M.Sc. Zoology

	Employability		Entrepreneurship		Skill Development

Name of the Programme	Course Code	Title of the Course	Employability	Entrepreneurship	Skill development
M.Sc. Zoology	PGZA	Animal Phylogeny and Biodiversity	✓		
	PGZB	Cell and Molecular Biology	✓		
	PGZC	Genetics	✓		
	PGZD	Micro Biology and Immunology	✓	✓	✓
	PGZG	Biochemistry, Bio Physic and Bio-Techniques	✓	✓	✓
	PGZH	Applied Biotechnology	✓	✓	✓
	PGZE1	Fishery Biology and Fish Processing Technology	✓	✓	✓
	PGZJ	Animal Physiology	✓		
	PGZK	Research Methodology	✓		✓
	PGZE2	Bioinformatics and Computer applications in Biology	✓	✓	✓
	PGZE4	Economic Entomology	✓	✓	✓
	PGZE5	Coastal Aquaculture	✓	✓	

Employability

Semester-II / Elective Course-I(CC)	Fishery Biology & Fish Processing	Course Code: PGZE1
Instruction Hours: 6	**Credits: 4**	**Exam Hours: 3**
Internal Marks:25	**External Marks:75**	**Total Marks: 100**

Cognitive Level	K-1 Acquire/Remember K2-Understand K3-Apply K-4 Analyze K-5 Evaluate K-6 Create	
Course Objectives	**Course Aims:** • To Learn the fish techniques of different fishes. • To learn the management strategy. • To know the fish processing technique. • To learn the induce breeding technique and fish pathology. • To study the fish population, growth and stock assessment	
UNIT	**Content**	**No. of Hours**
I	World and Indian Fisheries – Prosepects and Problems – Plans, Polices and Current Status of Indian Fisheries. Marine fisheries ; Sardines, Mackerels, Sciaenids, Ribbonfish, Silver bellies, Pomfrets, Carangids, Sharks, Shrimps, Prawns, Crabs, Lobsters, Mussels and Clams Inland fisheries ; Freshwater – riverine, reservoir, pond and cold water fisheries- Spawning and breeding habits of fishes.Estuarine and brackish water fisheries and their economics	18
II	Culture fisheries : Integrated fish farming technology – rice – cum – brackish water fisheries, rice-cum-common carp culture, fish –cum-duck culture, Sewage – fed	18

	fisheries – monosex culture – polyculture. Ornamental fish culture and its economics	
III	Fish Gears and Crafts used in South Indian Fisheires. Fish endocrinology – Induced breeding – technicques – examples. Fish Pathology : Parasites – Protozoan, fungal, bacterial, worms and arthropods	18
IV	Assessment of fish stocks : Marking and recapture method, area sampling method, biostatistical method, egg count method, hydroacoustic method, remote sensing. Age and Growth : Scale method, otolith method, other skeletal parts as age indicators, length – frequency method, length – weight relationship and condition factor. Population studies : estimation of population size, marking, tagging, population dynamics, population models.	18
V	Fish Processing and Preservation technology Salting, Icing, Sundrying, Smoking, Canning, Tinning, and Freezing techniques, Cold Storage, Brine water, brief account on transport and marketing. Lay out of Processing Plant - Factory Hygiene and Sanitation, Fish products and by products .	18

Text Books:

1. Khanna, S.S. and Singh, H.R. (3rd Edition, 2015). A Text book of Fish Biology and Fisheries. Narendra Publishing House. ISBN:9789384337117.

2. Handbook of Fisheries and Aquaculture (2017). Publisher:ICAR. ISBN-10-9788171641062; ISBN-13:978-8171641062.

3. Arumugam,N (2014). Aquaculture and Fisheries. Saras Publication.ISBN-10:9382459995; ISBN-13:978-9382459996

4. BISWAS, S.P., (1993) Manual of Methods in Fish Biology, International Book Co., Absecon Highlands, New Jersey.

5. JHINGRAN, V.G., (1991) Fish and Fisheries of India. Hindustan Publishing Copr., New Delhi.

6. PILLAI, T.V.R. (1993) Aquaculture : Principles and Practices. Fishing News Agency,

London.

7. AGARWAL, S.C. 2006. History of IndianFisheries. Daya publication.

8. SRIVASTAVA, C.B.L. A Text Book of Fishery science and IndianFisheries. Kitab Mahal Publishers.

Reference Books :

1. Bhardwaj,K.D. (2011)Modern Technique in Fish Handling and Processing. Cyber Tech Publications. ISBN-108178846896 ; ISBN-13 :978-8178846897.

2. Krishnaveni,G. and VeerabhdraRao,N. and Veeranjaneyulu, K.(2016) Récent Technologies in Fish and Fisheries. Rigi publication. ISBN-10 :9384314587 ; ISBN-13 :978-9384314583.

3. Bernard A. Megrey. (2nd Edition,2009) Computers in FisheriesResearch. Publisher : Springer. ISBN-10 :1402086350 ; ISBN-13 :978-1402086359.

4. Sen,D.P.(2005) Advances in Fish ProcessingTechnology. Allied Publisher Pvt. Ltd. ISBN-10 :8177646559 ; ISBN-13 :978-8177646559.

5. Faridi,A.Z.,(2014) Text Book of Fish ProcessingTechnology.NehaPublisherspvt. Ltd., ISBN-10 :9350301792 ; ISBN-10 :978-3550301791.

6. Daniela Borda, Anca I Nicolau, Peter Rasper. (2017) Trends in Fish ProcessingTechnologies.CRCPress Taylor & Francis Group. ISBN : 9781498729178.

7. Bose, A.N., Yang, C.T., And Mishra, A. (1991) Coastal Aquaculture Engineering. Oxford and IBH Publishing Co., PVt. Ltd., New Delhi.

8. Chakrabarti N.M., (1994) Diseases of Cultivable Freshwater Fishes and Their Control. International Books and PeriodicalsSupply service, New Delhi.

9. Day, F., (1986) The Fishes of India, Vols., I & II. Today and Tomorrow's Book Agency, New Delhi.

10. Govindan, T.K. (1992) Fish processing Technology, Oxford and IBH Publishing Co., Pvt. Ltd., New Delhi.

11. MPEDA Hand book of Aquafarming (1992) Freshwater Fishes, Marine Products Export Development Agency, Kochi.

12. New, M.B., Tacon., A.G.J., and CSAVAS., I. (1993) Farm – made – Aqua feeds. Food and AgrilcultureOrganization of United nations, Rome.

13. Santhanam, R., (1990) Fisheries Science, Daya Publishing House, New Delhi.

14. Seghal, K.K. (1992) Recent Researches in Cold Water Fisheries, Today and Tomorrow's Pbulishers and Printers, New Delhi.

15. Sinha, V.R.P. (1993) A Compendium of Aquaculture Technologies for Developing Countries. Center for Science and Technology and Oxford and IBH Publishing Co., Pvt., Ltd., New Delhi.

16. SubbhaRao (1986) Economics of Fisheries, Daya Publishing House, New Delhi.

17. Trivedi, K.K. (186) Fisheries Development: 2000 A.D. Association of Indian Fishery Industries and Oxford and IBH Publishing Co., Pvt. Ltd., New Delhi.

18. Uma Sharma., & Grover, S.P., (1982), An Introduction to Indian Fisheries, Bishen Singh Mahendra Pal Singh, Dehra Dun. Prediction

19. Rajagopalasamy, C.B.T &Velayutham, P. 1999. Quality control of Fish and Fishery products

Web Resources:

https://nios.ac.in/media/documents/srsec314newE/PDFEL34B.pdf

http://www.msewell.weebly.com/uploads/7/0/4/5/70453749/6_-_marine_fishes.pdf

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Course Outcome

On completion of the Course, Students should be able to

CO1:Understand the fish techniques of different fishes.

CO2:Understand and familiarized with construction of pond and its   management strategy.

CO3:Hands on training in fish processing technique.

CO4:Familiarize with Induced breeding

CO5:Job offer: Self employment, Entrepreneur, Executive in fish products,   Aquarist, Research Assistant in Fisheries university and Research   centre, MPEDA, RGCA, CIBA, CMFRI

Mapping of COs with POs & PSOs

CO/PO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	M	S	S	M	S	S	M	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	M	S	M	M	S
CO4	S	S	M	M	M	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

S- Strongly Correlated

M-Moderately Correlated

W-Weakly Correlated

N-No Correlation

Semester-IV / Elective Course- v (CC)	Coastal Aquaculture	Course Code: PGZE5
Instruction Hours: 6	Credits: 4	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	K-1 Acquire/Remember K2-Understand K3-Apply K-4 Analyze K-5 Evaluate K-6 Create	
Course Objectives	**Course Aims:** • To know the criteria for selecting suitable site for aquaculture • Familiar with the major cultivable species • Hands on training in fish culture • Understand the physio chemical parameter maintenance in aquaculture • To know the coastal zone management legal issues and government policies	
UNIT	Content	No. of Hours
I	Coastal Aquaculture : Definition, overview, status and importance. Criteria of selecting suitable site for aquaculture – fundamentals of survey, designing and lay out of aquaculture ponds. Seaweed Culture and major cultivable species of seaweeds	18
II	Biology of fin and shellfishes : freshwater prawns – shrimps – molluscs – fishes. Culture techniques – Traditional. extensive, modified extensive, semi intensive, intensive and super	18

	intensive. mono and poly culture, integrated and organic farming. Open sea farming – raceways – cages – pens – rafts – racks		
III	Shellfish Culture :Shrimps,prawns,crabs, fattening of crabs,lobsters,oysters,mussels and cephalopods. Fish Culture : Milk fish,mullets, Asian sea bass	18	
IV	Hatchery techniques – induced maturation and spawning – natural seed resources – hatchery production of fin and shellfish seeds. Farm management – Water quality management – Temperature – salinity – dissolved oxygen – pH – hardness – nutrients – ammonia – hydrogen sulphide. Feed management – feed ration – feeding schedule – feed broadcasting – partial feeding – feed acceptance – types of feeds – live and formulated feeds	18	
V	Health management – disease diagnosis and treatment – prophylactic measures – probiotics – immunostimulants Role of R & D institutions . Coastal zone management – legal issues – Government policies – Aquaculture Authority of India	18	

Text Books:

1. V.B.SAKHARE . Reservoir fisheries and Ecology – MangalamPublications,L-21/1.St.No.5,Shivaji margnear Kali Mandir,Delhi-53.

2. A.C.LORG.Fish feeding and Integrated fish farming,Cyber Tech Publications, New Delhi.

Reference Books:

1. BARDACH, J.E., J.H.RYTHER & W.O. MCLARNEY- Aquaculture, Wiley-Inter Science, 1972.

2. HUET, M & J. TIMMERMANS: Text Book of fish culture: Breeding and cultivation of fish, 2nd ed., fishing News Book Ltd., 1986.

3. PILLAY T.V.R. Aquaculture Principles and Practices, Fishing News Books, 1981.

4. ROBERT, R.STICKNEY. Principles of Aquaculture, John wiley& Sons Inc. 1984.

5. SANTANAM R, N. RAMANATHAM & G. JAGATHESAN. Coastal Aquaculture, CBS Publishers and Distributors, 1990

6. IMAI T. Aquaculture in shallow seas, Amerind Pub. Co.,1977.

7. JHINGRAN V.G . Fish and Fisheries of India,Hindustan Pub. corp., 1982.

8. MILNE P.H. Fish & Shellfish farming in Coastal waters, FNB Ltd., 1972.

9.SRIVASTA.C.B. Fisheries Science And Indian Fishery- KitalMahal 22A- Sangai Nadu, Allahabad.

10.VENKATARAMANUJAM,N.RAMANATHAN . Introduction to Fishery Science-Janshi Publications 11-A. PalayamkottaiRoad.Tuticorin – 628 008.

11.SHAMMI.Q.J. BHATINAGAR.A.S. Applied fisheries – UpdeshPurohit for agrobios(Indian), Jodhpur.

12.YADAV.B.N. Fish and Fisheries – Daya Publishing house

13. ROUNSEFELL .G.A.HAMYEVERHART .Fishery Science. Method & Application – International Books & Periodicals supply services.

14. KURIAN.C.V. SEBATIAN.V.O. Prawns and Prawn fisheries of India. Hindustan Publishing corporation – Delhi.

15. SHAILENDRA GHOSH . Fisheries and aquaculture management – Adhyayan Publication & Distributors

Web Resources:

https://www.fao.org/3/t0697e/t0697e04.htm

https://nios.ac.in/media/documents/srsec314newE/PDFEL34B.pdf

Course Outcome

CO1: Understand the criteria for selecting species, survey and design layout for aqua pond construction.

CO2: Study the biology of cultivable species and culture techniques..

CO3: Learn shell fishes and culture methods..

CO4: Skill develop for hatchery techniques and farm management.

CO5: Know the farm disease management, treatment and coastal zone managementcompletion of the Course, Students should be able to

Mapping of COs with POs & PSOs

CO/PO	PO					PSO				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	M	S	S	M	S	S	S	M	S
CO4	S	S	S	S	S	S	M	S	M	S
CO5	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W-Weakly Correlated

N – No Correlation