AP STATE COUNCIL OF HIGHER EDUCATION
w.e.f. 2015-16 (Revised in April, 2016)

ZOOLOGY SYLLABUS FOR I SEMESTER

ZOOLOGY - PAPER - I

ANIMAL DIVERSITY - NONCHORDATES

Periods:60 **Max. Marks:100**

1.1 Brief history, Significance of Diversity of Non Chordates

1.2 Protozoa
- 1.2.1 General characters
- 1.2.2 Classification of Protozoa up to classes with examples
- 1.2.3 *Elphidium* (type study)

1.3 Porifera
- 1.3.1 General characters
- 1.3.2 Classification of Porifera up to classes with examples
- 1.3.3 *Sycon* – External Characters, Types of cells,
- 1.3.4 Skelton in Sponges
- 1.3.5 Canal system in sponges

Unit - II

2.1 Coelenterata
- 2.1.1 General characters
- 2.1.2 Classification of Coelenterata up to classes with examples
- 2.1.3 *Obelia* - External Characters, Structure of Polyp and Medusa
- 2.1.4 Polymorphism in coelenterates
- 2.1.5 Corals and coral reef formation

2.2 Platyhelminthes
- 2.1.1 General characters
- 2.1.2 Classification of Platyhelminthes upto classes with examples
- 2.1.3 *Fasciola hepatica* - External Characters, Excretory system, Reproductive System, Life History and pathogenicity

Unit - III

3.1 Nemathelminthes
- 3.1.1 General characters
- 3.1.2 Classification of Nemathelminthes up to classes with examples

3.2 Annelida
- 3.2.1 General characters
- 3.2.2 Classification of Annelida up to classes with examples
- 3.2.3 *Hirudinaria granulosa* - External Characters, Digestive System, Excretory System and Reproductive System
- 3.2.4 Coelomoducts
- 3.2.5 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

Unit - IV

4.1 Arthropoda

- 4.1.1 General characters
- 4.1.2 Classification of Arthropoda up to classes with examples
- 4.1.3 Prawn - External Characters, Appendages, Respiratory system and Circulatory System
- 4.1.4 *Peripatus* - Structure and affinities

4.2 Mollusca

- 4.2.1 General characters
- 4.2.2 Classification of Mollusca up to classes with examples
- 4.2.3 Pearl formation in Pelecypoda
- 4.2.4 Torsion in gastropods

Unit - V

5.1 Echinodermata

- 5.1.1 General characters
- 5.1.2 Classification of Echinodermata up to classes with examples
- 5.1.3 Water vascular system in star fish

5.2 Hemichordata

- 5.2.1 General characters
- 5.2.2 Classification of Hemichordata up to classes with examples
- 5.2.3 *Balanoglossus* - Structure and affinities

5.3 Non-Chordata larval forms

- 5.3.1 Amphiblastula
- 5.3.2 Ephyra
- 5.3.3 Trochophore
- 5.3.4 Nauplius
- 5.3.5 Glochidium
- 5.3.6 Bipinnaria
- 5.3.7 Tornaria

ZOOLOGY PRACTICAL SYLLABUS FOR I SEMESTER

ZOOLOGY - PAPER - I
ANIMAL DIVERSITY - NONCHORDATES

Periods: 24 **Max. Marks: 50**

Observation of the following slides / spotters / models

Protozoa	**:**	*Elphidium, Paramecium* - Binary fission and conjugation
Porifera	**:**	*Spoonbill, Euspongia, Sycon, Sycon* - T.S and L.S
Coelenterata	**:**	*Obelia* - colony and medusa, *Physalia, Velella, Corallium, Gorgonia, Pennatula*
Platyhelminthes	**:**	*Planaria, Fasciola hepatica, Fasciola* larval forms - Miracidium, Redia, Cercaria, *Echinococcus granulosus*
Nemathelminthes	**:**	*Ascaris* - Male and female, *Ancylostoma duodenale*
Annelida	**:**	*Neries, Heteroneries, Aphrodite, Hirudo,* Trochophore larva
Arthropoda	**:**	Mouth parts of male and female *Anopheles* and *Culex,* Mouth parts of housefly, Mouth parts of Scorpion, Nauplius, Mysis, Zoea larvae, crab, prawn, *Scolopendra, Sacculina, Limulus, Peripatus*
Mollusca	**:**	*Chiton, Murex, Sepia, Loligo, Octopus, Nautilus,* Glochidium larva
Echinodermata	**:**	*Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Asterias,* Bipinnaria larva
Hemichordata	**:**	*Balanoglossus,* Tornaria larva

Demonstration of dissection / dissected / virtual dissection :

1. Leech / Prawn / Scorpion / Crab - Digestive system
2. Prawn - Appendages
3. Prawn / Scorpion / Crab - Nervous system
4. *Pila / Unio* - Digestive system
5. Mounting of Statocyst
6. Mounting of Radula

b **Laboratory record work shall be submitted at the time of practical examination**

b **Compulsory one species to be adopted for demonstration only by the faculty** b

Computer aided techniques should be adopted as per UGC guide lines

ZOOLOGY SYLLABUS FOR II SEMESTER

ZOOLOGY - PAPER - II

ANIMAL DIVERSITY - CHORDATES

Periods:60 **Max. Marks: 100**

Unit - I

1.1 General characters of Chordata

1.2 Prochordata

1.2.1 Salient features of Cephalochordata

1.2.2 Structure of *Branchiostoma*

1.2.3 Affinities of Cephalochordata

1.2.4 Salient features of Urochordata

1.2.5 Structure and life history of *Herdmania*

1.2.6 Significance of Retrogressive metamorphosis

Unit - II

2.1 Cyclostomata

2.1.1 General characters of Cyclostomata

2.1.2 Comparision of the *Petromyzon* and *Myxine*

2.2 Pisces

2.2.1 General characters of Fishes

2.2.2 Classification of fishes up to sub - class level with examples

2.2.3 *Scoliodon* - External features, Digestive system, Respiratory system, Heart, Brain

2.2.4 Migration in Fishes

2.2.5 Types of Scales

2.2.6 Dipnoi

Unit - III

3.1 Amphibia

3.1.1 General characters of Amphibian

3.1.2 Classification of Amphibia upto orders with examples.

3.1.3 *Rana hexadactyla* - External features, Digestive system, Respiratory system, Heart, Brain

3.2 Reptilia

3.2.1 General characters of Reptilia

3.2.2 Classification of Reptilia upto orders with examples

3.2.3 Calotes - External features, Digestive system, Respiratory system, Heart, Brain

3.2.4 Identification of Poisonous snakes and Skull in reptiles

Unit - IV

4.1 Aves

4.1.1 General characters of Aves

4.1.2 Classification of Aves upto subclasses with examples.

4.1.3 *Columba livia* - External features, Digestive system, Respiratory system, Heart, Brain

4.1.4 Migration in Birds

4.1.5 Flight adaptation in birds

Unit - V

5.1 Mammalia

5.1.1 General characters of Mammalia

5.1.2 Classification of Mammalia upto sub - classes with examples

5.2 Comparision of Prototherians, Metatherians and Eutherians

5.3 Dentition in mammals

ZOOLOGY PRACTICAL SYLLABUS FOR II SEMESTER

ZOOLOGY - PAPER - II

ANIMAL DIVERSITY - CHORDATES

Periods: 24 **Max. Marks: 50**

Observation of the following slides / spotters / models

Protochordata	**:**	*Herdmania, Amphioxus, Amphioxus* T.S. through pharynx
Cyclostomata	**:**	*Petromyzon, Myxine*
Pisces	**:**	*Pristis, Torpedo, Channapleuronectes, Hippocampus, Exocoetus, Eheneis, Labeo, Catla, Clarius, Auguilla,Protopterus* Placoid scale, Cycloid scale, Ctenoid scale
Amphibia	**:**	*Ichthyophis, Amblystoma, Siren, Hyla, Rachophous* Axolotl larva
Reptilia	**:**	*Draco, Chemaeleon, Uromastix, Vipera russeli, Naja, Bungarus, Enhydrina, Testudo, Trionyx, Crocodilus*
Aves	**:**	*Passer, Psittacula, Bubo, Alcedo, Columba, Corvus, Pavo,* Study of different types of feathers : Quill, Contour, Filoplume down
Mammalia	**:**	*Ornithorthynchus, Tachyglossus, Pteropus, Funambulus, Manis, Loris,* Hedgehog
Osteology	**:**	Appenducular skeletons of Varanus, Pigeon Rabbit - Skull, fore limbs, hind limbs and girdles

Demonstration of dissection / dissected / virtual dissection:

1. V, VII, IX, X cranial nerves of shark / locally available fishes
2. Arterial system, venous system of Shark / Calotes / Fowl / Rat
3. Digestive system of fish

b **Laboratory record work shall be submitted at the time of practical examination**

b **Compulsory one species to be adopted for demonstration only be the faculty**

ZOOLOGY SYLLABUS FOR III SEMESTER

ZOOLOGY - PAPER - III

CYTOLOGY, GENETICS AND EVOLUTION

Periods:60 **Max. Marks:100**

Unit - I

1. Cytology - I

1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma

1.2 Electron microscopic structure of eukaryotic cell.

1.3 Plasma membrane –Different models of plasma mem brane.

Unit – II

2. Cell organelles

2.1 Structure and functions of Endoplasmic Reticulum

2.2 Structure and functions of Golgi apparatus

2.3 Structure and functions of Lysosomes

2.4 Structure and functions of Ribosomes

2.5 Structure and functions of Mitochondria

2.6 Nucleus

2.7. Chromatin - Structure and significance, Chromosomes - Structure, types, functions

Unit - III

3.1 Genetics - I

3.1.1 Mendel's work on transmission on traits

3.1.2 Principles of inheritance

3.1.3 Incomplete dominance and codominance

3.1.4 Lethal alleles, Epistasis, Pleiotropy

Unit - IV

4.1 Genetics - II

4.1.1 Sex determination

4.1.2 Sex linked inheritance

4.1.3 Linkage and crossing over

4.1.4 Extra chromosomal inheritance

4.1.5 Human karyotyping

Unit - V

5.1 Evolution

5.1.1 Origin of life

5.1.2 Lamarckism, Darwinism, Neo – Darwinism, Hard y-Weinberg Equilibrium.

5.1.3 Variations, isolating mechanisms, natural selection

5.1.4 Types of natural selection (directional, stabilizing, disruptive)

5.1.5 Artificial selection and forces of evolution

5.1.6 Speciation (Allopatric and Sympatric)

5.1.7 Macro evolutionary principles (Example: Darwin's finches)

ZOOLOGY PRACTICAL SYLLABUS FOR III SEMESTER

ZOOLOGY - PAPER - III

CYTOLOGY, GENETICS AND EVOLUTION

Periods: 24 **Max. Marks: 50**

I. Cytology

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis and Meiosis with prepared slides
3. Mounting of salivary gland chromosomes of *Chiranomous*

II. Genetics

1. Study of Mendelian inheritance using suitable examples
2. Study of linkage recombination, gene mapping using the data
3. Study of human karyotypes

III. Evolution

1. Study of fossil evidences
2. Study of homology and analogy from suitable specimens and pictures
3. Phylogeny of horse with pictures
4. Darwin's finches (pictures)
5. Visit to natural history museum and submission of report

ZOOLOGY SYLLABUS FOR IV SEMESTER

ZOOLOGY - PAPER - IV

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

Periods:60 **Max. Marks: 100**

Unit - I

1.1 Developmental Biology and Embryology

1.1.1 Gametogenesis

1.1.2 Fertilization

1.1.3 Types of eggs

1.1.4 Types of cleavages

1.2 Development of Frog upto formation of primary germ layers

1.3 Formation and functions of Foetal membrane in chick embryo

1.4 Development, types and functions of Placenta in mammals

Unit - II

2.1 Physiology - I

2.1.1 Elementary study of process of digestion

2.1.2 Absorption of digested food

2.1.3 Respiration - Pulmonary ventilation, transport of oxygen and carbondioxide

2.1.4 Circulation - Structure and functioning of heart, Cardiac cycle

2.1.5 Excretion - Structure of nephron, urine formation, counter current mechanism

Unit - III

3.1 Physiology - II

3.1.1 Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers

3.1.2 Muscle contraction - Ultra structure of muscle fibre, molecular and chemical basis of muscle contraction

3.1.3 Endocrine glands - Structure, secretions and the functions (of hormones) of pituitary, thyroid, parathyroid, adrenal glands and pancreas

3.1.4 Hormonal control of reproduction in a mammal

Unit - IV

4.1 Ecology - I

4.1.1 Meaning and scope of Ecology

4.1.2 Important abiotic factors of Ecosystem - Temperature, light, water, oxygen and CO_2

4.1.3 Nutrient cycles - Nitrogen, carbon and phosphorus

4.1.4 Components of Ecosystem (Example:lake), food chains and food web, energy flow in ecosystem

Unit - V

5.1 Ecology - II

5.1.1 Habitat and ecological niche

5.1.2 Community interactions - Mutualism, commensalism, parasitism, competition, predation

5.1.3 Ecological succession

5.1.4 Population studies

5.2 Zoogeography

5.2.1 Zoogeographical regions

5.2.2 Study of physical and faunal peculiarities of Oriental, Australian and Ethiopian regions

ZOOLOGY PRACTICAL SYLLABUS FOR IV SEMESTER

ZOOLOGY - PAPER - IV

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

Periods: 24 **Max. Marks: 50**

I. Embryology

1. Study of T.S. of testis, ovary of a mammal
2. Study of different stages of cleavages (2, 4, 8 cell stages)
3. Study of chick embryos of 18 hours, 24 hours, 33 hours and 48 hours of incubation

II. Physiology

1. Qualitative tests for identification of carbohydrates, proteins and fats
2. Qualitative tests for identification of ammonia, urea and uric acid
3. Study of activity of salivary amylase under optimum conditions
4. Study of prepared slides of T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage

III. Ecology

1. Determination of pH of given sample
2. Estimation of dissolved oxygen of given sample
3. Estimation of total alkalinity of given sample
4. Estimation of salinity of given sample

ZOOLOGY SYLLABUS FOR V SEMESTER
ZOOLOGY - PAPER - V
ANIMAL BIOTECHNOLOGY

Periods:60 **Max. Marks:100**

Unit 1: Tools of Recombinant DNA technology - Enzymes and Vectors
Restriction modification systems: Types I, II and III. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering
DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases
Cloning Vectors: Plasmid vectors:pBR and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs,

Unit 2 Techniques of Recombinant DNA technology
Cloning: Use of linkers and adaptors
Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated delivery
PCR: Basics of PCR.
DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing
Hybridization techniques: Southern, Northern and Western blotting,
Genomic and cDNA libraries: Preparation and uses

UNIT 3 Animal Cell Technology
Cell culture media: Natural and Synthetic
Cell cultures: primary culture, secondary culture, continuous cell lines; Protocols for Primary Cell Culture; Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures.
Hybridoma Technology: Cell fusion, Production of Monoclonal antibodies (mAb), Applications of mAb
Stem cells: Types of stem cells, applications

Unit 4 Reproductive Technologies & Transgenic Animals
Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization , super ovulation, Embryo transfer, Embryo cloning
Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish; applications

Unit 5 Applied Biotechnology
Industry: Fermentation: Different types of Fermentation: Short notes on - Submerged & Solid state; batch, Fed batch & Continuous; Stirred tank, Air Lift, Fixed Bed and Fluidized; Downstream processing - Filtration, centrifugation, extraction, chromatography, spray drying and lyophilization
Agriculture: fisheries – monoculture in fishes, polyploidy in f ishes; DNA fingerprinting

ZOOLOGY PRACTICAL SYLLABUS FOR V SEMESTER
ZOOLOGY - PAPER - V
ANIMAL BIOTECHNOLOGY

Periods: 24 **Max. Marks: 50**

Any SIX of the following:

1. Maintenance and storage of*E.coli* DH5 alpha cells.
2. Isolation of Plasmid DNA from *E.coli*
3. Preparation of genomic DNA from *E. coli*/animals/ human.
4. DNA quantification using agarose gel electrophoresis (by using lambda DNA as standard).
5. Restriction digestion of lambda (λ) DNA using EcoR1 and Hind III.
6. Preparation for insertion and vector for ligation.
7. Performance of ligation reaction using T4 DNA ligase.
8. Preparation of competent cells
9. Transformation of *E. coli* with plasmid DNA using CaCl2,
10. Selection of transformants on X-gal and IPTG
11. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
12. Interpretation of sequencing gel electropherograms
13. Amplification of DNA by PCR
14.Packing and sterilization of glass and plastic wares for cell culture.
15,Preparation of culture media.

ZOOLOGY SYLLABUS FOR V SEMESTER

ZOOLOGY - PAPER - VI

ANIMAL HUSBANDRY

Periods:60 **Max. Marks: 100**

UNIT – I : 10 Hours

General introduction to poultry farming. Principles of poultry housing. Poultry houses. Systems of poultry farming. Management of chicks, growers and layers. Management of Broilers.

UNIT – II: 10 Hours

Poultry feed management – Principles of feeding. N utrient requirements for different stages of layers and broilers. Methods of feeding. Poultry diseases – viral, bacterial, fungal and parasitic (two each); symptoms, control and management.

UNIT – III: 10 Hours

Selection, care and handling of hatching eggs. Egg testing. Methods of hatching. Brooding and rearing. Sexing of chicks.

UNIT- IV: **20 Hours**

Breeds of Dairy Cattle and Buffaloes – Definition o f breed; Classification of Indian Cattle breeds, exotic breeds and Indian buffalo breeds. Systems of inbreeding and crossbreeding. Housing of dairy animals – Selection of site for dairy farm; s ystems of housing – loose, housing system. Conventional dairy barn. Cleaning and sanitation of dairy farm. Weaning of calf. Castration and dehorning. Deworming and Vaccination programme. Records to be maintained in a dairy farm.

UNIT - V: **10 Hours**

Care and management of dairy animals - Care and management of calf, heifer, milk animal, dry and pregnant animal, bulls and bullocks.

ZOOLOGY PRACTICAL SYLLABUS FOR V SEMESTER
ZOOLOGY –PRACTICAL - VI

ANIMAL HUSBANDRY

Periods:24 **Max. Marks: 50**

1. Study of various breeds of layers and broilers (photographs)
2. Identification of disease causing organisms in poultry birds (as per theory)
3. Study of the anatomy of a poultry bird by way of dissecting a bird. (Demonstration)
4. Study of various activities in a poultry farm (layers and broilers) and submission of a report.
5. Study of various breeds of cattle (photographs/microfilms)
6. Study of various activities carried out in a dairy farm and submission of a report.

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ZOOLOGY SYLLABUS FOR VI SEMESTER

ZOOLOGY –ELECTIVE PAPER:VII-(A)

IMMUNOLOGY

Periods:60 **Max. Marks:100**

Unit - I

1.1 Overview of Immune system

1.1.1 Introduction to basic concepts in Immunology

1.1.2 Innate and adaptive immunity

1.2 Cells and organs of Immune system

1.2.1 Cells of immune system

1.2.2 Organs of immune system

Unit - II

2.1 Antigens

2.1.1 Basic properties of antigens

2.1.2 B and T cell epitopes, haptens and adjuvants

2.1.3 Factors influencing immunogenicity

Unit - III

3.1 Antibodies

3.1.1 Structure of antibody

3.1.2 Classes and functions of antibodies

3.1.3Monoclonal antibodies

Unit - IV

4.1 Working of Immune system

4.1.1 Structure and functions of major histocompatibility complexes

4.1.2 Exogenes and Endogenes pathways of antigen presentation and processing

4.1.3 Basic properties and functions of cytokines

Unit - V

5.1 Immune system in health and disease

5.1.1 Classification and brief description of various types of hyper sensitivities

5.1.2 Introduction to concepts of autoimmunity and immunodeficiency

5.2 Vaccines

5.2.1 General introduction to vaccines

5.2.2 Types of vaccines

ZOOLOGY PRACTICAL SYLLABUS FOR VI SEMESTER

ZOOLOGY - ELECTIVE PAPER – VII-(A)

IMMUNOLOGY

Periods: 24 **Max. Marks: 50**

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination
4. Demonstration of
    a. ELISA
    b. Immunoelectrophoresis

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ZOOLOGY SYLLABUS FOR CLUSTER ELECTIVE –VIII-B:
VI SEMESTER

AQUACULTURE

Cluster Elective Paper: VIII-B-1

PRINCIPLES OF AQUACULTURE

Periods:60 **Max.Marks:100**

Unit – I

1.1 Introduction / Basics of Aquaculture

1.1.1 Definition, Significance and History of Aquaculture
1.1.2 Present status of Aquaculture – Global and National scenario
1.1.3 Major cultivable species for aquaculture: freshwater, brackish water and marine.
1.1.4 Criteria for the selection of species for culture

Unit – II

2.1 Types of Aquaculture

2.1.1 Freshwater, Brackishwater and Marine
2.1.2 Concept of Monoculture, Polyculture,Composite culture, Monosex culture and Integrated fish farming

2.2Culture systems

2.2.1 Ponds, Raceways, Cages, Pens, Rafts and water recirculating systems

2.3Culture practices

2.3.1Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.

Unit – III

3.1 Design and construction of aquafarms

3.1.1Criteria for the selection of site for freshwater and brackish water pond farms
3.1.2 Design and construction of fish and shrimp farms

3.2 Seed resources

3.2.1 Natural seed resources and Procurement of seed for stocking: Carp and shrimp

3.3 Nutrition and feeds

3.3.1 Nutritional requirements of a cultivable fish and shellfish
3.3.2 Natural food and Artificial feeds and their importance in fish and shrimp culture

Unit – IV

4.1Management of carp culture ponds

4.1.1 Culture of Indian major carps: Pre-stocking management – Dewatering, drying, ploughing/desilting; Predators, weeds and algal blooms and their control, Liming and fertilization; Stocking management – Stocking den sity and stocking; Post-stocking management – Feeding, water quality, growth and hea lth care; and Harvesting ofponds

4.2Culture of giant freshwater prawn, *Macrobrachium rosenbergii*

Unit – V

5.1Culture of shrimp (*Penaeus monodon* or *Litopenaeus vannamei*)
5.2 Culture of pearl oysters
5.3 Culture of seaweeds-species cultured, culture techniques, important by-products, prospects
5.4 Culture of ornamental fishes – Setting up and maintenance of aquarium; and breeding.

Cluster Elective Paper: VIII-B-2

AQUACULTURE MANAGEMENT

Periods : 60 **Max.Marks : 100**

Unit – I

1.1Breeding and Hatchery Management
1.1.1 Bundh Breeding and Induced breeding of carp by Hypophysation; and use of synthetic hormones
1.1.2Types of fish hatcheries; Hatchery management of Indian major carps
1.1.3 Breeding and Hatchery management of *Penaeus monodon*/ *Litopenaeus vannamei*
1.1.4 Breeding and Hatchery management of giant freshwater prawn.

Unit – II

2.1 Water quality Management
2.1.1Water quality and soil characteristics suitable for fish and shrimp culture
2.1.2 Identification of oxygen depletion problems and control mechanisms in culture ponds
2.1.3 Aeration: Principles of aeration and Emergency aeration
2.1.4 Liming materials, Organic manures and Inorganic fertilizers commonly used and their implications in fish ponds

Unit – III

3.1 Feed Management
3.1.1Live Foods and their role in shrimp larval nutrition.
3.1.2 Supplementary feeds: Principal foods in artificial diets; Types of feeds; Feed additives and Preservatives; role of probiotics.
3.1.3 Feed formulation and manufacturing; Feed storage
3.1.4 Feeding strategies: Feeding devices, feeding schedules and ration size; Feed evaluation- feed conversion efficiencies and ratios

Unit – IV

4.1 Disease Management
4.1.1 Principles of disease diagnosis and health management;
4.1.2 Prophylaxis, Hygiene and Therapy of fish diseases
4.1.3 Specific and non-specific defense systems in fish; Fish immunization and vaccination
4.1.4Etiology, Symptoms, prophylaxis and therapy of common fish diseases in fish ponds
4.1.5Etiology, Symptoms, prophylaxis and therapy of common shrimp diseases in shrimp ponds

Unit – V

5.1 Economics and Marketing

5.1.1 Principles of aquaculture economics – Capital costs, variable costs, cost-benefit analysis

5.1.2Fish marketing methods in India; Basic concepts in demand and price analysis

5.2 Fisheries Extension

5.1.3 Fisheries Training and Education in India; Role of extension in community development.

5.3 Fish Genetics

5.1.4 Genetic improvement of fish stocks – Hybridiz ation of fish.

5.1.5 Gynogenesis, Androgenesis, Polyploidy, Transgenic fish, Cryopreservation of gametes, Production of monosex and sterile fishes and their significance in aquaculture.

Cluster Elective Paper: VIII-B-3

POSTHARVEST TECHNOLOGY

Periods : 60 **Max.Marks : 100**

Unit – I

1.1 Handling and Principles of fish Preservation

1.1.1 Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.

1.1.2 Principles of preservation– cleaning, loweri ng of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to lowradiation of gamma rays.

Unit – II

2.1 Methods of fish Preservation

2.1.1 Traditional methods - sun drying, salt curing, pickling and smoking.

2.1.2 Advanced methods – chilling or icing , refrigerated sea water, freezing, canning, Irradiation and Accelerated Freeze drying (AFD).

Unit – III

3.1 Processing and preservation of fish and fish by-products

3.1.1Fish products – fish minced meat, fis h meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.

3.1.2 Fish by-products – fish glue, ising glass, chitosan, pearl essence, shark fins, fish leather and fish maws.

3.2Seaweed Products

3.2.1Preparation of agar, algin and carrageen. Use of seaweeds as food for humanconsumption, in diseasetreatment and preparation of therapeutic drugs.

Unit – IV

4.1Sanitation and Quality control

4.2.1 Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.

4.2.2 Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

4.2 Regulatory affairs in industries

Unit – V

5.1 Quality Assurance, Management and Certification

5.1.1 Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.

5.1.2 National and International standards – ISO 9000: 2000 Series of Quality Assurance System, *Codex Alimentarius*.

ZOOLOGY PRACTICLSYLLABUSCLUSTER ELECTIVE PAPER: VIII-B
VI SEMESTER

AQUACULTURE

Periods : 24_ **Max.Marks : 50**

PRACTICAL: I

Cultivable fishes

1. Identification and study of important cultivable and edible fishes - Any ten
2. Identification and study of important cultivable and edible crustaceans - Any five
3. Identification and study of common aquarium fishes – Any five
4. General description and recording biometric data of a given fish.

Diseases

1. Identification and study of fish and shrimp diseases - Using specimens / pictures
2. External examination of the diseased fish – diagn ostic features and procedure.
3. Autopsy of fish – Examination of the internal or gans.
4. Determination of dosages of chemicals and drugs for treating common diseases.

Pond Management

1. Water Quality -Determination of temperature, pH, salinity in the pond water sample; Estimation of dissolved oxygen, free carbondioxide, total alkalinity, total hardness, phosphates and nitrites.
2. Soil analysis – Determination of soil texture, pH, conductivity, available nitrogen, available phosphorus and organic carbon.
3. Identification and study of common zooplankton, aquatic insects and aquatic weeds – Each 5

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PRACTICAL - II

Periods :24 **Max.Marks : 50**

Nutrition

1. Identification and study of Live food organisms – Any five
2. Formulation and preparation of a balanced fish feed
3. Estimation of Proximate composition of aquaculture feeds – Proteins, carbohydrates, lipids, moisture, ash content.
4. Gut content analysis to study artificial and natural food intake.

Post harvest Technology

1. Evaluation of fish/ fishery products for organoleptic, chemical and microbial quality.
2. Preparation of dried, cured and fermented fish products, examination of salt, protein, moisture in dried / cured products, examination of spoilage of dried / cured fish products, marinades, pickles, sauce.
3. Preparation of isinglass, collagen and chitosan from shrimp and crab shell. ?
4. Developing flow charts and exercises in identification of hazards – preparation of hazard analysis worksheet, plan form and corrective action procedures in processing of fish.

PRACTICAL - III

Project Work

Visit to a fish breeding centre / fish farms and submit a project report
or
Visit to a feed manufacturing unit and submit a project report
or
Visit to a shrimp hatchery / shrimp farms and submit a project report
or
Visit to a shrimp processing unit and submit a project report