

S.K.S.D. MAHILA KALASALA, UG & PG (AUTONOMOUS), TANUKU
ZOOLOGY SYLLABUS FOR I SEMESTER
1ST B.SC. ZOOLOGY - PAPER - I
ANIMAL DIVERSITY – NONCHORDATES
SEMESTER - I

Unit - I

Brief history, Significance of Diversity of Non Chordates

Protozoa

General characters

Classification of Protozoa up to classes with examples

Elphidium (type study)

Porifera

General characters

Classification of Porifera up to classes with examples

Sycon – External Characters, Types of cells,

Skeleton in Sponges

Canal system in sponges

Unit – II

Coelenterata

General characters

Classification of Coelenterata up to classes with examples

Obelia - External Characters, Structure of Polyp and Medusa

Polymorphism in coelenterates

Corals and coral reef formation

Platyhelminthes

General characters

Classification of Platyhelminthes upto classes with examples

Fasciola hepatica - External Characters, Excretory system, Reproductive System,

Life History and pathogenicity

Nemathelminthes

General characters

Classification of Nemathelminthes up to classes with examples

Additional Input – Parasitic Adaptations in Helminthes.

Unit - III

Annelida

General characters

Classification of Annelida up to classes with examples

Hirudinaria granulosa - External Characters, Digestive System, Excretory System

and Reproductive System

Coelomoducts

Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

Arthropoda

General characters

Classification of Arthropoda up to classes with examples

Prawn - External Characters, Appendages, Respiratory system and Circulatory System

Peripatus - Structure and affinities

Unit - IV

Mollusca

General characters

Classification of Mollusca up to classes with examples

Pearl formation in Pelecypoda

Echinodermata

General characters

Classification of Echinodermata up to classes with examples

Water vascular system in star fish

Hemichordata

General characters

Classification of Hemichordata up to classes with examples

Balanoglossus - Structure and affinities

Non-Chordata larval forms

Amphiblastula

Ephyra

Trochophore

Nauplius

Glochidium

Bipinnaria

Tornaria

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1ST B.SC. ZOOLOGY - PAPER - I
ANIMAL DIVERSITY - NONCHORDATES

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

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ZOOLOGY SYLLABUS FOR II SEMESTER
1ST B.SC. ZOOLOGY - PAPER - II
ANIMAL DIVERSITY – CHORDATES

Unit - I

General characters of Chordata

Prochordata

Salient features of Cephalochordata

Structure of *Branchiostoma*

Affinities of Cephalochordata

Salient features of Urochordata

Structure and life history of *Herdmania*

Significance of Retrogressive metamorphosis

Cyclostomata

General characters of Cyclostomata

Comparison of the *Petromyzon* and *Myxine*

Unit - II

Pisces

General characters of Fishes

Classification of fishes up to sub - class level with examples

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

Migration in Fishes

Types of Scales

Dipnoi

Amphibia

General characters of Amphibian

Classification of Amphibia upto orders with examples.

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

Additional Input – Parental Care in Amphibia

Unit - III

Reptilia

General characters of Reptilia

Classification of Reptilia upto orders with examples

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

Identification of Poisonous snakes and Skull in reptiles

Aves

General characters of Aves

Classification of Aves upto subclasses with examples.

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

Unit - IV

Migration in Birds

Flight adaptation in birds

Mammalia

General characters of Mammalia

Classification of Mammalia upto sub - classes with examples

Comparison of Prototherians, Metatherians and Eutherians

Dentition in mammals

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ANIMAL DIVERSITY - CHORDATES

Observation of the following slides / spotters / models

Protochordata : *Herdmania, Amphioxus, Amphioxus* T.S. through pharynx

Cyclostomata : *Petromyzon, Myxine*

Pisces : *Pristis, Torpedo, Channapleuronectes, Hippocampus,*
Exocoetus, Ehenis, Labeo, Catla, Clarius,
Auguilla, Protopterus

Placoid scale, Cycloid scale, Ctenoid scale

Amphibia : *Ichthyophis, Amblystoma, Siren, Hyla, Rachophous*

Axolotl larva

Reptilia : *Draco, Chamaeleon, 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 : *Ornithorynchus, Tachyglossus, Pteropus, Funambulus,*
Manis, Loris, Hedgehog

Osteology : Appendicular 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

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ZOOLOGY SYLLABUS FOR III SEMESTER
2ND B.SC. ZOOLOGY - PAPER - III
CYTOLOGY, GENETICS AND EVOLUTION

Unit - I

Cytology - I

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

Electron microscopic structure of eukaryotic cell.

Plasma membrane –Different models of plasma membrane.

Structure and functions of Ribosomes

Additional Input – Cell Theory

Unit - II

Cell organelles

Structure and functions of Endoplasmic Reticulum

Structure and functions of Golgi apparatus

Structure and functions of Lysosomes

Structure and functions of Mitochondria

Chromosomes - Structure, types, functions

Unit - III

Genetics

Mendel laws of inheritance

Gene interactions

Sex determination

Sex linked inheritance

Linkage and crossing over

Extra chromosomal inheritance

Human karyotyping

Unit - IV

Evolution

Origin of life

Lamarckism, Darwinism, Neo – Darwinism, Hardy-Weinberg Equilibrium.

Variations, isolating mechanisms, natural selection

Types of natural selection (directional, stabilizing, disruptive)

Artificial selection and forces of evolution

Speciation (Allopatric and Sympatric)

Macro evolutionary principles (Example: Darwin's finches)

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ZOOLOGY PRACTICAL SYLLABUS FOR III SEMESTER
2ND B.SC. ZOOLOGY - PAPER - III
CYTOLOGY, GENETICS AND EVOLUTION

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 *Chironomus*

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

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ZOOLOGY SYLLABUS FOR IV SEMESTER
2ND B.SC. ZOOLOGY - PAPER - IV
EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

Unit - I

Physiology - I

Additional Input - Modes of Nutrition

Elementary study of process of digestion

Absorption of digested food

Respiration - Pulmonary ventilation, transport of oxygen and carbondioxide

Circulation - Structure and functioning of heart, Cardiac cycle

Excretion - Structure of nephron, urine formation.

Unit - II

Physiology - II

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

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

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

Hormonal control of reproduction in a mammal.

Unit - III

Developmental Biology and Embryology

Gametogenesis

Fertilization

Types of eggs

Types of cleavages

Development of Frog upto formation of primary germ layers

Unit - IV

Ecology - I

Meaning and scope of Ecology

Important abiotic factors of Ecosystem - Temperature, light, water, oxygen and CO₂

Nutrient cycles - Nitrogen, carbon and phosphorus

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

Habitat and ecological niche

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

Ecological succession

Population studies

Zoogeography

Zoogeographical regions

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

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ZOOLOGY PRACTICAL SYLLABUS FOR IV SEMESTER 2ND B.SC. ZOOLOGY - PAPER - IV EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

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

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ZOOLOGY SYLLABUS FOR V SEMESTER
ZOOLOGY - PAPER – V (w.e.f.2017-18)
ANIMAL BIOTECHNOLOGY

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 & Reproductive Technologies

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

Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization, super ovulation, Embryo transfer, Embryo cloning

Unit 4: Transgenic Animals & Applied Biotechnology

Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish; applications

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 fishes; DNA fingerprinting

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ZOOLOGY PRACTICAL SYLLABUS FOR V SEMESTER
ZOOLOGY - PAPER – V (w.e.f.2017-18)
ANIMAL BIOTECHNOLOGY**

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.

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ZOOLOGY SYLLABUS FOR V SEMESTER
ZOOLOGY - PAPER – VI (w.e.f.2017-18)
ANIMAL HUSBANDRY

UNIT – I:

General introduction to poultry farming. Principles of poultry housing. Poultry houses. Systems of poultry farming. Management of chicks, growers and layers. Management of Broilers. Poultry feed management – Principles of feeding. Nutrient requirements for different stages of layers and broilers. Methods of feeding.

UNIT – II:

Poultry diseases – viral, bacterial, fungal and parasitic (two each); symptoms, control and management.

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

UNIT – III:

Breeds of Dairy Cattle and Buffaloes – Definition of 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; systems of housing – loose, housing system.

UNIT - IV:

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

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ZOOLOGY PRACTICAL SYLLABUS FOR V SEMESTER
ZOOLOGY –PRACTICAL - VI(w.e.f.2017-18)
ANIMAL HUSBANDRY

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) (w.e.f.2017-18)
IMMUNOLOGY

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

3.1.3 Monoclonal antibodies

3.2 Working of Immune system

4.1.1 Structure and functions of major histocompatibility complexes

4.1.2 Basic properties and functions of cytokines

Unit - IV

4.1 Immune system in health and disease

5.1.1 Classification and brief description of various types of hypersensitivities

5.1.2 Introduction to concepts of autoimmunity and immunodeficiency

4.2 Vaccines

5.2.1 General introduction to vaccines

5.2.2 Types of vaccines

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ZOOLOGY PRACTICAL SYLLABUS FOR VI SEMESTER
ZOOLOGY - ELECTIVE PAPER – VII-(A) (w.e.f.2017-18)
IMMUNOLOGY

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(w.e.f.2017-18)

PRINCIPLES OF AQUACULTURE

Unit – I

Introduction / Basics of Aquaculture & Types of Aquaculture

Major cultivable species for aquaculture: freshwater, brackish water and marine.

Criteria for the selection of species for culture

Freshwater, Brackishwater and Marine

Concept of Monoculture, Polyculture, Composite culture, Monosex culture and Integrated fish farming

Culture systems

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

Culture practices

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

Unit – II

Design and construction of aquafarms

Criteria for the selection of site for freshwater and brackish water pond farms

Design and construction of fish and shrimp farms

Seed resources

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

Nutrition and feeds

Nutritional requirements of a cultivable fish and shellfish

Natural food and Artificial feeds and their importance in fish and shrimp culture

Unit – III

Management of carp culture ponds

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 density

and stocking; Post-stocking management – Feeding, water quality, growth and health care; and Harvesting of ponds

Culture of giant freshwater prawn, *Macrobrachium rosenbergii*

Unit – IV

Culture of shrimp (*Penaeus monodon* or *Litopenaeus vannamei*)

Culture of pearl oysters

Culture of seaweeds-species cultured, culture techniques, important by-products, prospects

Culture of ornamental fishes – Setting up and maintenance of aquarium; and breeding.

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ZOOLOGY SYLLABUS FOR CLUSTER ELECTIVE –VIII-B:

VI SEMESTER

AQUACULTURE

Cluster Elective Paper: VIII-B-2 (w.e.f.2017-18)

AQUACULTURE MANAGEMENT

Unit – I

Breeding and Hatchery Management

Bundh Breeding and Induced breeding of carp by Hypophysation; and use of synthetic hormones

Types of fish hatcheries; Hatchery management of Indian major carps

Breeding and Hatchery management of *Penaeus monodon*/ *Litopenaeus vannamei*

Breeding and Hatchery management of giant freshwater prawn.

Unit – II

Water quality Management

Water quality and soil characteristics suitable for fish and shrimp culture

Identification of oxygen depletion problems and control mechanisms in culture ponds

Feed Management

Live Foods and their role in shrimp larval nutrition.

Supplementary feeds: Principal foods in artificial diets; Types of feeds; Feed additives and Preservatives; role of probiotics.

Feed formulation and manufacturing; Feed storage

Feeding strategies: Feeding devices, feeding schedules and ration size; Feed evaluation- feed conversion efficiencies and ratios

Unit – III

Disease Management

Principles of disease diagnosis and health management;

Prophylaxis, Hygiene and Therapy of fish diseases

Specific and non-specific defense systems in fish; Fish immunization and vaccination

Etiology, Symptoms, prophylaxis and therapy of common fish diseases in fish ponds

Etiology, Symptoms, prophylaxis and therapy of common shrimp diseases in shrimp ponds

Unit – IV

Economics and Marketing

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

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

Fisheries Extension

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

Fish Genetics

Genetic improvement of fish stocks – Hybridization of fish.

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

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ZOOLOGY SYLLABUS FOR CLUSTER ELECTIVE –VIII-B:

VI SEMESTER

AQUACULTURE

Cluster Elective Paper: VIII-B-3 (w.e.f.2017-18)

POSTHARVEST TECHNOLOGY

Unit – I

Handling and Principles of fish Preservation

Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor

mortis and spoilage), spoilage in marine fish and freshwater fish.

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

Methods of fish Preservation

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

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

Unit – II

Processing and preservation of fish and fish by-products

Fish products – fish minced meat, fish 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.

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

Seaweed Products

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

Unit – III

Sanitation and Quality control

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

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

Regulatory affairs in industries

Unit – IV

Quality Assurance, Management and Certification

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