GOVT. DIGVIJAY AUTO. P.G. COLLEGE RAJNANDGAON (C.G.)

Department of Zoology
B.Sc. FYUG/LOCF Pattern

B.Sc. Industrial Fish & Fisheries
Semester Pattern
I – VI Semester
2024 – 25

Syllabus for B.Sc. Industrial Fish & Fisheries Undergraduate Program

(Approved by Board of Studies)

Effective from July 2024-25

As Per provisions of NEP 2020 to be implemented from academic year 2022

GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE, RAJNANDGAON(C.G.)

Department of Zoology

FYUGP (CBES/LOCF Pattern)

B.Sc. Industrial Fish & Fisheries I to VIII SEM

Session 2024-25

Sem	Course	Course Name	Credit	Credits (L+P)	Internal Marks	ESE Max Marks	M.M.
I	DSC -I	Ichthyology (Fish Biology)	3	3+0	20	80	100
		Lab Course	1	0+1	-	-	50
II	DSC -II	Capture Fisheries (Inland & Marine)	3	3+0	20	80	100
		Lab Course	1	0+1	-	-	50
III	DSC -III	Fresh water aquaculture	3	3+0	20	80	100
		Lab Course	1	0+1	-	-	50
IV	DSC -IV	Fish Breeding & Hatchery Technology	3	3+0	20	80	100
		Lab Course	1	0+1	-	-	50
V	DSC- V	Fish Pathology & Post harvest Technology	3	3+0	20	80	100
		Lab Course	1	0+1	-	-	50
VI	DSC –VI	Construction & Management of Aquarium	3	3+0	20	80	100
		Lab Course	1	0+1	-	-	50
VII	DSC –VI	Fishery Economics & Extension	3	3+0	20	80	100
		Lab Course	1	0+1	-	-	50
VIII	DSC –VI	Fish Genetics & Biotechnology	3	3+0	20	80	100
		Lab Course	1	0+1	-	-	50

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GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNADGAON (C.G.)

FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2024-25	**Program: B.Sc.**
Semester: I	**Subject: Industrial Fish & Fisheries**
Course type: DSC- I	**Course Code:**
Course Title : Fish Biology (Ichthyology)	
Credit: 04 (03+01)	**Lecture – 60 (45+15)**
MM: 100 = (ESE 80+IA 20)	**Minimum Passing Marks: 40%**

Title	**Fish Biology (Ichthyology)**
Course Learning Outcome:	• This syllabus provide basic information about the diversity and classification of Fishes. • To study the different Organs system. • To study Physiology of Fishes.
Program Specific Outcome:	• Students gain knowledge about the basics of Fish classification. • They acquire knowledge about structure & function of Fishes. • They acquire knowledge of Fish Morphology, Anatomy and Physiology.

Unit	Lectures	Topics	Credits
I	10	**Classification** 1.Class - Elasmobranchii 2.Class - Holocephali 3.Class - Dipnoi 4.Class –Teleostomi	0.75
II	10	1. Integument of Fishes, its structure and function. 2. Scales in Fishes. 3. Coloration in fishes. 4. Fins in fishes. 5. Locomotion in Fishes.	0.75
III	10	1. Alimentary canal Digestion: Food, feeding habits, seasonal fluctuation of food. Alimentary canal of Clarias batrachus, Modification of alimentary canal & digestion. 2. Cardio vascular system structure and Physiology of the heart, arterial & venous system. 3. Structure & Function of Gills. 4. Accessory respiratory organ. 5. Swim bladder –Structure and function.	0.75
IV	15	1. Nervous system – Structure of Brain & Cranial Nerve. 2. The sense organ -Eye, Internal Ear, Electric Organs, Lateral line system. 3. Excretory system of Fishes. 4. Osmoregulation in freshwater fishes and marine water fishes. 5. Endocrine Glands in Fishes.	0.75
Lab course	15	1. Visual aids/ display/ model of a. Nervous system of Scholidon b. Digestive and urinogenital system of any Carp Fish. c. Afferent and efferent branchial vessels of any common teleost/ Elasmobranch d. Accessory respiratory organ of *Clarias batrachus, Heteropneustes*	01

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		fossilis, *Anabas sp.*, *Channa sp.* e. Internal ear and cranial nerves of teleost. 2. Study of Museum Specimens. 3. Study of Permanent Slides (Anatomy, Histology & Endocrine Glands). 4. Skeleton system of fishes. 5. Permanent slide preparation:- Students are to familiar in to the basic principle of narcotisation, fixation, staining, dehydration and mounting of Cycloid and ctenoid scale, daphnia, cyclops, mysis. 6. Qualitative and quantitative estimation of stomach content of clarias/ Channa sp. 7. Age determination by scale method. 8. Temporary mounting of Fish Scales. 9. Study of Accessory respiratory organ of Fishes. 10. Study of Swim bladder in fishes. 11. Field study:- Students are to visit any water bodies or fish farm. They are to observe fishing and collecting field data regarding species composition, crafts and gears and field problems. 12. Submission of field report giving analysis of data, drawing of graph, Photograph etc.indicating their distribution and duly certified by the concerned teacher guide.	
Recommended Books		1. Fish Morphology: Horizon of new research by-J.S. Datta & H.N. Dutta. 2. A text Book of Fishery Science & Indian Fisheries by - C.B.L. Shrivastava. 3. Encyclopedia of Fishes & Fisheries of India by- A.K. Pandey & G.S. Sandhu. 4. A text Book of Fish Biology & Fisheries by -S.S. Khanna & H.R. Singh. 5. An Introduction to Fishes - G. Singh & H. Bhaskar. 6. A Textbook of Fish Biology & Fisheries.	

Evaluation Scheme

Evaluation Scheme	Sections in Question Paper	Question type	Word Limit	No. of Questions	Marks per Question	Total
External	A	Very Short answer type	50	8	2	16
	B	Short answer type	100	4	6	24
	C	Long answer type	200	4	10	40
Internal	**Based on CT & Assignment/Project**					20
	Total =					50

Evaluation Scheme of Practical

Practical	Experiment 01	12
	Experiment 02	08
	Experiment 03	04
	Spotting	16
	Viva	05
	Sessional	05
Total -		**50**

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GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNADGAON (C.G.)

FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2024-25	**Program: B.Sc.**
Semester: II	**Subject: Industrial Fish & Fisheries**
Course type: DSC- II	**Course Code:**
Course Title : Capture fisheries Inland & Marine	
Credit: 04 (03+01)	**Lecture – 60 (45+15)**
MM: 100 = (ESE 80+IA 20)	**Minimum Passing Marks: 40%**

Title	**Capture fisheries Inland & Marine**
Course Learning Outcome:	This syllabus contains information about • The Capture fisheries of India Inland. • Marine capture fisheries of India. • Fish Harvesting and Preservation. • Marine water culture.
Program Specific Outcome:	• Students will acquire knowledge about Inland and Marine capture fisheries of India. • Coastal Fisheries of India. • Harvesting and post harvesting techniques in Fisheries.

Unit	Lectures	Topics	Credits
I	10	**Inland capture fisheries of India** 1. Riverine fisheries: Different Riverine systems in India and their fishery, Problems and management. 2. Reservoir Fisheries – Types of Reservoirs Major, Medium and Minor Different reservoirs of river systems in India. 3. Estuarine fisheries – Definition of an estuary. Origin and classification. Different estuaries in India.	0.75
II	10	**Marine capture fisheries of India** 1. The E.E. Z. concept and its implementation. 2. Coastal Fisheries 3. Pelagic Fisheries- Oil sardines , Mackerels ,Ribbon fishes ,Lesser sardines. 4. Demersal Fisheries: Fisheries of Bombay duck & flat fishes.	0.75
III	10	1. Lacustrine Fisheries- Lakes and reservoirs; development of reservoir fisheries. 2. Brackish Water Fisheries. 3. Non Fish organism fisheries:-Prawn, Crab, Lobsters, and clams. 4. Pearl oysters	0.75
IV	15	1. Fishing Craft and gears. 2. Fish Harvesting.(Unconventional fishing method (Electro fishing ,Light fishing, Eco-sounder and sonar) 3. Handing, Spoilage, Preservation and Transportation of fresh fish. 4. Over fishing	0.75
DSC-Lab course	15	1. Identification, classification and commercial importance of following fishes. i) Sardine ii) Mackeral iii) Bombay duck iv) Sole fish v) Pomfret vi) Ribbon fish vii) Hilsa viii) Mugil	01

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		2. Identification, classification and commercial importance of following Non fish organisms i) *Penaeus indices* ii) *Penaeus monodon* iii) Edible oyster iv) Pearl oyster v) Sepia vi) Loligo vii) Chanks. viii) Mytilus 4. Identification penaeid and non penaeid prawns with sex. 5. Estimation of fish fecundity. 6. Identification of seeds of cultivable fish species. 7. Study of Traditional Fishing Methods. 8. Study of Fishing craft & gears used by Local Fisherman. 9. Study of Fish preservation methods. 10. Field visits to observe fishing and collect field data regarding species composition, Morphometric and Meristic characters of all fisheries. 11. Fish market survey – Detailed report on fish fauna available in local market. 12. Extension work – preparation of charts, posters, flashcards displaying different aspects of fisheries. 13. Study of socio-economic status of fishermen community.	
Recommended Books		1. A Text book of Fish, Fisheries & Technology by- K.P. Biswas. 2. Fresh Water Aquaculture by Dr. Radheshyam & Dr. S. Ayyapan. 3. Fish Morphology: Horizon of new research by- J.S. Datta & H.N. Dutta. 4. A text Book of Fishery Science & Indian Fisheries by - C.B.L. Shrivastava. 5. Encyclopedia of Fishes & Fisheries of India by- A.K. Pandey & G.S. Sandhu. 6. A text Book of Fish Biology & Fisheries by -S.S. Khanna & H.R. Singh. 7. An Introduction to Fishes - G. Singh & H. Bhaskar. 8. Freshwater Aquaculture by - R.K. Rath.	

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Evaluation Scheme of Practical

Practical	Experiment 01	12
	Experiment 02	08
	Experiment 03	04
	Spotting	16
	Viva	05
	Sessional	05
Total -		**50**

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GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNADGAON (C.G.)

FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2024-25	**Program: B.Sc.**
Semester: III	**Subject: Industrial Fish & Fisheries**
Course type: DSC- III	**Course Code:**
Course Title : Fresh water aquaculture	
Credit: 04 (03+01)	**Lecture – 60 (45+15)**
MM: 100 = (ESE 80+IA 20)	**Minimum Passing Marks: 40%**

Title	**Fresh water aquaculture**
Course Learning Outcome:	This syllabus contains information about the Fresh water aquaculture.
Program Specific Outcome:	Students will acquire knowledge about Inland and Marine capture fisheries of India, Coastal Fisheries of India, harvesting and post harvesting techniques.

Unit	Lectures	Topics	Credits
I	10	1. Definition and history of aquaculture, scope important status of aquaculture in different countries. 2. Importance of water in fish production, its physical & chemical parameters. 3. Importance of soil in aquaculture, important properties & type. 4. Preparation of fish form – principles of site selection for various kinds of fish form. 5. Control of weeds and algal blooms.	0.75
II	10	**Management of pond** 1. Liming and fertilization, Management of nutritive elements. 2. Control of predators and aquatic insects. 3. Reproduction and seed production. (A) Induced breeding (B) Bund breeding. (C) Hatchery methods – (Different types of hatcheries including Chinese hatchery) (D) Different stages of seed- spawn, fry & fingerlings. (E) Breeding of common carp. 4. Procurement of seeds, transportation and stocking, Post stocking management. 5. Preparation of nursery and rearing pond & their management.	0.75
III	10	**Aquaculture in fresh water** 1. Extensive, semi-intensive culture of Carp fishes. 2. Culture of air breathing fishes. 3. Cold water aquaculture. 4. Breeding and culture of fresh water prawn. 5. Carp culture and its importance.	0.75
IV	15	**Fish Feeding** 1. Characters and types of food.(Natural and artificial food) 2. Importance of nutritive elements of fish food. 3. Methods of food preparation. 4. Storing of fish food.	0.75
Lab course	15	1. Analysis of following parameters of water sample	01

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		(a) Dissolved oxygen(b) pH(c) CO(d) Alkalinity(e) Hardness 2. Preparation of culture ponds. 3. Morphological study of important culturable finfishes. 4. Morphological study of important culturable shellfish species. 5. Collection and identification of (a) Aquatic insects(b) Weeds (c) Local fishes 6. Formulation of fish feed using locally available ingredients. 7. Visit to different aquaculture systems. (a) Carp fish farm (b) Trout fish farm (c) Mahseer farm 8. Design and working of Hatcheries. 9. Identification of fish seed. 10. Packing of fish seed for stocking. 11. Preparation of charts/models of different aquaculture systems. 12. Visit to different hatcheries to observe breeding and hatching technology.	
Recommended Books		• A Text book of Fish, Fisheries & Technology by- K.P. Biswas. • Fresh Water Aquaculture by Dr. Radheshyam & Dr. S. Ayyapan. • Fish Morphology: Horizon of new research by-J.S. Datta & H.N. Dutta. • A text Book of Fishery Science & Indian Fisheries by - C.B.L. Shrivastava. • Encyclopedia of Fishes & Fisheries of India by- A.K. Pandey & G.S. Sandhu. • A text Book of Fish Biology & Fisheries by -S.S. Khanna & H.R. Singh. • An Introduction to Fishes - G. Singh & H. Bhaskar. • Freshwater Aquaculture by - R.K. Rath.	

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Evaluation Scheme of Practical

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	Experiment 02	08
	Experiment 03	04
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	Viva	05
	Sessional	05
Total -		**50**

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GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNADGAON (C.G.)

FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2024-25	**Program: B.Sc.**
Semester: IV	**Subject: Industrial Fish & Fisheries**
Course type: DSC- IV	**Course Code:**
Course Title : Fish Breeding and Hatchery Technology	
Credit: 04 (03+01)	**Lecture – 60 (45+15)**
MM: 100 = (ESE 80+IA 20)	**Minimum Passing Marks: 40%**

Title	**Fish Breeding and Hatchery Technology**
Course Learning Outcome:	Student Undersland the Brccding Biology of fishes, Methods of collection of fish secd, Inducсd brccding by hypophysation, Bundh Brecding Technology, Hatchery Management.
Program Specific Outcome:	Student can breed commercially important finfish and can setup his/her of hatchery.

Unit	Lectures	Topics	Credits
I	10	**Breeding Biology of fishes** • Sexual maturity and maturity stages among fishes. • Spawning and fecundity of fishes. • Fertilization and embryonic development • Hatching and larval development.	0.75
II	10	**Natural collection of fish seed** • Riverine seed resources of India. • Selection of seed collection site. • Methods of collection of fish seed. • Transportation of fish seed.	0.75
III	10	**Induced Breeding** • Brood stock maintenance • Induced breeding by hypophysation. • Synthetic hormones and new generation drugs used in induced • breeding. **Bundh Breeding Technology** • Bundh breedin,Types of bundhs(Dry bundh, Wet bundh, Modern bundh) • Breeding operation in bundhs. • Collections of egg and spawn from bhunds.	0.75
IV	15	**Hatchery Management** • Introduction to fish hatcheries- Traditional hatcheries Hatching • pits, Hatching happa • Chinese hatchery • Glass jar hatchery	0.75
Lab course	15	1. Study of different maturity stages of fishes from slides / charts. 2. Study of eggs of different species. 3. Study of spawn, fry and fingerlings 4. Morphological study of culturable fishes: : *Labeo* ,*Catla*, Cirrhina, *Chanos chanos*, Sea bass, *Clarius*, Anabus, Channa,	01

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		Heteropneustes fossilis 5. Design and working of (a) Seed collection nets (b)Brecding happa (c)Hatching happa 6.Non fish organisms - *P. indicus* , *P.monodon*, Crab 7.Study of phytoplankton and zooplanktons (Any 5) 8.Study of locally available feed ingredients (Any 5) 9. Formulation of fish feed. 10. Estimation of crude protein from feed ingredients and feed. 11. Estimation of lipid from feed ingredients and feed. 12. Estimation of carbohydrate from feed ingredients and feed. 13. Estimation of vitamin from feed ingredients and feed. 14. Collection and submission of locally available feed ingredients. 15. Submission of prepared fish feed. 16. Calculate per hector income of fish production from given data. 17. Design and working of hatcheries. 18. Field visits to different seed collection centers, bunds and Hatcheries. 19. Visit to fisheries co-operative society/ Fish market.	
Recommended Books		• Purdom.C.E. (1993) Genetics and Fish Breeding. • Chaltopadhyay .N. (2016) Induced Fish Brccding. • Shukla, A. N. (2014) Fish Brecding • Andrews. C. (2010) Guide to fish brecding Wedemneyer, G.A (2002) Fish Hatchery Management.	

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GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNADGAON (C.G.)

FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2024-25	**Program: B.Sc.**
Semester: V	**Subject: Industrial Fish & Fisheries**
Course type: DSC- V	**Course Code:**
Course Title : Fish Pathology & Post harvest Technology	
Credit: 04 (03+01)	**Lecture – 60 (45+15)**
MM: 100 = (ESE 80+IA 20)	**Minimum Passing Marks: 40%**

Title	**Fish Pathology & Post harvest Technology**
Course Learning Outcome:	• Understand the Fish pathology and its cure. • Acquire knowledge of different fish parasites affecting fish culture. • Creating Awareness on Seaweed culture. • Knowledge on Post harvest technology.
Program Specific Outcome:	• Student gain knowledge about Fish pathology. • Student gain knowledge of post harvest technology. • Student gain knowledge of Fish preservation technology.

Unit	**Lectures**	**Topics**	**Credits**
I	10	1. Fish Disease, its Type and affected Organs. 2. Morphology, Biology, Diagnosis, Prophylaxis and Treatment of disease caused by 1. Viral disease 2. Bacterial disease. 3. Fungal disease 4. Protozoan disease	0.75
II	10	1. Epizootic Ulcerative syndrome or EUS Diseases. 2. Worm parasites 3. Crustacean Parasites 4. Miscellaneous disease a) Stress b) Gas bubble disease c) Yolk coagulation disease. (White spot disease) d) Malformation & Tumors. e) Nutritional and intrinsic causes	0.75
III	10	**(Post Harvest technology)** 1. Biochemical Composition of Fish 2. Cause of Decomposition of fishes. 3. Handing, preservation and transportation of fresh fish. 4. Quality control and factory sanitation.	0.75
IV	15	**Fish Preservation Techniques** 1. Salt curing and drying of Fish. 2. Freezing preservation of Fish. 3. Canning preservation of Fish. 4. Modern techniques in Fish preservation. 5. Fish by product – Fish meal, Fish oil, Fish protein etc.	0.75

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Lab course	15	1. Identification of fish diseases/pathogen/parasites. 2. External & Internal examination of diseased finfish and shellfish. 3. Collection and Preservation of Diseased Fish. 4. Antibiotic sensitivity. 5. Staining methods of Preparation and sterilization of microbial media. Microorganisms. 6. Study of normal histopathology of gills, skins kidney, spleen, liver and related histopathology. 7. Preparation of stained blood film to study various types of blood cells of fishes. 8. Qualitative tests of functional groups in carbohydrates, proteins and lipids. 9. Paper chromatography of essential amino acids. 10. Quantitative estimation of water soluble protein following Lowry' Methods. 11. Enumeration of specific spoilage microbes from fish and fishery products. 12. Field visits to Fish feed production units of nearby. 13. Visit to fisheries co-operative society/ Fish market and make a survey report on post harvest traditional techniques. 14. Fish market survey – Detailed report on fish spoilage in local fish market. 15. Extension work – preparation of charts, posters, flashcards displaying different aspects of Fish pathology & post harvest technology. 16. Study of socio-economic status of fish farmer.	01
Recommended Books		• Srivastava, C.B.L (2006) A textbook of fishery science and Indian fisheries • Balachandran, K.K. (2002) Post Harvest Technology of Fish and Fish Products. • Jhingran, V.K. 1984 "Fish and Fisheries of India" • Parihar, R.K, 1994 "Fish Biology and Indian Fisheries"	

Evaluation Scheme

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GOVT. DIGVIJAY AUTONOMOUS PG COLLEGE RAJNADGAON (C.G.)

FYUGP (CBCS and LOCF Pattern)

Department of Zoology

Session: 2024-25	**Program: B.Sc.**
Semester: VI	**Subject: Industrial Fish & Fisheries**
Course type: DSC- VI	**Course Code:**
Course Title : Construction & Management of Aquarium	
Credit: 04 (03+01)	**Lecture – 60 (45+15)**
MM: 100 = (ESE 80+IA 20)	**Minimum Passing Marks: 40%**

Title	**Construction & Management of Aquarium**
Course Learning Outcome:	Student learns the Construction of Glass Aquarium, Ornamental fisheries, Décor, Setting of aquarium and its management.
Program Specific Outcome:	Student can construct glass aquarium and breed commercially important aquarium fish. after studies student can start their own cottage industry of aquarium.

Unit	Lectures	Topics	Credits
I	10	**Unit - I** • Introduction – Aquarium Fish keeping and role of aquarists. • Water and its management, N Cycle in the aquarium, Mulm and artificial light. • Aeration and its structure. • Filtration – Structure and different type of filters.	0.75
II	10	**Unit – II Fish keeping** • Setting of fresh water aquarium, post setting steps. • Construction of all glass aquarium tank bedding material for aquarium • Transporting and stocking of fresh water aquarium. • Tools and accessories used in aqua	0.75
III	10	**UNIT - III** • Decor. • Food, feed and feeding. • Breeding –Breeding tank, breeding habit. • Fish health and hygiene – stress and Alignment.	0.75
IV	15	**UNIT- IV** • Common aquarium plants, Morphology. • Marine aquaria and its management. • Marine ornamental Fishes • Fresh water ornamental Fishes. • Other ornamental organism – Sea - Anemone, Octopus, Star-fish etc.	0.75
Lab course	15	1. Glass cutting with the help of glass cutter. 2. Construction & Setting of Freshwater Glass aquarium of suitable size.(Maintained by students can be evaluated after one month) 3. Identification of aquarium plants. (10 species) 4. Study of live food organisms. 5. Water quality management in freshwater and marine aquariums 6. Morphological Study of Fresh water Ornamental fishes (Exotic-	01

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		Goldfish, Angel, Tiger barb, Sword tail, Fighter fish, Oscar. Indigenous- Dwarf Gourami, Indian glass fish, Zebra Danio, Y loach, Peacock eel, Rosy barb) 7. Morphological Study of ornamental organisms. a. Sea anemone b. Lobster c. Shrimp d. Star fish e. Corals 8. Identification, Design and working Aquarium accessories and equipments : a. Aerator b. Filter c. Heater and thermostat d. Hand net e. decors f. feeding equipments g. pumps h. lights 9. Breeding of egg layers(Gotd fish), live bearers (Guppy) and bubble nest builder (Gourami). 10. Omamental fish diseases and their diagnosis and treatment. Calculation of medicine/chemical treatment dosages. 11. Conditioning and packing of omamental fishes. 12. Visit to Aquarium cum Awareness centre. (Project). 13. Identification of aquarium Egg layers &Live Bearers fishes (any eight).	
Recommended Books		• Zaidi, S.G.S (2002) Ornamental fish culture • Mahapatra, B.K., Dutta S., Pailan, G.H.(2015) Ornamental Fish Breeding, Culture and Trade • Ahilan, B., Felix, N., Santham, R., (2008) A text book of Aquariculture • Dholakia A.D. (2010)Ornamental Fish culture and Aquarium Management • Srivastava, C.B.L (2006) A textbook of fishery science and Indian fisheries. • Mahapatra, B.K., Dutta S., Pailan, G.H.(2015) Ornamental Fish Breeding, Culture andTrade.	

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