

Rayat Shikshan Sanstha's
YASHAVANTRAO CHAVAN INSTITUTE OF
SCIENCE, SATARA
(An Autonomous College)

Reaccredited by NAAC with 'A+' Grade

Bachelor of Science

Part - II

Fisheries

Syllabus

to be implemented w .e. f. June, 2022

1. Structure of Syllabus:

Semester –III

Sr. No.	Course Title	Theory			Practical		
		Course No.& Course Code	No. of lectures Perweek	Credits	Course Title	No. of lectures per week	Credits
1	Fisheries	Course- I: BZFT301	3	2	Practical Course – I : BZFP303	8	4
		Course- II: BZFT302	3	2			

Semester –VI

Sr. No.	Course Title	Theory			Practical		
		Course No.& Course Code	No. of lectures Per week	Credits	Course Title	No. of lectures Per week	Credits
1	Fisheries	Course -III: BZFT401	3	2	Practical Course – II: BZFP403	8	4
		Course -IV: BZFT402	3	2			

Note: B: B. Sc. T=Theory and P= Practical

Evaluation Structure: B.Sc. II Sem-III & IV (Fisheries)

Semester	Course No.& Code	ESE	InternalExam		Paper No. & Code	Practical		Submission		Total
			ISE I	ISE II		Exam	Journal	Sem inar	Day to Day Performance	
III	Course I :BZFT301	30	5	5	Pr. Course I: BZFP 303(A)	25	5	5	5	150
	Course II :BZFT302	30	5	5	Pr. Course I: BZFP 303(B)	25	5			
	Total	60	10	10	Total	50	10	5	5	
IV	Course III BZFT 401	30	5	5	Pr. Course II: BZFP 403(A)	25	5	5	5	150
	Course IV :BZFT 402	30	5	5	Pr. Course II: BZFP 403(B)	25	5			
	Total	60	10	10	Total	50	10	5	5	
Total of Sem. III &IV		120	20	20	Total	100	20	10	10	300

Structure and titles of the course of B.Sc. II course

Semester III

Code	Name of Course	Units
BZFT 301	FISHERY BIOLOGY I (CREDITS:02; TOTAL HOURS : 45)	Unit I: An introduction to Fisheries, Taxonomy of Shell-fish and fin fish Unit II: External Morphology of – Unio, Scoliodon and Labeo and Internal Anatomy of Fin fish: Scoliodon Unit III : Internal Anatomy of Fin fish:Labeo and Economic importance of Shell-fish and fin fish Unit IV : Study of the general topics
BZFT 302	INLAND FISHERIES (CREDITS:02; TOTAL HOURS : 45)	Unit I: Freshwater Habitat and Freshwater Ecosystems in Ponds, Rivers and Reservoirs Unit II: Inland Capture Fisheries: Unit III : Fishing Crafts and Gears and its maintenance Unit IV : Global inland fish production

Semester IV

Code	Name of Course	Units
BZFT 401	FISH PHYSIOLOGY I (CREDITS:02; TOTAL HOURS : 45)	Unit I: Nutrition and Respiration Unit II: Circulation and excretion Unit III : Reproduction Unit IV : Sense organs and Amazing organs in fishes
BZFT 402	AQUACULTURE (CREDITS:02; TOTAL HOURS : 45)	Unit I: Introduction to Aquaculture and types of aquaculture Unit II: Prerequisites of site selection and layout of fish farm Unit III : Physico- chemical conditions of fish pond, Criteria for selection of aquaculture species and major species of fishes for freshwater aquaculture. Unit IV : Freshwater Plankton and aquarium fishery

B. Sc. Part II Semester- III

FISHERIES

COURSE-I

BZFT- 301 (FISHERY BIOLOGY I)

Theory: 36 hrs. (45 lectures of 48 minutes)

Marks-50 (Credits: 02)

Course Objectives: Student will able to

1. Study brief history of fishery, different fishery activities, importance of fisheries as well as taxonomy of shell fishes and fin fishes.
2. Recognize morphology of Bivalve, Scoliodon and Labeo and internal anatomy of Scoliodon.
3. Aware of the internal anatomy of typical bony fish and also learn the economic importance of some important fin and shellfish.
4. Learn important general topics that is study of fins, swim bladder, migration, locomotion in fishes, lung fishes hill stream adaptation and parental care in fishes

Credits (Total Credits 2)	SEMESTER-III BZFT- 301 (FISHERY BIOLOGY I)	No. of hours per unit/credits
UNIT - I	1. An introduction to Fisheries: 1.1 History in brief. 1.2 Inland, marine, capture and culture fisheries. 1.3 A broad outline of fishery activity: i. Fishing. ii. Processing iii. Marketing 1.4 Importance of fisheries	(04)
	2. Taxonomy of Shell-fish: 2.1 Classification and General Characters of Crustacea and Mollusca	(03)
	3. Taxonomy of Finfish: 3.1 General outline of the classification. 3.2 Chondrichthyes, Osteichthyes and Dipnoi.	(05)
UNIT - II	4. External Morphology of: 4.1 Bivalve- Unio. 4.2 Typical cartilaginous fishes - Scoliodon 4.3 Typical bony fish- Labeo	(04)

	5. Internal Anatomy of Fin fish: Scoliodon With reference to – 5.1 Digestive system 5.2 Circulatory system 5.3 Excretory and reproductive system 5.4 Brain	(07)
UNIT - III	6. Internal Anatomy of Fin fish:Labeo With reference to – 6.1 Digestive system 6.2 Circulatory system 6.3 Excretory and reproductive system 6.4 Brain 6.5 Life Cycle of Labeo	(07)
	7. Economic importance of the following: Prawn, Unio, Oyster, <i>Scoliodon</i> , <i>Harpodon</i> , Pomphret, Sardine, <i>Labeo</i> and <i>Catla</i>	(04)
UNIT - IV	8. Study of the following general topics: 8.1 Study of fins: Evolution of paired and unpaired fins in fishes 8.2 Swim bladder and its functions 8.3 Migration in fishes. 8.4 Locomotion in fishes:Carangiform, Anguilliform and Ostraciform 8.5 Lung Fishes. 8.6 Hill stream adaptation in fishes. 8.7 Parental care in fishes	(11)

Course Outcomes: Student should be able to

1. Recall the history of fisheries, fisheries activities, importance of fisheries and classification of shell and fin fishes using standard key.
2. Demonstrate the morphology of and anatomy of unio, cartilaginous fish *Scoliodon* by observing external morphological peculiarities.
3. Illustrate anatomy of typical bony fish (*Labeo*) by studying different systems. Students acquire the knowledge of economic importance of fin and shell fish.
4. Develop the knowledge regarding different types of fins, swim bladders, types of migrations and locomotion in fishes and lung fishes. learns different hill stream adaptation in fish and parental care in fishes.

References:

1. Fish and Fisheries of India : V. G. Jhingran. Hindustan Publication Corp. (India), Delhi **(Unit I)**
2. Tropical Fish Farming : D. K. Belsare. Environmental Publi. Karad, Maharashtra **(Unit I)**
3. Aquaculture : J. E. Bardach. J. H. Ryther and W. O. McLarney **(Unit I)**
4. Encyclopaedia of Fishes and Fisheries of India. A. K. Pandey. G. S. Sandhu Vol. IV. Anmol Publi. New Delhi. **(Unit I)**
5. An Introduction to Fishes : S. S. Khanna. Central Book Depot. Allahabad **(Unit I, II, III, IV)**
6. Vertebrate Zoology -Kotpal R.L. **(Unit II, III)**
7. Vertebrate Zoology- J.Z.Young **(Unit II, III)**
8. Chordate Zoology- Dhami and Dhami. **(Unit II, III)**

9. A Textbook of Fishery Science and Indian Fisheries : C. B. Shrivastav. Kitab Mahal, New Delhi.(Unit III)

B. Sc. Part II Semester- III

FISHERIES

COURSE -II

BZFT- 302 (Inland Fisheries)

Theory: 36 hrs. (45 lectures of 48 minutes)

Marks-50 (Credits: 02)

Course Objectives: Student will able to

1. Impart knowledge of different types of fresh water habitats, freshwater ecosystems with reference to food chain, food web and primary productivity.
2. Aware about of activities in Inland waters and riverine, reservoir, lacustrine capture fisheries
3. Gain knowledge of maintenance of crafts and gears.
4. Understand Cold water fisheries of India, Capture fishery resources of India as well as potential of inland water bodies with reference to respective state.

Credits (Total Credits 2)	SEMESTER-III BZFT- 302 (Inland Fisheries)	No. of hours per unit/credits
UNIT - I	1. Freshwater Habitat: 1.1 Introduction. 1.2 Characters and classification of : Ponds, Lakes, Streams, Rivers and Reservoirs.	(05)
	2. Freshwater Ecosystems in Ponds, Rivers and Reservoirs with respect to: 2.1 Food chain. 2.2 Food web. 2.3 Primary productivity.	(08)
UNIT - II	3. Inland Capture Fisheries: 3.1 Riverine capture fisheries. 3.2 Reservoir capture fisheries. 3.3 Lacustrine capture fisheries.	(10)
UNIT - III	4. Fishing Crafts and Gears: 4.1 Fishing Crafts: Rafts, Catamaran, Canoes, Machwa, Trawler. 4.2 Fishing Gears : Hooks and Lines, Cast net, Gill net, Trap net, Rampani net and Trawl net.	(12)
	4.3 Maintenance of Fishing Crafts and Gears.	(03)

UNIT - IV	5.1 Global inland fish production data. 5.2 Capture fishery resources of India. 5.3 Potential of inland water bodies with reference to respective state. 5.5 Problems in the estimation of inland fish catch data. Flood-plain capture fishery- present status of their exploitation and future prospects. Cold water fisheries of India.	(07)
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Course Outcomes: Student should be able to

1. Recognize different types of fresh water habitats, freshwater ecosystems with reference to food chain, food web and primary productivity.
2. Summarize activities in Inland waters and get knowledge about riverine, reservoir, lacustrine capture fisheries
3. Categorize between different types fishing crafts, gears and to aware about its maintenance.
5. Develop the knowledge regarding Cold water fisheries and potential of inland water bodies of India with reference to respective state.

References:

1. Fish and Fisheries of India : V. G. Jhingran. Hindustan Publication Corp. (India), Delhi(**Unit I**)
2. Ecology - P.D. Sharma(**Unit I**)
3. A Textbook of Fishery Science and Indian Fisheries : C. B. Shrivastav. Kitab Mahal, New Delhi(**Unit I**)
4. A Manual of Freshwater Acquaculture : R. Santhanam. N. Sukumaran and P. Natrajan. (**Unit II**)
5. An Introduction to Fishes : S. S. Khanna. Central Book Depot. Allahabad. (**Unit II,III**)
6. Manual of Methods in Fish Biology : S. P. Biswas.(**Unit II,IV**)
7. Manual in Fishery Science : K. R. Reddy and M. G. Babare. (**Unit II**)
8. Fishery technology – Balachandran (**Unit IV**)

B. Sc. Part II

FISHERY PRACTICAL-I

Marks-50 (Credits: 02)

Course Objectives: Student will able to

1. Study the Fin fish & shell fish by studying morphological peculiarities.
2. Identify types of paired and unpaired fins, types of scales, types of swim bladder and their function.
3. Dissect out digestive system, Heart and major blood vessels in fish.

4. Identify different type of fishing crafts and gears and economically important shell and fin fishes.

Credits (Total Credit 04)	SEMESTER-III BZFP303 PRACTICAL-I (Based on Biology and inland fisheries).	No. of hours per unit/credits
	Group A:	
	I. Taxonomy of fin fishes; Classification of the following fishes up to families: 1. Scoliodon, Pristis, Torpedo, Chimaera, Polypterus, 2. Acipenser, Amia, Lepidosteus, Harpodon, Eel, 3. Labeo, Clarias, Exocoetus, Hippocampus, Ophiocephalus, 4. Anabas, Pleuronectes, Echeneis, Tetradon and Antennarius.	
	II. Taxonomy of shell fishes: 5. Crustacea: Prawn, lobster and crab. 6. Mollusca: Unio, Pearl oyster and Sepia.	
	III. Morphology 7. Morphology of Scoliodon 8. Morphology of Labeo.	
	IV. Study of Fin: 9. Paired fins: Pectoral and pelvic fins 10. Unpaired fins: Dorsal, ventral and different types of caudal fins	
	Group B:	
	V. Mounting of the following scales: 11. Placoid 12. Cycloid and Ctenoid scales	
	VI. Study of different types of swim bladders: 13. Physostomous & Physoclistous	
	VII. Dissection of Catla, Mrigal or Cyprinus (Demonstration): 14. Digestive system 15. Heart and major blood vessels. (Demonstration) 16. Brain	
	VIII. Study of Crafts and Gears: 17. Crafts – i. Raft. ii. Catamaran. iii. Dugout canoe. iv. Trawler 18. Gears – i. Cast net. ii. Gill net. iii. Rampani net iv. Trawl net.	
	IX. Economic importance of the following: 19. Prawn, Oyster, Bivalve, Scoliodon, 20. Pomphret, Harpadon, Sardine, Labeo. X. Visit to fish market	
	XI. Project related to economics of local fish market / survey of fish market / fish by-products [Note: Sketches, Specimen/photographs may be used]	

Course Outcomes: Student should be able to

1. Identify the Fin fish & shell fish by studying morphological peculiarities

2. Explain different types of paired and unpaired fins and their functions, different types of scales, their microscopic structure, function & importance in taxonomy, different types of swim bladder and function.
3. Determine Digestive system, Heart and major blood vessels, Brain by demonstration method.
4. Develop knowledge about different type of fishing crafts and gears, economically important shell and fin fish and economics of different fishes in fish market.

References:

1. Vertebrate Zoology- R.L. Kotpal
2. Vertebrate Zoology – P.S.Dhami&J.K.Dhami
3. Vertebrate Zoology – S.S. Lal
4. Practical Zoology Invertebrates – S.S. Lal
5. Practical zoology B.Sc. I – Mutkekar, Shinde
6. Handbook of Practical Zoology B.Sc.I - Jadhav
7. Practical Zoology Chordates- Verma & Agarwal
8. Practical methods in ecology and environmental science- R K Trivedy, P K Goel
C.L.Trisal
9. Techniques in Life sciences –D.B.Tembhare
10. Anatomy and Physiology of Fishes- Szantosh Kumar, ManjuTembhre
11. Chordates- H.V. Bhaskar
12. Chordate Zoology- E.L. Jordan & P.S. Verma

B. Sc. Part II Semester- IV

FISHERIES

COURSE -III

BZFT- 401 (FISH PHYSIOLOGY I)

Theory: 36 hrs. (45 lectures of 48 minutes)

Marks-50 (Credits: 02)

Course Objectives: Student will able to

1. Learn about physiology of nutrition and respiration in fish.
2. Impart knowledge about physiology of circulation and excretion in freshwater and marine water fishes.
3. Get knowledge of modes of reproduction and different maturity stages in gonads of fishes.
4. Study about importance of different sense organs as well as amazing organ in fishes.

Credits (Total Credits 2)	SEMESTER-IV BZFT- 401 (FISH PHYSIOLOGY I)	No. of hours per unit/credits
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UNIT - I	1. Nutrition: 1.1 Food and Feeding. 1.2 Physiology of digestion. 1.3 Teeth: - Types and function. 1.4 Gill Rakers: -structure, types and function. 1.5 Alimentary canal:- alimentary canal of herbivorous and carnivorous fish	(06)
	2. Respiration: 2.1 Types of gills. 2.2 Mechanism of respiration. 2.3 Accessory respiratory organs- Anabas, Clarias and Saccobranchus.	(07)
UNIT - II	3. Circulation: 3.1 Composition and functions of blood 3.2 Structure of heart in Scoliodon and Labeo 3.3 Mechanism of circulation in Scoliodon and Labeo	(06)
	4. Excretion: 4.1 Osmoregulation in freshwater, marine and diadromous fishes. 4.2 Structure and function of kidney. 4.3 Excretory function of gills	(06)
UNIT - III	5. Reproduction: 5.1 Modes of Reproduction: Oviparity, Viviparity, Ovo-viviparity and Hermaphroditism. 5.2 Maturity stages in gonads: i) Resting phase (immature) ii) Early maturing phase. iii) Advanced maturing phase. iv) Matured phase. v) Spawning phase vi) Spent phase.	(07)
UNIT - IV	6. Sense organs: 6.1 Olfactory Organs: 6.2 Taste buds. 6.3 Eye. 6.4 Membranous labyrinth. 6.5 Lateral line system. 6.6 Ampullae of Lorenzini. 6.7 Weberian ossicles.	(08)
	7. Amazing organs in fishes: 7.1 Electric organs in fishes 8. Bioluminescence in fishes 9. Venomous and Non-venomous fishes	(05)

Course Outcomes: Student should be able to

1. Recall physiology of nutrition and respiration and gain knowledge of accessory respiratory organs.
2. Summarize physiology of circulation and excretion.
3. Determine different modes of reproduction and different maturity stages in gonads of fishes.

4. Build the knowledge regarding importance of different sense organs and also structure and function of different amazing organs in fishes.

References :

1. Textbook of Fish Culture: Breeding and Cultivation of Fish. Mare. Huet. (Unit III)
2. An Introduction to Fishes: S. S. Khanna. Central Book Depot. Allahabad. (Unit I,II,III,IV)
3. Textbook of Fish Culture: Breeding and Cultivation of Fish. Mare. Huet. (Unit III)
4. Fish and Fisheries- Pandey & Shukla (Unit I,II,III,IV)
5. Manual in Fishery Science: K. R. Reddy and M. G. Babare (Unit IV)
6. Manual of Methods in Fish Biology: S. P. Biswas. (Unit I,II,III)

B. Sc. Part II Semester- IV

FISHERIES

Paper-IV

BZFT- 402 (AQUACULTURE)

Theory: 36 hrs. (45 lectures of 48 minutes)

Marks-50 (Credits: 02)

Course Objectives: Student will able to

1. Study definition, scope, history of aquaculture, its origin and growth and able to compare aquaculture with agriculture at national and global level as well as to impart knowledge of types of aquaculture.
2. Gain the knowledge regarding pre-requisite of site selection and ideal layout of fish farm.
3. Learn about physico-chemical parameters of water bodies and criteria for selection of major species of fish for aquaculture.
4. Aware of different type of plankton and its importance and to give knowledge of construction and setting of an aquarium.

Credits (Total Credits 2)	SEMESTER-IV BZFT- 402 (AQUACULTURE)	No. of hours per unit/credits
UNIT - I	1. Introduction to Aquaculture: 1.1 Basic Aquaculture- Definition and scope. 1.2 History of Aquaculture- Origin and growth. 1.3 Present national and global scenario. 1.4 Comparison of aquaculture and agriculture.	(05)

	2. Types of aquaculture: 2.1 Semi Intensive, Intensive and Extensive aquaculture. 2.2 Pond culture. 2.3 Pen and cage culture. 2.4 Running water culture.	(07)
UNIT - II	3. Prerequisites of site selection 3.1 Topography 3.2 Soil type. 3.3 Water supply.	(04)
	4. Layout of Fish farm: 4.1 Types of ponds. 4.2 Construction of pond. 4.3 Nutrient cycles in culture ponds – Phosphorus, Carbon and Nitrogen. 4.4 Concepts of Productivity, estimation and improvement of productivity in ponds.	(04)
UNIT - III	5. Physico- chemical conditions of fish pond: 5.1 Physical conditions: Depth, Temperature, Turbidity, Light. 5.2 Chemical conditions: Oxygen, Carbon dioxide, PH , Organic and inorganic contents.	(07)
	6. Criteria for selection of aquaculture species.	(03)
	7. Major species of fishes for freshwater aquaculture.	(03)
UNIT - IV	8. Freshwater Plankton: 8.1 Definition and classification 8.2 Morphological study of : a) Phyto- plankton b) Zoo-plankton 8.3 Importance of plankton	(06)
	9. Aquarium Fishery: 9.1 Setting of an aquarium. 9.2 Common aquarium fishes: a) Angel fish. b) Gold fish. c) Guppy fish. d) Gourami. e) Swordtail Fish. f) Molly g) Koi etc. 9.3 Breeding of aquarium fish 9.4 Maintenance	(06)

Course Outcomes: Student should be able to

1. Define scope, history of aquaculture, its origin and growth and to compare aquaculture with agriculture at national and global level.
2. Interpret the knowledge regarding pre-requisite of site selection, the layout, construction of fish farm and type of ponds
3. Analyze about physico-chemical parameters of water bodies and different criteria for selection of major species of fish for aquaculture.
4. Develop the knowledge to identify different type of plankton as well as setting of aquarium and rearing different type of an aquarium fish.

References:

1. Fish and Fisheries of India : V. G. Jhingran. Hindustan Publication Corp. (India), Delhi. **(Unit I,II,III)**
2. Tropical Fish Farming : D. K. Belsare. Environmental Publi. Karad, Maharashtra. **(Unit I)**
3. Text Book of Aquaculture. M. S. Reddy **(Unit I)**
4. Freshwater Fish Pond Culture and Management. M. Chakrof.9 **(Unit II, III)**
5. A Handbook of Fish Farming : S. C. Agarwal, Narendra Publication House, Delhi **(Unit II,III)**
6. Encyclopaedia of Fishes and Fisheries of India. A. K. Pandey. G. S. Sandhu Vol. IV. Anmol Publi. New Delhi **(Unit II, III)**
7. Methods of Physical and Chemical Analysis of Water :Gotterman et.al. **(Unit III)**
8. An Introduction to Fishes : S. S. Khanna. Central Book Depot. Allahabad. **(Unit IV)**
9. Planktonology by kuby **(Unit IV)**
10. Aquarium System : 1981 : A. D. Hawkins. Academic Press. **(Unit IV)**
11. Aquarium Fishes and Plants : K. Bajaj and R. Zokal Himalayan Publication. **(Unit IV)**
12. Freshwater Aquarium : J. A. Dawas. Robert Royce. Ltd. **(Unit IV)**

B. Sc. Part II

BZFP 403

FISHERY PRACTICAL-II

Marks-50 (Credits: 02)

Course Objectives: Student will able to

1. Carry out estimation of physicochemical properties and primary productivity of water sample as well as estimation of total glycogen, protein and lipid from fish organ.
2. Gain knowledge regarding accessory respiratory organ in different fishes and Weberian ossicles.
3. Evaluate quantitative & qualitative estimation of zoo-plankton, different stages of life cycle in Labeo.
4. Design aquarium tank and carry out setting of aquarium and rearing of different types of aquarium fishes.

Credits (Total Credit 04)	SEMESTER-III BZFP303 PRACTICAL-II (Based on Fish Physiology and Aquaculture)	No. of hours per unit/credits
	Group A:	

	I. Estimation of the following chemical factors from water sample. 1. Dissolved oxygen. 2. Free carbon dioxide. 3. Alkalinity 4. Hardness	
	II. Determination: 5. Determination of primary productivity	
	III. Estimation of: 6.Total glycogen in fish organ 7. Protein in fish organ 8.Lipid in fish organ	
	IV. Demonstration of accessory respiratory organs in: 9. Anabas 10. Clarias. 11. Saccobranchus	
	V. Study of amazing organs in fish: 12. Electric organ in fish Torpedo 13. Bioluminescence in fish Antennarius 14. Venomous & non- venomous fish Puffer	
	Group B:	
	VI. Demonstration of: 12. Weberian ossicles	
	VII. Study of planktons: 13. Quantitative estimation of plankton 14. Qualitative estimation of zooplankton	
	VIII. Study of life cycle in Labeo- 15. Egg and sperms, fertilized egg, hatchling, fry, fingerling and adults	
	IX. Aquarium fishery: 16. Demonstration of tank fabrication 17. Setting of an aquarium 18. Aquarium fishes: i) Angel. ii) Gold fish iii) Guppy iv) Gouramy v) Molly vi) Swordtail fish vii) Koi	
	X. Visit to fish seed production center/Visit to aquarium shop	

Course outcomes-Students should be able to

1. Perform estimation of Dissolved oxygen, Free carbon dioxide, Alkalinity, Hardness of water samples, primary productivity of the water body, estimation of total glycogen in fish organ, protein in fish organ, lipid in fish organ.
2. Demonstrate accessory respiratory organ in different fishes and Weberian ossicles.
3. Analyze quantitative & qualitative estimation of zoo-plankton, different stages of life cycle in Labeo.
4. Generate the knowledge regarding construction of aquarium, setting of aquarium and rearing of different types of aquarium fishes and learns different type of activities carried out at fish seed production center during their educational tour.

References:

1. Vertebrate Zoology- R.L. Kotpal

2. Vertebrate Zoology – P.S.Dhami&J.K.Dhami
3. Vertebrate Zoology – S.S. Lal
4. Practical Zoology Invertebrates – S.S. Lal
5. Practical zoology B.Sc. I – Mutkekar, Shinde
6. Handbook of Practical Zoology B.Sc.I - Jadhav
7. Practical Zoology Chordates- Verma & Agarwal
8. Practical methods in ecology and environmental science- R K Trivedy, P K Goel
C.L.Trisal
9. Techniques in Life sciences –D.B.Tembhare
10. Anatomy and Physiology of Fishes- Szantosh Kumar, ManjuTembhre
11. Chordates- H.V. Bhaskar
12. Chordate Zoology- E.L. Jordan & P.S. Verma