SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus for B.Sc. III FISHERIES

(To be implemented from June 2010)

Paper III

Fishery Biology II Aquaculture Management, Fish Physiology II and Biostatistics

A) Lectures / contact hours / unit - 11
B) Contact hours / practical - 05

Section I

Fishery Biology II & Aquaculture Management

Objectives-

1) To impart knowledge is the basic aim of education. The students are expected to acquire the knowledge of animal science with reference to the anatomy and behaviour of different fisheries

2) Understanding the scientific terms, concepts, facts, phenomenon & their interrelationships with reference to fish farms, Aquaculture and its Management

3) To develop skills in practical work, experiments & laboratory materials, instruments. and Fish Physiology and Biostatistics for analyzing abilities to apply scientific methods, collection of scientific data, problem solving, organize science exhibitions, clubs etc, planning and data keeping for informatics

5) To develop interests in the fisheries science & scientific hobbies.

Sr No	UNIT number	TOPICS /SUB topics	No. of Lecturers
1	I	1. Type study - Prawn (Palaemon sp) i. Systematic position ii. Habits and habitat iii. External Morphology iv. Functional anatomy of: a) Digestive system b) Respiratory system c) Circulatory system d) Excretory system e) Nervous system and sense organs f) Reproductive system	10

2	II	2 A .Type study— Fresh water bivalve Functional anatomy of - a) Digestive system b) Respiratory system c) Excretory system d) Circulatory system e) Nervous system and sense organs f) Reproductive system and life cycle 2 B Fish seed trade and transport	8 3
	III	3 **A** **Fish farm Management :** Brood stock and hatchery management, nursery management,rearing, and stocking. 3 B Prawn culture: Stocking pond maintenance harvesting. 3 C Oyster culture (Edible and pearl).	**6** **3** **3**
4	IV	**4 A** Integrated fish farming and its economics. Fish farming with Agriculture: Rice cum fish culture i. Culturable species in rice fields ii. Rotational and simultaneous culture iii. Fish farming with live stock-Duck, Pig& cattle fish culture 4 B i) Sewage fed fisheries: ii) Culture of air breathing fishes. iii) Cold water fisheries (Mahaseer fish)	7 5
		TOTAL PERIODS	45

Section II

Fish Physiology II and Biostatistics

Sr No	UNIT number	TOPICS /SUB topics	No. of Lecturers
5	I	1. Study of endocrine glands A) Structure , role of hormones and their regulation with reference to: a) Pituitary gland b) Inter-renal gland	11

		c) Corpuscles of Stannius d) Gonads e) Hepatopancreas f) Thyroid gland	
6	II	**2. A** Ecological and hormonal influence on maturation and spawning. **2.B** Breeding in fishes: i Natural breeding . ii Induced breeding . iii Methods of obtaining eggs , spawn , fry and fingerlings from natural resources **2 C** Breeding of ornamental fishes **2 D) Biostatistics:** A) Classification. i. Definition ii Collection of data iii Basis of classification iv Types of classification	**2** **5** 2 2
	III	3 Biostatistics: A) Frequency distribution with examples. a) Principles b) Examples on grouped data c) Graphical representation i. Histogram for equal and unequal classes ii. Polygon and frequency curve iii. Ogive curves 3 B) Tabulation : a. Definition b. Requirements of good statistical table c. Parts of table d. Types of tabulation e. Examples on tabulation 3C) Measures of central tendency: Mean, Mode and Median. 3D) Dispersion: i. Mean deviation ii. Standard deviation	3 3 3 2
4	IV	4 A . Biostatistics: Correlation: i Scatter diagram ii Types of correlation iii Correlation coefficients - Spearman's rank correlation coefficient	4

		- Karl Pearson's correlation coefficient 4. B Bioinformatics: i. Study of computer and computer devices ii. Three levels of Bioinformatics in structural Biology iii. Applications of Bioinformatics in life sciences iv. Internet and web site	 2 2 3 1

Total periods: 45

Paper IV

Marine Ecology and Fisheries, Fish Pathology and Fishery Technology

Objectives-

1) To impart knowledge is the basic aim of education. The students are expected to acquire the knowledge of animal science with reference to the Marine Ecology and different Fisheries.

2) Understanding the scientific terms, concepts, facts, phenomenon & their interrelationships with reference to marine habitats its classifications.

3) To develop skills in practical work, experiments & laboratory materials, study of instruments.

4) Study different diseases of fishes and causes etc

5) To develop interests in the fisheries science & scientific hobbies: to study its economic and commercial importance

6) Fishery Technology with reference to gears and fish preservations.

Section I

A) Lectures / contact hours per unit - 11
B) Contact hours per practical - 05

Marine Ecology and Fisheries

Sr No	UNIT number	TOPICS /SUB topics	No. of Lecturers
1	I	1. Marine habitat A. Physical parameters B. Chemical parameters C. Classification of habitat	8

		2 Brackish water habitat fisheries: A) Definition of Brackish water B) Definition of estuary C) Types of estuary	4
2	II	3 Characteristics and fauna of : i. Rocky shore ii. Muddy shotre iii. Sandy shore iv. Types of fauna in estuary – Permanent and migratory v. Physico-chemical parameters of estuary	11
3	III	4.Study of fisheries A. Crustacean fisheries B. Molluscan fisheries C. Study of fisheries of commercial importance with respect to Bionomics, food, feeding and economic importance of : a. Mackerel b. Pomfret c. Bombay duck d. Sardine	12
4	IV	5.A Capture and culture fisheries: Milk fish, Tilapia, Perches, Anguilla, Hilsa,Asin sea bass and Mullet. 5 B. Oceanographic instruments: i. Grabs ii. Dredges iii. Sacchi disc iv. Water samplers v. Reversing and non reversing thermometers vi. Plankton net	**4** **6**

Total periods 45

Section II

Fish Pathology and Fishery Technology

Sr No	UNIT number	TOPICS /SUB topics	No. Lect
5	V	1. Fish spoilage: A) Criteria for freshness of fish B) Post mortem changes i. Rigor mortis ii. Bacterial spoilage	5

		iii. Chemical spoilage 2. Fish pathology: I) Signs of sickness and effects on fish II) Pathological procedure for diagnosis of fish diseases	6
6	VI	3 Fish pathology I) Aetiology, symptoms and control measures for the following: i. Viral diseases ii. Bacterial diseases iii. Fungal diseases iv. Protozoan diseases v. Epizootic ulcerative syndrome (EUS) vi. Worm diseases vii. Crustacean diseases	1
7	VII	**4 .** Fish preservation and processing techniques: Principles and methods with reference to- a. Refrigeration and freezing b. Drying c. Salting d. Smoking e. Canning	**1**
8	VIII	5 Fish products and byproducts: a. Fish body oil b. Fish liver oil c. Fish meal d. Isinglass e. Fish protein concentrate f. Fish glue g. Fish manure h. Surimi 6 Fishing gear technology: i. Materials used in fishing gears ii. Properties of fibers iii. Numbering system iv. Net making by braiding and cutting , mounting of webbing, rigging of various gears, principles of mending. knots, hitches and bends**.**	6 5

Total periods 45

Reference Books

1. **Ichthyology by Lagler, K.F.J.E.Bvardach and R.R. Miller**
2. **A History of fishes by Greenwood**
3. **Fishes : An introduction to Ichthyology by Moyle P.B. and J.J.Cech.**

4. **The Biology of fishes by KyleH.M.T. .FH. Publi**
5. **The life of fishes by Marshall N.B.**
6. **The marine and fresh water fishes of Ceylon by Munro**
7. **Inland fishes of India and adjacent countries (vol.I,II) by Talwar P.K.and A.G.Jhingran.**
8. **Commercial sea fishes of India byTalwar P.K. and R.K. Kacher**
9. **FAO species identification sheets for fishery purpose.Vol.I,II**
10. **Hand book of museum techniques by Aiyyappan A. and S.T. Satyamurthy.**
11. **Fisheries Ecology by Pitcher T.J. and P.J.T. Hart.**
12. **An introduction to the Pacific Fisheries. by Royce U.F.**
13. **Fish stock assessment : A manual of basic methods.**
14. **Manual of methods of fisheries biology, Pisciculture by Laevastu T.**
15. **Fisheries-Its methods and applications by Rounsfell G.A. and W.H. Everhart.**
16. **History of fishes by Norman**
17. **Manual of methods in fish biology by S.P. Biswas**
18. **Fish and fisheries by B.N. Yadav**
19. **The Cambridge Natural History by Himesh Shiploy**
20. **Proceedings of the symposium on living resources of the seas around India-CMFRI-1073**
    Spl. pub. Cochin
21. **Fish and fisheries of India. by Jhingran V.G.**
22. **Principles and practice of pond culture: A state of the art review. Lannan J.F. H.D. Smitherman and G. Tehobanglous(eds)1983, Oreggaon state University, U.S.A.**
23. **Giant prawn farming , New .M.B. (ed). Elsevier Scientific Publishing Co.Amsterdam.**
24. **Fresh water prawn farming :A manual of the culture of *M. rosenbergii*,New,M.B. and S. Sngholka, 1982, FAO , Fish. Tech. Pap. 225 FAO , Rome.**
25. **The biology and culture of Tilapias. Pull in R.S.V. and R.H. Lowe –Mcconel (Eds)**
26. **Standard methods for the examination of water and waste water APHA 1981, American public health association, Washington D.C.**

27. **Theory and practice of induced breeding in fish, by Harvey B.J. and W.S.Hoor , 1979, IDRC-TS . Ottawa, Canada.**
28. **Bivalve culture in Asia and Pacific , Davy, F.B. and M. Brahm(Eds), 1982, IDRC-200. IDRC Asia, Regional ofice , Singapore.**
29. **Fish and fisheries of India by Thingrajan V.G. , 1982, Hindustan Publishing Corporation, New Delhi.**
30. **General topics in fishery by Ravi Reddy, Mohan Babare, Ramrao patil.**
31. **Introduction to aquaculture - Mathew and Landew**
32. **Aquaculture – Rath**
33. **Fisheries technology - Balchandran**

B.Sc III Fisheries

Practical I

Sr No	UNIT number	TOPICS /SUB topics	No. of PRACTICALS
1	I	**1**. Dissection of Prawn a . Digestive system . b . Nervous system . c . Mountings . i Mouth parts ii Thoracic appendages iii Abdominal appendages iv Cornea v Statocyst 2 . Dissection of Bivalve . a . Digestive system b . Nervous system c . Observation of : i Gills ii Heart iii Glochidium larva	**4** 4
2	II	1. Identification of larval / life cycle stages of: a. Prawn / Shrimp b. Mytilus c. Fish 2. Identification of following: a. Weeds: Eichornia, Marcelia, Hydrilla, Pistia, Spirogyra. b. Weed fishes: Rasbora , *Puntius ticto* , and Tilapia c. Predatory fishes: Clarius, Anabas and Eel. d. Food and fertilizers: Lime, NPK fertilizers and fish meal. 3. Identification and histological study of following fish organs: a. Pituitary gland b. Testis c. Ovary d. Hepatopancreas	**2** **3** **1**
3	III	1. Examples based on Biostatistics: (Any ten as per syllbus) 2. **Bioinformatics** ;-Study of Computer and computer devices & peripherals input & out devices.Examples of	**3**

		bioinformatics in relation to nucleotides and amino acid sequences. 3. Estimation of sulphate , Phosphate and Nitrate from water sample. 4. Visit to fish farm to study management. Submission of tour report at the time of practical examination. 5. A suitable project related to subject should be carried out and report thereof be submitted at the time of practical examination .	**1** **2**

Practical II

Sr No	UNIT number	TOPICS /SUB topics	No. of PRACTICALS
1	I	1. 1 Analysis of gut contents in fish. 2. Estimation of fish blood chloride. 3. Total RBCs and WBCs counts. 4. Esimation of haemoglobin of fish.	**5**
2	II	5. Determination of fecundity 6. Determination of moisture content of fish. 7. Ovo- diamatery & study of stages of maturity. 8. Gonadosomatic index (GSI) and conditioning factor	**5**
3	III	9. Fish morphometry – Length-weight relationship 10. Study of Ecological adaptations of the following: a. Mytilus b. Echeneis c. Exocoetus d. Anguilla e. Pleuronectes 11. Study of oceanographic instruments. 12. Observations of mortality with respect to: a. Stocking density b. Use of different chemicals – LC 50 13. Study of Economic importance of:	**5**

		a. Bombay duck b. Mackerel c. Pomfret d. Sardine	
		14. Study of pathological condition of fish and treatment. a. Fin rot b. Argulus c. Nematode 15. Study of knots , hitches & bends. 16. Organoleptic tests for freshness of fish. 17. Visit to sea shore/ fish market / processing factories. A report of visit be submitted at the time of university practical examination.	**4**

Paper III & IV

Times Hours – 3

Section- I			
Q.1	**Multiple Choice Questions (Ten Questions)**		**Marks 10**
Q.2	**Long answer questions (Attempt any Two)**		
	A		**Marks 10**
	B		**Marks 10**
	C		**Marks 10**
Q.3	**Short Notes (Any Four Out of Six)**		**Marks 20**
	Section- II		
Q.4	**Multiple Choice Questions (Ten Questions)**		**Marks 10**
Q.5	**Long answer questions (Attempt any Two)**		
	A		**Marks 10**
	B		**Marks 10**
	C		**Marks 10**
Q.6	**Short Notes (Any Four Out of Six)**		**Marks 20**
	Total Marks -		**100**

Skeleton Paper for B.Sc. III FISHERIES

Practical Examination

Practical I

		Marks
Q1.	**Major Dissection**	**12**
Q2.	**Temporary Mounting**	**05**
Q3	**Ecological Experiment**	**06**
Q4	**Example on Biostatistics**	**07**
Q5.	**Identification (Five spots)**	**05**
Q6	**Project Report and Viva-voce**	**10**
Q7.	**Journal**	**05**
	Total	**50**

Practical II

Q1.	**Fecundity / ovo-diametry**	**06**
Q2.	**Estimation of blood chloride / total blood cell count**	**10**
Q3.	**Morphometry**	**05**
Q4.	**Gut content analysis of fish**	**07**
Q5.	**Identification (Five spots)**	**10**
Q6.	**Excursion report and viva voce**	**07**
Q7.	**Journal**	**05**
	Total	**50**

B.Sc. III FISHERIES

EQUIVALANCE TO OLD SYLLABII

OLD PAPER III- Fishery biology, Management and brackish water fishery.

NEW PAPER III - Fishery biology II , Aquaculture Management , fish physiology II and Biostatistics.

OLD PAPER IV- Marine ecology and fishery science.

NEW PAPER IV - **Marine ecology and fisheries , fish pathology and fishery technology**