Hall.
6. Chakroff, M. (1982): Freshwater Fish Pond Culture and Management. Scientific Publishers Main Bhawan, Jodhpur.
7. Sharma, U. and Grover, S. P. (1982). An Introduction to Indian Fisheries. Bishensing Mahendrapal Singh, Dehra Dun.
8. Tilak, R. and Sharma, U. (1982). Game Fishes of India and Angling. International Book Distributors, Dehra Dun.
9. Timmernams, J. A. and Khan, H. (1979). Textbook of Fish culture, Breeding and Cultivation of fish. Fishing New Book Ltd. England.

Practical Course - II: BZFP- 123

Course Objectives: Students Should be able to...

1. identify fishes from different habitats.
2. study ornamental fishes.
3. memorise primary productivity.
4. analyze soil & identification of aquatic plants & insects.

Credits (Total Credits 2)	SEMESTER – II Practical course – II (BZFP 123) (Based on BZFT-122 and BZFT -123) List of Practical (15)	No. of hours per Practical
1	Identification of Fishes from different Habitat. a) Fresh water habitat – (Any Two) b) Brackish water habitat – (Any Two) c) Marine water habitat -(Any Two)	4
2	Identification of ornamental fish	4
3	Determination of primary productivity	4
4	Study of plankton	4
5	Water Analysis collection and preservation of water samples. transparency, turbidity, determination of pH, electrical conductivity, salinity, chlorinity	4
6	To Study total solids (TDS, TSS, TVS, TVDS)	4
7	To Estimation of dissolved oxygen from any given water sample	4
8	Estimation of total alkalinity from any given water sample	4
9	Estimation of free carbon dioxide from given water sample	4

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10	Estimation of total hardness from given water sample	4
11	Soil analysis: Determination of soil texture, soil pH, conductivity, soil available nitrogen	4
12	Soil analysis: Determination soil available phosphorus and organic carbon	4
13	Collection, identification and control of aquatic weeds, insects, predatory fishes, weed fishes and eggs and larval forms of fishes	4
14	Methods of collection and identification of different live food organisms. Evaluation of live food organisms	4
15	Visit to Aquaculture / any suitable place	4

Course Outcomes: Students will be able to...

1. compare different types of planktons
2. discuss fishes from different habitats.
3. examine Water quality of given sample
4. analyse soil parameters.

Reference Books:

1. Adhikari S and Chatterjee DK. (2008). Management of Tropical Freshwater Ponds. Daya Publ.
2. Rajagopalsamy CBT and Ramadhas V. (2002). Nutrient Dynamics in Freshwater Fish Culture System. Daya Publ.
3. ICAR. (2006). Handbook of Fisheries and Aquaculture. ICAR
4. APHA, AWWA, WPCF. (1998). Standard Methods for the Examination of Water and Waste water, 20th Ed. American Public Health Association, American Water Works Association, and Water Pollution Control Federation, Washington, D. C.
5. Boyd, C. E. and Tucker, C. S. (1992). Water Quality and Pond Soil Analyses for Aquaculture, Alabama Agricultural Experimental Station, Auburn University.
6. Boyd CE. (1979). Water Quality in Warm Water Fish Ponds. Auburn University.
7. Parsons TR, Maita Y and Lalli CM. (1984). A Manual of Chemical and Biological Methods for Seawater Analysis. Pergamon Press.

Semester – II**Minor Fisheries****Paper Course- III: Fish Behaviour (BZFT-124)**

Course Objectives: Students should be able to...

1. understand different fish behaviours.
2. differentiates egg layer and live bearer fishes.
3. explain nest building fishes
4. discuss the relationships among aquatic organisms and their environment.

Credits (Total Credits 2)	SEMESTER – II Course– III Fish Behaviour (BZFT-124)	No. of hours per unit
Unit – I	General behavioural patterns of fishes 1.1 Locomotion in Fishes 1.2 Types of Locomotion 1.3 Advantages of Locomotion	(08)
Unit – II	Migration in fishes 2.1 General account of migration. 2.2 Types of migration 2.3 Advantages of migration 2.4 Factors influencing migration. 2.5 Types of migratory fishes	(08)
Unit – III	Reproductive behaviour 3.1 Spawning habits of fishes 3.2 Live Bearers 3.3 Egg Layers	(06)
Unit – IV	Parental care in fishes 4.1 Factors responsible for Parental care in fishes 4.2 Nest building in fishes- Basin, Circular, Foamy, Barrel and Burrow nest 4.3 Non nest building care behavior- Deposition eggs in suitable places and body	(08)

Course Outcomes: Students will be able to...

1. identify behavioural adaptations to diverse environment.
2. explain parental care in fishes.
3. discuss different behavioural patterns of fish in relation to ecological perspective.
4. describe different types of nests in fishes.

Reference Books:

1. Brown, C., Laland, K. N. and Krause, J., (2010). Fish cognition and behavior. Blackwell Science.UK.
2. Sloman, K.A., Wilson, R.W. and Balshine, S., (2006). Behaviour and Physiology of Fish. Elsevier, Netherlands.
3. Grubb, T.C. J. (2003). The Mind of the Trout. University of Wisconsin Press, Madison.
4. Lucas, C.M. and Baras, E. (2002). Migration of Freshwater Fishes. Blackwell Science Ltd. UK.
5. Reeb, S., (2001). Fish behaviour in the aquarium and in the wild. Cornell University Press, USA

Course - IV: BZFT-125 Fish By-Products

Course Objectives: Students Should be able to...

1. acquire the present status of aquaculture
2. execute product, processing and storage of fish products within the country and exporting it.
3. compare the importance of fishes in daily life
4. explain fish by- Products.

Credits (Total Credits 2)	Semester – II Course – IV: BZFT-125 Fish By- Products	No. of hours per unit
Unit – I	Fish meal 1.1 Use of fish meal as feed ingredient 1.2 Raw materials used in fish meal 1.3 Processing Method used for preparation of fish meal	(08)
Unit – II	Fish oil 2.1 Production of fish oil 2.2 Wet reduction Process 2.3 Dry reduction Process 2.4 Processing of Fish oil 2.5 Fatty acid : Saturated and Unsaturated	(08)
Unit – III	Other Products 3.1 Isinglass- Processing 3.2 Shark leather 3.3 Fish glue 3.4 Pearl Essence 3.5 Fish protein concentrate	(08)
Unit - IV	4.1 Fish maw, 4.2 Chitin, chitosan 4.3 Fish gelatin, 4.4 Shark fin rays	(06)

Course Outcomes: Students will be able to ...

1. recall names of fish by-product.
2. Identify fish oil processing methods.
3. prepare Fish meal, Fish manure etc. Fish by-products.
4. evaluate budget of processing of fish meal.

Reference Books:

1. Winton and Winton. (1999). Fish and Fish Products. Allied Scientific Publishers.
2. Vaaland S. and Piyarat W., (1982). Comparison of production costs of some dried fish products. FAO, Working paper FIIU, 41 p.
3. Velayutham, P. and Indira Jasmine, G. (1996). Manual on Fishery By-Products, Tamilnadu
4. Ruiter. (1995). Fish and Fishery Products. CAB International Publication.

Practical Course – II (BZFP- 126)

Course Objectives: Students should be able to...

1. identify different types of fish behaviours
2. recall types of migration in fishes
3. explain ingredients of Fish meal and fish oil.
4. discuss of Fish by-products.

Credits (Total Credits 2)	Semester – II Practical Course -II BZFP- 126 (Practical Based on BZFT- 124 and BZFT- 125)	No. of hours per Practical
1	To Study the locomotion in Fishes	4
2	To Study of migration in Fishes	4
3	Study live bearer fishes	4
4	Study of Egg layer Fishes	4
5	Study of parental care in fish.	4
6	Study of Fish meal	4
7	Study of Fish oil	4
8	Preparation of fish manure and fish maw	4
9	Quality assessment of individual by-products	4
10	Preparation of isinglass and fish silage	4
11	Study of Non nest building care behaviour	4
12	Collection of fish by-products	4
13	Preparation of fish protein concentrate and fish hydrolysate.	4
14	Visit to Fish Processing industry and fish meal plants	4
15	Field visits to fish farms to observe spawning in fishes	4

Course Outcomes: Students will be able to...

1. describe raw materials of Fish byproducts.
2. Discuss examples of parental care.
3. demonstrate skills for the preparation of various fish by-products
4. design any Fish by product from give fish sample

Reference Books:

1. Winton and Winton. (1999). Fish and Fish Products. Allied Scientific Publishers.
2. Velayutham, P. and Indira Jasmine, G. (1996). Manual on Fishery By-Products, Tamilnadu
3. Ruitter. (1995). Fish and Fishery Products. CAB International Publication
4. Vaaland S. and Piyyarat W., (1982). Comparison of production costs of some dried fish products. FAO, Working paper FIIU, 41 p.

SEMESTER – II

OE Course - III BZFT – 127 : ORNAMENTAL FISH FARMING

Course Objectives: Students will be able to,

1. study basics of aquaculture-definition and scope.
2. learn aquarium and aquarium accessories.
3. get knowledge of indigenous species
4. study setting of an aquarium

Credits (Total Credits 2)	SEMESTER – II OE Course – III BZFT – 127 ORNAMENTAL FISH FARMING	No. of hours per unit/credits
Unit – I	Introduction to Aquaculture and Ornamental Fishes Trading 1.1 Basics of aquaculture-definition and scope. History of aquaculture: Present global and national scenario. 1.2 World trade of ornamental fish and export potential. Different varieties of exotic and indigenous fishes. 1.3 Ornamental fisheries-e new dimensions in aquaculture entrepreneurship	(08)
Unit – II	Introduction to Ornamental fishes 2.1 Introduction to aquarium and aquarium accessories. 2.2 Basic knowledge on profile of ornamental fishes in world 2.3 Basic knowledge and profile of some selected indigenous Indian ornamental	(08)
Unit – III	Engineering Aspect and construction of aquarium (I) 3.1 Design and construction of public fresh water and marine aquaria and oceanarium. 3.2 Aerators, filters and lighting. 3.3 Biofilters in aquarium	(08)
Unit - IV	Engineering Aspect and construction of aquarium (II) 4.1 Construction, settings and maintenance of aquarium 4.2 Construction of ornamental fish unit 4.3 Engineering aspect in Ornamental Fish Farming	(06)

Course Outcomes: Students should be able to,

1. express aquaculture-definition and scope.
2. understand aquarium and aquarium accessories.
3. identify indigenous species
4. construct, set & maintain of an aquarium

Reference Book :

1. Pillay T.V.R. (1988). Aquaculture, Principles and Practices by Fishing New Books.
2. Michael King (1995). Fisheries Biology, Assessment and Management . Fishing News Publishers
3. Khanna S.S (1993). An Introduction to Fishes. Central Book Depot, Allahabad
4. Jhingran V.G (1991). Text Book of Fish Biology and Indian. Hindustan Pub. Corp.

OE Course - IV BZFT – 128 : ORNAMENTAL FISH BREEDING AND MANAGEMENT

Course Objectives: Students will be able to,

1. gain knowledge of fish Breeding and rearing in Live Bearers
2. learn fish Breeding and rearing in egg layers.
3. study health management in Ornamental Fish Farming.
4. acquire the knowledge of management of ornamental aquatic plants and its trading

Credits (Total Credits 2)	SEMESTER – I OE Course – IV BZFT – 128 Ornamental Fish Breeding and Management	No. of hours per unit/credits
Unit - I	<p>Fish Breeding and rearing in Live Bearers</p> <p>1.1 Breeding of ornamental fish with reference to live bearer species.</p> <p>1.2 Breeding of Guppies, Mollies, Swordtail fish and Platy fish</p> <p>1.3 Introduction hatchery management system for live bearers</p> <p>1.4 Nursery management of live bearers</p> <p>1.5 Rearing of live bearers</p>	(08)
Unit – II	<p>Fish Breeding and rearing in Egg layers</p> <p>2.1 Breeding of ornamental fish with reference to selected egg layer species.</p> <p>2.2 Introduction to Breeding of Angel fish, Zebra fish and Neon tetra</p> <p>2.3 Introduction hatchery management system for egg layers</p> <p>2.4 Nursery management of egg layers</p> <p>2.5 Special emphasis on Breeding of Gold fish.</p>	(08)
Unit – III	<p>Ornamental fish farming-Management Aspects</p> <p>3.1 Ornamental Fish-diseases and their management</p> <p>3.2 Live Food culture for tropical ornamental fish</p> <p>3.3 Feeding for breeding and maintenance of ornamental fish.</p> <p>3.4 Health management in Ornamental Fish Farming.</p>	(08)

Unit – IV	Introduction to Aquarium plants and its propagation techniques	(06)
	4.1 Introduction to Aquarium plants and their export potential.	
	4.2 Profiles of some selected aquarium plants. Morphology, multiplication of aquarium plants – different methods. Indigenous ornamental plants of Western Ghats.	
	4.3 Aquarium plant propagation.	
	4.4 Management of ornamental aquatic plants and its trading	

Course Outcomes: Students should be able to,

1. explain breeding and rearing in Live Bearers
2. learn fish Breeding and rearing in egg layers
3. understand health management in Ornamental Fish Farming.
4. manage ornamental aquatic plants and its trading

Reference Books:

1. Pillay T. V. and Kutty M. N. (2011). Aquaculture: Principles and Practices. Wiley-Blackwell. Sec. Edition
2. Pillay T. V. and Kutty M. N. (2005). Aquaculture: Principles and Practices. Wiley-Blackwell.
3. Moyle,P.B. and Cech,J.J. Fishes (2003). An Introduction to Ichthyology. Pearson.
4. Huet, M. and Timmermans J. (1994). Textbook of Aquaculture Wiley; 2nd edition

**OE Practical Course – II,
BZFP - 129 : (Course –III and IV)**

Course Objectives: Students will be able to,

1. study identification of live bearer fish
2. learn identification of egg layer fish
3. learn fabrication of glass aquaria
4. gain knowledge Setting-up and maintenance of aquarium

Credits (Total Credits 2)	SEMESTER – II OE Practical Course – II (Based on Course –III and IV: BZFP - 127 and BZFP - 128)	No. of hours per Practical
1	Identification of common live bearer ornamental fishes: - Guppy, Molly, Platy, Sword Tail,	2
2	Identification of common Egg layer ornamental fishes: - Angel, Neon tetra	2
3	Identification of common Egg layer ornamental fishes: Discus and Siamese fighter	2
4	Identification of common Egg layer ornamental fishes: Gold fish, Koi Carp,	2
5	Identification of common Egg layer ornamental fishes: Danio-Zebra, and Flower Horn.	2
6	Fabrication of all-glass aquarium demonstration and individual performance.	2
7	Setting-up and maintenance of aquarium	2
8	Introduction to Aquarium accessories and equipment.	2
9	Conditioning and packing of ornamental fishes.	2
10	Preparation of ornamental fish feed.	2
11	Setting-up of breeding tank for live bearers	2
12	Setting-up of breeding tank of goldfish	2
13	Identification of ornamental fish diseases and prophylactic measures.	2

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14	Identification of aquarium plants	2
15	Field Visit- Any Suitable Place	2

Course Outcomes: Students should be able to,

1. identify live bearer fish
2. identify egg layer fish
3. fabricate glass aquaria
4. practice setting-up and maintenance of aquarium

Reference Books:

1. Latha Shenoy (2023). Course Manual in Fishing Technology.
2. Khanna S.S (1993). An Introduction to Fishes By. Central Book Depot, Allahabad
3. King Michael (1995). Fisheries Biology, Assessment and Management . Fishing News Publishers.
4. Pillay T.V.R (1988). Aquaculture, Principles and Practices. Fishing New Books

B.Sc. I SEMESTER II
Skill Enhancement Course (SEC)
SEC: AQUARIUM MANAGEMENT

Course objectives:

The students should be able to...

1. understand the different types of aquarium.
2. study the aquarium accessories
3. know the application of Aquarium.
4. learn the management of aquarium

Credits (Total Credits 1)	SEMESTER – II SEC: AQUARIUM MANAGEMENT	No. of hours per Practical
1	UNIT-1 Aquarium- construction, setting and its management 1.1 Present status of ornamental fish industry 1.2 Definition and types of aquaria 1.2 Construction and setting of aquarium 1.3 Maintenance of aquarium -Basic and Ornamental aquarium accessories 1.4 Business opportunities in ornamental/aquarium industry	07
2	UNIT – 2 Ornamental fishes and their management 2.1 Important Indigenous ornamental fishes 2.2 important Exotic ornamental fishes 2.3 Common ornamental fish diseases and their management 2.4 Types of feeds of ornamental fishes	08

Course outcomes:

Student will be able to...

1. analyze different types of aquarium fishes.
2. start their own small scale business of aquaria
3. apply the application of aquarium Management.
4. explain the concept of aquarium

Reference Books:

1. Latha Shenoy (2023). Fishing Gear and Craft Technologies for Sustainable Fishing. Om Publications.
2. Kalaiarasan, M. (2019). Text Book on Fishing Gear Technology. Narendra Publications.
3. Sreekrishna Y & Shenoy L. (2001). Fishing Gear and Craft Technology. ICAR.
4. Sanisbury J.C. (1996). Commercial Fishing Methods-An Introduction to Vessels and Gear. Fishing News Books.
5. Baranov FI. (1977). Selected Works on Fishing Gear. Keterpress Enterprises.Israel.

B.Sc. I SEMESTER II

Practical Course I

Course objectives:

The students should be able to...

1. understand the concept of the Aquarium.
2. learn aquarium maintains.
3. study the different aquarium accessories.
4. understand working of aquarium.

Credits (Total Credits 1)	SEMESTER-II Practical course I practical based on SEC	No. of hours per Practical (30)
	3.1 Ornamental fish breeding 3.2. Museum survey of indigenous aquarium fishes 3.2 Museum survey of exotic aquarium fishes 3.3 Basic accessories required for aquarium setting i) Aerators ii) Filters iii) Thermostat 3.4 Ornamental accessories required for aquarium setting 3.5 Production of Ornamental aquatic plants 3.5 Determination of water parameters of aquarium i) pH ii) Temperature, Dissolve oxygen, Ammonia, TSS. Alkalinity, Hardness 3.6 Construction of all glass aquarium	

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	3.7 Study of fish pathogens of ornamental fishes through slides/charts	
	3.8 Visit to Aquarium Cum Awareness Centre	
	3.9 Visit to Local ornamental fish shop	

Commented [B1]: Not clear

Course outcomes:

Student will be able to...

1. analyze different types of aquarium fishes.
2. start their own small scale business of aquaria
3. apply the application of aquarium Management.
4. explain the concept of aquarium

Reference Books:

1. Latha Shenoy (2023). Fishing Gear and Craft Technologies for Sustainable Fishing. Om Publications.
2. Kalaiarasan, M. (2019). Text Book on Fishing Gear Technology. Narendra Publications.
3. Sreekrishna Y & Shenoy L. (2001). Fishing Gear and Craft Technology. ICAR.
4. Sanisbury J.C. (1996). Commercial Fishing Methods-An Introduction to Vessels and Gear. Fishing News Books.
5. Baranov FI. (1977). Selected Works on Fishing Gear. Keterpress Enterprises.Israel.