पुणे विद्यापीठ

परिपत्रक क्र.२७८/ १९९०

विषय: अेम.अेस्सी.प्राणिशास्त्र अभ्यासक्रम.

विद्यापीठ अधिकार मंडळाच्या निर्णयानुसार सर्व संबंधितांच्या माहितीसाठी कळविण्यात येते की, अेम.अेस्सी.प्राणीशास्त्र साठी केलेला अभ्यासक्रम मान्य करण्यात आलेला आहे. परिशिष्ट "अ" मध्ये दिलेला सुधारित अभ्यासक्रम जून १९९१ पासून लागू करण्यात येईल.

मा.विभाग प्रमुख प्राणीशास्त्र विभाग, पुणे विद्यापीठ आणि ज्या ठिकाणी अेम.अेस्सी.प्राणीशास्त्र, पदव्युत्तर केंद्राचे विभाग प्रमुख यांना विनंती की, त्यांनी या परिपत्रकाचा आशय सर्व संबंधित प्राध्यापकांच्या आणि विद्यार्थ्यांच्या नजरेस आणावा.

गणेशखिंड,
पुणे-४११ ००७
जा.क्र.सीबीअेस/ 1251
दिनांक: 12/10/1990

कुलसचिवांकरिता.

प्रत माहितीसाठी सादर रवाना:-

१. संलग्न शास्त्र महाविद्यालयाचे मा.प्राचार्य
२. सर्व विद्याशाखेचे मा.अधिष्ठाता.
३. शास्त्र अभ्यास मंडळाचे मा.सदस्य
४. मा.संचालक, दूरशिक्षण केंद्र
५. मा.संयोजक, परीक्षा सुधार विभाग
६. मा.उपकुलसचिव (परीक्षा)
७. मा.सहाय्यक कुलसचिव (परीक्षा) (को-ऑर्डिनेशन)
८. मा.सहाय्यक कुलसचिव (परीक्षा) एस.अॅण्ड टी.विभाग)
९. मा.सहाय्यक कुलसचिव (सभा व दप्तर विभाग)
१०. मा.सहाय्यक कुलसचिव (शैक्षणिक पात्रता)
११. मा.जनसंपर्क अधिकारी
१२. मा.कायदाअधिकारी
१३. अधिनियम समिती विभाग (संदर्भ ठ १ पीअे ५१/९० विद्यापरिषद - २१-२२/९/९०)
१४. विभाग प्रमुख प्राणीशास्त्र, पुणे विद्यापीठ, पुणे-७
१५. उपकुलसचिव प्रवेश
१६. सहाय्यक कुलसचिव प्रवेश
१७. मा.कार्याधिकारी(बहि:स्थ)
१८. मा.कुलसचिव यांचे स्वीय सहाय्यक
१९. विद्यापीठ उपकेंद्र, अहमदनगर, धुळे, नाशिक.

५५४७/१९९०/सी/-

Encl. to Circular No. 278/1990

Encl.to item B11
AC 21, 22-8-90

Sub
REPORT of the committee, appointed for consideration of "Inland Fisheries" syllabus at M.Sc. Zoology (Special)

I am glad to submit this report to the members of BOS in Zoology regarding implementation of a new course in 'Inland Fisheres' at M.Sc. level.

The sub committee had in all four meetings to discuss & finalise the syllabus during meetings members thought necessary to make relevant and appropriate changes in the syllabus submitted by PVP College Pravaranagar. Taking into consideration the applied value of the subject the members have specified the syllabus so as to make it standard and practical.

Thanks are due to

(i) Dr. P.S. Karekar - a senior member of the sub-committee for proper outlining the syllabus.

(ii) Dr. B.V. Thete - for preparing the relevant practicals in the syllabus.

(iii) Dr. A.N. Late - for proper shiftingand placement of various courses from the syllabusand making them fit in present M.Sc. semester system pattern.

I request the members of BOS in Zoology to accept this modified syllabus prepared by the sub committee.

Thanking you,

Yours faithfully,

Sd/-
( P.S. Ghaisas)
Chairman, Sub-Committee
'INLAND Fisheries'

INLAND FISHERIES

Semester - IX :

| | | |
|---|---|---|
| ZO | 926 | Ichthyology |
| ZO(a) | 902 (a) | Limnology |
| ZO | 902 (b) | Fishery Biology -I |
| ZO | 933 | Aquaculture - I |
| ZO | 934 | Fish and Prawn Fisheries |
| ZO | 936 | Practicals: 18 practicals (ZO 926) plus 7 practicals (ZO 933) |
| ZO | 937 | Practicals : 7 practicals (ZO 934) plus 6 practicals (ZO 902 a) plus 6 practicals (ZO 902b) plus 6 practicals for projects. |

Semester - X:

| | | |
|---|---|---|
| ZO | 026 | Aquaculture - II |
| ZO | 002(a) | Fishery Biology - II |
| ZO | 002(b) | Fish pathology, Parasitology and Pollution |
| ZO | 029 | Fishery Management and Technology |
| ZO | 051 | Practicals : 7 practicals (ZO 026) plus 12 practicals for Research project plus 6 practicals (ZO 002a) |
| ZO | 052 | Practicals : 6 practicals (ZO 002 b) plus 18 practicals (ZO 029) |

## 20 - 926 - Ichthyology

1. General classification of Pisces. Crustaceans and Molluscs Diagnostic characters of these animals of economic importance.
2. External morphology, body form, fins and other appendages, skin, colouration and scalation.
3. Endoskeleton: Skull, jaw suspension, axial and appendicular skeleton.
4. Musculature and locomotion.
5. Nutrition: Digestive system, food and feeding habits.
6. Respiration: Structure and function of gills, adaptations for air breathing and air bladder.
7. Exevetion and osmo-regulation.
8. Nervous system : Anatomy and special structures.
9. Sense organs: Photoreceptors, chemoreceptors and statoaccoustic organs.
10. Reproduction and Development: reproductive system and cycles, spawning, parental care, outline of embryonic and larval development.
11. Biology of fishes: (a) Migration.
    (b) Ecological relationships of fishes.

Practicals:

1. Identification of commercially important fishes, crustaceans and molluscs.
2. Study of external characters, body form, fins and scales of fishes.
3. Collection and preservation of fishes.
4. Preparation and application of identification keys.
5. Study of anatomical structures important from the point of view of locomotion, nutrition, respiration and reproduction.

## ZO 902 (a) - Limnology

1. Introduction to Limnology.
2. Classification of inland waters.
3. Physical, chemical and biological factors affecting aquatic life.
4. Lakes: Origin and diversity, morphometry and physical characteristics, water movements, density, vertical stratification, thermal exchange, trophogenic and tropholytic zones, biochemical stratification, dissolved gases and salts, bottom deposits, ecological factures.
5. Rivers and streams: Physical and chemical properties of water, ecological features.
6. Brackish waters : Physical and chemical properties of brakish waters, econological features, influence of tidal currents.
7. Plankton: Phyto-and zoo-planters, plankton of standing and flowing waters. Seasonal flutuations and abundance.
8. Concept of productivity in fresh and brackish water environment; standing crop production and removal, biological communities in freshwater and brackish water bodies.
9. Freshwater and brackish-water pollution, sources of pollution and effects of pollution./ measures for control of water pollution.
10. Benthos: Physical, chemical and biological characteristics.

Practicals:

1. Collection and analysis of water samples for study of temperature, turbidity, pH, oxygen, carbon-dioxide, alkalinity, hardness, nitrates, phosphates, silicates, chlorides.
2. Study of methods of recording and analysis of the morpho-edaphic characters of water bodies.
3. Study of methods estimation of productivity of water bodies.
4. Study of methods of monitoring of pollution.
5. Field trips to places of importance from the point of view of limnological studies.

## ZO : 902 (b) Fishery Biology -I

1. Food and feeding habits of freshwater fishes and prawns.
2. Reproduction, embryonic and larval development of freshwater fishes and prawns. Spawning habits. Gono-somatic index, fecundity and breeding.
3. Age and growth : Length-weight relationships, vital ponderal index, condition factor.
4. Migrations : for feeding, breeding and development.
5. Population studies: Unit stock, recruitment, age and size composition of stocks.
6. Mortality and survival : Catch and fishing effort, estimation of stock density and fishing mortality rates, selection, yield curves, estimation of optimum yield and overfishing.

Practicals:

1. Study of food and feeding habits on the basis of anatomical structures, analysis of contents of stomach of fishes.
2. Study of gonads based on microscopic study ovaldiameter observations.
3. Study of life histories of selected food fishes.
4. Observation of scales, and otoliths from the point of view of estimation of growth and age of fishes.
5. Computation of length-weight relationship, and indices on the basis of observations on fish populations.

ZO : 933 - Aquaculture - I

1. Ecology and productivity of fish ponds and lakes:

   (a) Physical conditions of water: Depth, Temperature Turbidity, Light.

   (b) Chemical conditions of water : Dissolved gases, oxygen, carbon dioxide, Total alkalinity, Total hardness, dissolved solids.

2. Biological conditions of water: Aquatic vegation plankton, Benthos.

3. The soil:

   (a) Types of soil, (b) Soil fertility (c) Chemical conditions of soil, (d) Calcium-carbonate phosophorus system, (e) Iron-phosphorus system.

4. Productivity of a Fish pond:

   (a) Pond chain, (b) Concept of productivity, (c) Methods of measuring productivity, (d) Classification of water bodies.

5. History and principles of aquaculture, comparision of aquatic productivity with land productivity, Trophic levels in aquatic environment and their significance in productivity.

Practicals:

1. Study of methods of estimation of various tropic levels.

2. Study of organisms constituting and utilising various tropic levels.

3. Study of energy flow through the tropic levels in aquatic environment.

ZO : 934 - Fish and Prawn Fisheries

1. Selected species of Inland fish prawns:

Natural habitat - food and feeding habits, growth, maturity, fecundity and breeding of -

(a) Indian carps - Catla Catla, Labeo rohita, Labeo calbasu, Labeo fimbriatus, Cirrhina mrigala and Ton Ton.

(b) Common Carp : Cybrinus carpio and its varieties.
(c) Chinese carps - Ctenopharyngon idellus and Hypophylmichthys molitrix.

(d) Cat fishes - Wallago attu, Mystus seenghala and pangasius pangasius.

(e) Feather back - Notopterus chitala.

(f) Live fishes - Channa striatus, Channa marutius Anabas testudineus, Heteropneustes fossilis and Clarias magur.

(g) Other fish - Osphronemus gorami, Tilapia mossambica and Salmo trulla.

(h) Freshwater prawns - Macrobrachium rosenbergii and Macrobrachium malcomsoni.

2. Fisheries : Important riverine fisheries location special characteristics, development and management measures fisheries of juveniles, fish seed resources, Dams, Wairs and fish-passes, Hill stream fishes, Lacustrine reservoir and pond fisheries, Principal fish seasonal waters.

3. Fisheries of chilka and pulicat lakes :

Estinine fisheries of India, Tidal influences and monsoon discharge, Fluctuation of water conditions fish food and fisheries, Backwater fisheries, Important species including prawns and clams.

4. Induced spawning of fish, Breeding of carps in bundh types of tanks, by injecting pituitary hormones, spawning of common carp, techniques of hatching and spawn taking spawn and fry transport.

5. Fish pond farming: Types of ponds required criteria of a suitable pond site, pond construction, layout of a model seed production farm and a production farm; reclamation of pond for fish culture.

Management of stocking ponds nursery and control of predators and weeds manuring, rearing ponds, compatible species, stock density and manipulation surivival growth and production in various types of ponds.

Practicals:

1. Identification, morphology, feeding habits, reproduction gonads; sperms, stages in growth, of the presecribed fishes and prawns

2. Field trips to study fish farms, hatcheries, nurseries.

3. Field trips to study ponds, rivers, estuary from the point of view of fisheries.

4. Induction of spawning in a suitable fish.

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## 20 : 026 - Aquaculture-II

1. Brackish water aquaculture Brackish water environment and its its influence on physical chemical and biological aspects of aquaculture. Present status of brackish water aquaculture of Indian and abroad.

2. Endemic and exotic species of brackish water, aquaculture Mangroves and their influence on aquatic productivity.

3. General account of practice and economics of milk fish mullet, sigaid penacid prawn culture.

4. Principles of intensive aquaculture comparision of intensive and extensive aquaculture.

5. Modern methods of aquaculture raceway culture, cage and pen culture. Water management in closed system. Mono and mixed culture.

6. Food organisms in aquaculture, principles of aquariology.

7. Breeding, largal development, hatchery systems and cultivation of Macro-brachium, Peneaus, Mugil, clarids, chanos, Eels, and air breething fishes.

8. Potential and constraints of intensive aquaculture in India with special reference to Maharashtra.

Practicals:

1. Analysis of sample of brackish water.
2. Visit to a brackish water farms to study detail's of construction maintenance and operations.
3. Identification and collection and transport of prawn and fish seed.
4. Study of techniques of maintenance of aquaria.
5. Experiments in breeding and rearing of larvae of fish and prawns.

## 20 : 002(a) Fishery Biology-II

1. Population dynamics :

Principles of population dynamics and their application to fisheries, Unit stock, problems of age rate of growth natality, mortality and recruitment. Analytical approach to population inchargement and overfishing.

2. Fish Breeding :

Reproduction in fishes, Hybridization in fishes, and breeding neurohormonal influence on maturity, fecundity in relation to menthods of seed production, Rieverine seed collection, hypophysation and influence of environmental factors like

temperature rainfuall, quality of water, light etc. Fish breeding, hatcheries, handling of eggs and spawn.

Practicals:

1. Study of methods of sampling fish population.
2. Recording and analysis of morpho-metric data.
3. Exercise in simulation of exploited population.
4. Field trips to study practices in fish farming induced spawning etc.

20 : 002 (b) Fish pathology, parasitology and Pollution biology

1. Study of bacterial and fungal diseases and pathological conditions in fishes. Viral diseases of fishes.

2. Methods of isolation, cultures and identification of pathogens, control of diseases.

3. External and internal parasites of fishes, their identification and control.

4. Nutritional and respiratory disease conditions.

5. Degradation of inland water bodies :

Siltation of inland water bodies through deforestation over orgazing and over cultivation, optimisation of land use, effects of dams, [illegible] anicuts of fishery environment migration of fishes and their fishery, uses of fish passes, fish way and fish ladders, their merits and demarits.

6. Pollution of lotic and lentic environment : Agricultural pesticides and fertilisers pollutients on fish fife ( eggs, spawn, young ones) on breeding and feeding grounds of fishes. Biological indicators of pollution, effects of pollutants on physiology of fish and productivity of water, determination of effect of poloution by bioasay techniques.

7. Pollution monitoring;
Bioassy of biological organisms, weeds, plankton, benthos, birds physical, chemical and biological methods of pollution abatement.

Practicals :

1. Isolation, culturing and identification of common bacterial fungal pathogens.

2. Study of specimens of fish from the point of pathological conditions.

3. Study of common external and internal parasites of fishes and prawns.

4. Study of methods of application of measures for the control and eradication of pathogens and parasites.

5. Study of methods of analysis of freshwater samples of detecting and estimating toxic chemicals and constitutents.

## ZO : 029 Fishery Management and Technology

1. Food microbiology : general account of beneficial and harmful microoganisms and different types of food spoilage. Bacteriology of fish. Microbial spilage of fish. Microflora on various types of processed and semi-processed fish products. Influance of environmental factors on spoilage. Microbiclogical quality control in fish processing industry. Chemical and physical preservaties.

2. Freezing technology : Preservation of food spoilage by low temperatures, basic principles of retrigeration, latent heat, specific heat and other thermal properties of fresh food freezing point. process of food freezing. Freezing curve and its relation to method of freezing, changes that occur during freezing, methods of food freezing and allied factors thawing process and thawing process and thawing curve.

3. Canning technology : Basic principles of canning. Comparision of canning and other methods of food preservation, Raw materials, canning procedure, changes in canned food spoilage and its investigation, canning requisites, sanitation and waste disposal.

4. Craft engineering : Types of fishing boats, carve and maintance of boats.

5. Gear engineering: Fishing gear and its classification. Different types of rear employed in India, Sports fishery, hooks, baits, angling theory and practice.

6. Post-harvest technology : General principles of marketing theory of perfect and imperfect markets, price systems and price determination in fish markets, channals of distribution o of fish middleman in fish marketing, Importance of processing for marketing, sales promotion and regulation General co-operative principles, co-operative movement in fisheries in India, fishery co-operatives and their working finonic for co-operative projects, fishery project preparation and analysis.

Practicals :

1. Study of methods for handling, packing and transport of fresh fish.
2. Study of methods of preservation of fish by freezing and storage by refrigeration.
3. Visit to fish freezing plants.
4. Study of canning from the point of view of a condouble canning, (b) inspection of canned foods(c) contant test for canned products, (d) evaluation of changes in the canned food.
5. Visit to fishing centres to study of fishing craft and gear its maintenance.
6. Visit to fish market to study transport arrangement, storage, distribution and sale of fish.

## List of the books on Inland Fisheries

| Sr.No. | Author | Name of the Book |
|---|---|---|
| 1. | Jhingran V.G. | Fish and Fishories of India |
| 2. | War and Whipple | Fresh water biology. |
| 3. | Hickling C.G. | Tropical Inland Fisheries |
| 4. | Needham and Needham | A guide to the study of fresh water biology. |
| 5. | Bardach J.E. | Aquaculture the farming and husbandary of freshwater and Marine organisms. |
| 6. | Huet Marcel | Text-book of Fish Culture breeding and cultivation of fish |
| 7. | Hickling C.G. | Fish Culture. |
| 8. | Kurian C.V. | Prawn and Prawn Fishories of India |
| 9. | Hanson J.A. | Shrimp & Prawn farming in the Western Hemisphore. |
| 10. | Alabaster J.S. | Water quality criteria for freshwater fish. |
| 11. | Chander S.L. | Hypophysation of Indian Major Carps by pituitary Harmone injection. |
| 12. | Pillary T.V.R. | Advance in Aquaculture. |
| 13. | Brown E.E. | World fish farming, cultivation and economics. |
| 14. | Lackey R.T. | Fishery Management. |
| 15. | Shang Y.C. | Aquaculture economics |
| 16. | Reid G.K. | Ecology of Inland Water & Estuaries |
| 17. | Brown E.E. | Fish Farming handbook. |
| 18. | Shigene K. | Problems in Prawn culture |
| 19. | Shrivastava U.K. | Stategy for Development of Inland Fishery Resource in India. |
| 20. | Royce, W.F. | Fishery Development. |
| 21. | Royce, W.F. | Brakish water fisheries in India |
| 22. | Reid Word | Ecology of Inland water ane Esturaries. |
| 23. | Hiralal Chaudhari | Induced breeding of Carps. |
| 24. | C.F.Mason | Biology of freshwater pollution. |
| 25. | Downing J.S. | A manual of methods for the assessment of secondary productivity in fresh water. |
| 26. | Chakroff, M. | Freshwater fish pond culture and management. |
| 27. | V. Jayraman | Fishes of India. |
| 28. | Sir Francis Ley | Fishes of India. Vol. I & II. |
| 29. | R.Santhanam | A manual of freshwater aquaculture |
| 30. | R.K.Trivedy PK.Goel | Chemical and Biological methods for water pollution studies. |
| 31. | D.K.Belsare | Tropical fish farming. |
| 32. | P.S.Rao | Fishery Economics and Management in India. |
| 33. | D.V.Bal., K.Virabhandra Rao. | Marine Fisheries. |

| Sr.No. | Author | Name of the books |
|---|---|---|
| 34. | Arun G.Ghingran & V.V.Sugunan | Conservation and management of Inland capture fishery resource of India. |
| 35. | Agarwal V.P. | Management of Aquatic Ecosystem. |
| 36. | Agarval S.C. | Management of Fishery Resource Development. |
| 37. | Beveridge M. | Cago Aquaculture. |
| 38. | Belsare D.K. | Fropical fish farming. |
| 39. | Das S.M. | Handbook of Limnology & Water pollution. |
| 40. | Kyle H.M. | Hiology of Fishes. |
| 41. | Lagler K.F. | Ichthyology. |
| 42. | Misra S.R. | Fisheries in India. |
| 43. | Matty A.J. | Fish Endocrinology. |
| 44. | Martyshev F.G. | Pond Fisheries. |
| 45. | Mishra S.N. | Cost Benefit Analysis |
| 46. | Rounseefoll | Fishery science its methods and applications. |
| 47. | Stevenson J.P. | Trout Farming Manual. |
| 48. | Sinha B.M. | Wallago, Attu-Fresh water Shes of India. |
| 49. | Sharma V. | An Introduction to Indian Fisheries |
| 50. | Trivedi R.K. | Ecology & pollution of Indian Rivers. |
| 51. | Warshney C.K. | water pollution and Management. |

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