

**SRI Y N COLLEGE(A)**

# Zoology Syllabus

**2021-2022**

# DEPARTMENT OF ZOOLOGY

## ZOOLOGY SYLLABUS FOR I SEMESTER ZOOLOGY - PAPER - I

### ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES

Hours: 60

Max. Marks: 75

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#### UNIT – I

- 1.1 Principles of Taxonomy – Binomial nomenclature – Rules of nomenclature
- 1.2 Whittaker's five kingdom concept and classification of Animal Kingdom.

#### PHYLUM PROTOZOA

- 1.3 General characters and Classification up to classes with suitable examples
- 1.4 Locomotion, Nutrition and Reproduction in Protozoans
- 1.5 *Elphidium* (type study)

#### UNIT - II

#### PHYLUM PORIFERA

- 2.1 General characters and Classification up to classes with suitable examples
- 2.2 Skeleton in Sponges
- 2.3 Canal system in sponges

#### PHYLUM COELENTERATA

- 2.4 General characters and Classification up to classes with suitable examples
- 2.5 Metagenesis in *Obelia*
- 2.6 Polymorphism in Coelenterates
- 2.7 Corals and coral reef

#### PHYLUM CTENOPHORA

- 2.8 General characters and Evolutionary significance (Affinities)

#### UNIT - III

#### PHYLUM PLATYHELMINTHES

- 3.1 General characters and Classification up to classes with suitable examples
- 3.2 Life cycle and pathogenicity of *Fasciola hepatica*
- 3.3 Parasitic adaptations in Helminthes

## PHYLUM NEMATHELMINTHES

- 3.4 General characters and Classification up to classes with suitable examples
- 3.5 Life cycle and pathogenicity of *Ascaris lumbricoides*

### UNIT - IV

## PHYLUM ANNELIDA

- 4.1 General characters and Classification up to classes with suitable examples
- 4.2 Evolution of Coelom and Coelomoducts
- 4.3 Vermiculture – Scope, Significance, Earthworm species, processing, Vermicompost, economic importance of vermicompost

## PHYLUM ARTHROPODA

- 4.4 General characters and Classification up to classes with suitable examples
- 4.5 Vision and respiration in Arthropoda
- 4.6 Metamorphosis in Insects
- 4.7 *Peripatus* - Structure and affinities
- 4.8 Social life in Bees and Termites

### UNIT – V

## PHYLUM MOLLUSCA

- 5.1 General characters and Classification up to classes with suitable examples
- 5.2 Pearl formation in Pelecypoda
- 5.3 Sense organs in Mollusca

## PHYLUM ECHINODERMATA

- 5.4 General characters and Classification up to classes with suitable examples
- 5.5 Water vascular system in star fish
- 5.6 Larval forms of Echinodermata

## PHYLUM HEMICHORDATA

- 5.7 General characters and Classification up to classes with suitable examples
- 5.8 *Balanoglossus* - Structure and affinities

### **CO-CURRICULAR ACTIVITIES (SUGGESTED)**

Preparation of charts/models of Phylogenetic Tree of Life, 5-kingdom classification, *Elphidium* life cycle etc.

Visit to Zoology museum or Coral island as part of Zoological tour

Charts on life cycle of *Obelia*, Polymorphism, Sponge Spicules

Preparation of charts on life cycle of *Fasciola* and *Ascaris*

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# DEPARTMENT OF ZOOLOGY

## ZOOLOGY SYLLABUS FOR II SEMESTER ZOOLOGY - PAPER - II

### ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

Periods: 60

Max. Marks: 75

#### UNIT - I

- 1.1 General characters and classification of Chordata up to classes
- 1.2 Protochordata – Salient features of Cephalochordata, Affinities of Cephalochordata.
- 1.3 Salient features of Urochordata
- 1.4 Structure and life history of *Herdmania*
- 1.5 Retrogressive metamorphosis – Process and Significance

#### UNIT - II

- 2.1 Cyclostomata, General characters, Comparison of *Petromyzon* and *Myxine*
- 2.2 Pisces - General characters of Fishes
- 2.3 *Scoliodon*: External features, Digestive system, Respiratory system, structure and functions of Heart, Structure and functions of the Brain.
- 2.4 Migration in Fishes
- 2.5 Types of Scales
- 2.6 Dipnoi

#### UNIT - III

- 3.1 General characters of Amphibia
- 3.2 Classification of Amphibia up to orders with examples.
- 3.3 *Rana hexadactyla*: External features, Digestive system, Respiratory system, Structure and functions of Heart.
- 3.4 Reptilia: General characters of Reptilia, Classification of Reptilia up to orders with examples.
- ~~3.5 Classification of Reptilia up to orders with examples~~
- 3.5 *Calotes*: External features, Digestive system, Respiratory system, Structure and function of Heart, Structure and function of Brain
- 3.6 Identification of Poisonous snakes and skull in reptiles.

## UNIT – IV

- 4.1 General characters of Aves
- 4.2 *Columba livia*: External features, Digestive system, Respiratory system. Structure and function of Heart, Structure and function of Brain
- 4.3 Migration in Birds
- 4.4 Flight adaptation in birds

## UNIT – V

- 5.1 General characters of Mammalia
- 5.2 Classification of Mammalia up to sub - classes with examples
- 5.3 Comparison of Prototherians, Metatherians and Eutherians
- 5.4 Dentition in mammals

### *Co-curricular activities (suggested)*

Preparation of charts on Chordate classification (with representative animal photos) and retrogressive metamorphosis.

Thermocol or Clay models of Herdmania and Amphioxus.

Visit to a local fish market and identification of local cartilaginous and bony fishes.

Thermocol models of fish heart and brain.

Collecting and preparation of Museum specimens with dead frogs/snakes/lizards etc.

Chart preparation for Dentition in mammals.

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**DEPARTMENT OF ZOOLOGY**  
**ZOOLOGY SYLLABUS FOR III SEMESTER**  
**ZOOLOGY – PAPER- III**  
**Cell Biology, Genetics, Molecular Biology and Evolution**

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Hours: 60

Max. Marks: 75

**UNIT -I**

**Cell Biology:**

Definition, history, prokaryotic and eukaryotic cells, virus, viroids, and mycoplasma  
Electron microscopic structure of animal cell. Plasma membrane –Models and transport  
functions of plasma membrane. Structure and functions of Golgi complex. Endoplasmic  
Reticulum and Lysosomes Structure and functions of Ribosomes, Mitochondria, Nucleus,  
Chromosomes

**UNIT-II**

**Genetics-I**

Mendel's work on transmission of traits Gene Interaction – Incomplete Dominance, Co  
dominance, Lethal Genes Polygene's (General Characteristics & examples): Multiple  
Alleles (General Characteristics and Blood group inheritance Sex determination  
(Chromosomal, Genic Balance, Hormonal, Environmental and Haplo- diploidy types of sex  
determination) Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance.

**UNIT -III**

**Genetics – II**

Mutations & Mutagenesis, Chromosomal Disorders (Autosomal and Allosomal) Human  
Genetics – Karyo typing, Pedigree Analysis (basics) Basics on Genomics and Proteomics

## UNIT-IV

### Molecular Biology:

Central Dogma of Molecular Biology Basic concepts of-

1. DNA replication – Overview (Semi-conservative mechanism, Semi- discontinuous mode, Origin & Propagation of replication fork)
2. Transcription in prokaryotes – Initiation, Elongation and Termination, Post-transcriptional modifications(basics)
3. Translation – Initiation, Elongation and Termination Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes

## UNIT-V

### Evolution:

Origin of life Theories of Evolution: Lamarckism, Darwinism, Germ Plasma Theory, And Mutation Theory Neo- Darwinism: Modern Synthetic, Theory of Evolution, (Hardy-Weinberg Equilibrium Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection, Speciation. )

### Co-curricular activities (Suggested)

- Model of animal cell
- Working model of mitochondria to encourage creativity among students
- Photo album of scientists of cell biology
- Charts on plasma membrane models/cell organelles
- Observation of Mendelian / Non-Mendelian inheritance in the plants of college botanical garden or local village as a student study project activity
- Observation of blood group inheritance in students, from their parents and grandparents
- Karyo typing and preparation of pedigree charts for identifying diseases in family history
- Charts on chromosomal disorders
- Charts on central dogma/lac Operon/genetic code
- Model of semi-conservative model of DNA replication
- Model of tRNA and translation mechanism
- Power point presentation of transcription or any other topic by students
- Draw geological time scale and highlight important events along the timeline
- Chart on industrial melanism to teach directed selection, Darwin's finches to teach genetic drift, collection of data on weight of children born in primary health centers to teach stabilizing selection etc.

### REFERENCE BOOKS:

1. Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell 'Molecular Cell Biology' W.H.Freeman and company New York.
2. Cell Biology by DeRobertis

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**DEPARTMENT OF ZOOLOGY**  
**ZOOLOGY – PAPER- IV**  
**ZOOLOGY SYLLABUS FOR IV SEMESTER**  
**Animal Physiology, Cellular Metabolism and Embryology**

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Hours: 60

Max Marks: 75

**UNIT-I**

**Animal Physiology -I:**

Process of digestion and assimilation, Respiration - Pulmonary ventilation, transport of oxygen and CO<sub>2</sub>, (Note: Need not study cellular respiration here), Circulation - Structure and functioning of heart, Cardiac cycle, Excretion - Structure and functions of kidney urine formation, counter current Mechanism

**UNIT-II**

**Animal 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, molecular and chemical basis of muscle contraction, Endocrine glands - Structure, functions of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas, Hormonal control of reproduction in a mammal

**UNIT- III**

**Cellular Metabolism – I**

(Biomolecules) Carbohydrates - Classification of carbohydrates, Structure of glucose  
Proteins - Classification of proteins, General properties of amino acids Lipids -  
Classification of lipids, Enzymes: Classification and Mechanism of Action

**UNIT -IV**

**Cellular Metabolism –II:**

Carbohydrate Metabolism - Glycolysis, Krebs cycle, Electron Transport Chain, Glycogen metabolism, Gluconeogenesis, Lipid Metabolism - Synthesis of fatty acids,  $\beta$ -oxidation of palmitic acid, Protein metabolism - Transamination, Deamination and Urea Cycle



## UNIT - V

### Embryology:

Gametogenesis Fertilization, Types of eggs Types of cleavages. Development of Frog up to formation of primary germ layers

### Co-curricular activities (Suggested)

- Chart on cardiac cycle, human lung, kidney/nephron structure etc.
- Working model of human / any mammalian heart.
- Chart of sarcomere/location of endocrine glands in human body
- Chart affixing of photos of people suffering from hormonal disorders
- Student study projects such as identification of incidence of hormonal disorders in the local primary health centre, studying the reasons thereof and measures to curb or any other as the lecturer feels good in nurturing health awareness among students
- Chart on structures of Biomolecules/types of amino acids (essential and non-essential) Chart preparation by students on Glycolysis / kreb's cycle/urea cycle etc.
- Model of electron transport chain
- Preparation of models of different types of eggs in animals
- Chart on frog embryonic development, fate map of frog blastula, cleavage etc.

### REFERENCE BOOKS:

1. Eckert H. *Animal Physiology: Mechanisms and Adaptation*. W.H. Freeman & Company.
2. Flory E. *An Introduction to General and Comparative Animal Physiology*. W.B. Saunders Co., Philadelphia.
3. Goel KA and Satish KV. 1989. *A Text Book of Animal Physiology*. Rastogi Publications, Meerut, U.P.
4. Hoar WS. *General and Comparative Physiology*. Prentice Hall of India, New Delhi.
5. Lehninger AL, Nelson and Cox. *Principles of Biochemistry*. Lange Medical Publications, New Delhi.
6. Prosser CL and Brown FA. *Comparative Animal Physiology*. W.B. Saunders Company, Philadelphia.
7. Developmental Biology by Balinsky
8. Developmental Biology by Gerard Karp
9. Chordate embryology by Varma and Agarwal
10. Embryology by V.B. Rastogi
11. Austen CR and Short RV. 1980. *Reproduction in Mammals*. Cambridge University Press.

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DEPARTMENT OF ZOOLOGY  
ZOOLOGY SYLLABUS FOR V SEMESTER  
ZOOLOGY - PAPER - V

ANIMAL BIOTECHNOLOGY

Periods: 60

Max. Marks: 75

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UNIT - I

Tools of Recombinant DNA technology - Enzymes and Vectors  
Restriction modification systems: Types I, II and III.  
Application of Type II restriction enzymes in Genetic Engineering.  
Cloning Vectors - Plasmid vectors, pBR and pUC series.

UNIT - II

Techniques of Recombinant DNA technology  
Gene delivery: Microinjection, Electroporation, Biolistic method (gene gun), liposome and viral-mediated delivery  
PCR: Basics of PCR.  
Hybridization techniques - Southern and Northern.  
Genomic and cDNA libraries - Preparation and Uses

UNIT - III

Animal Cell Technology  
Cell culture media: Natural and Synthetic  
Cell cultures: primary culture, secondary culture, continuous cell lines, Protocols for Primary Cell Culture - Organ culture and Cryopreservation.  
Hybridoma Technology-Cell fusion, Production of Monoclonal antibodies (mAb), Applications of mAb  
Stem cells: Types of stem cells, applications

UNIT - IV

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 and applications

UNIT - V

Agriculture: fisheries - monoculture in fishes, polyploidy in fishes. DNA finger .printing

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DEPARTMENT OF ZOOLOGY  
ZOOLOGY SYLLABUS FOR V SEMESTER  
ZOOLOGY - PAPER - VI

ANIMAL HUSBANDRY

Periods: 60

Max. Marks: 75

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UNIT - I

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

UNIT - II

Poultry feed management - Principles of feeding.  
Nutrient 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

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

UNIT- IV

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.  
Conventional dairy barn. Cleaning and sanitation of dairy farm.  
Weaning of calf. Deworming and Vaccination programme.  
Records to be maintained in a dairy farm.

UNIT - V

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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DEPARTMENT OF ZOOLOGY  
ZOOLOGY SYLLABUS FOR VI SEMESTER  
ZOOLOGY – ELECTIVE PAPER - VII

IMMUNOLOGY

Periods: 60

Max. Marks: 75

UNIT – I

1. OVERVIEW OF IMMUNE SYSTEM

- 1.1 Introduction to basic concepts in Immunology
- 1.2 Innate and adaptive immunity
- 1.3 Cells and organs of Immune system
- 1.4 Cells of immune system
- 1.5 Organs of immune system

UNIT – II

2. ANTIGENS

- 2.1 Basic properties of antigens
- 2.2 B and T cell epitopes, haptens and adjuvants
- 2.3 Factors influencing immunogenicity

UNIT – III

3. ANTIBODIES

- 3.1 Structure of antibody
- 3.2 Classes and functions of antibodies
- 3.3 Monoclonal antibodies

UNIT – IV

4. WORKING OF IMMUNE SYSTEM

- 4.1 Structure and functions of major histocompatibility complexes
- 4.2 Exogenous and Endogenous pathways of antigen presentation and processing
- 4.3 Basic properties and functions of cytokines

UNIT – V

5. IMMUNE SYSTEM IN HEALTH AND DISEASE

- 5.1 Classification and brief description of various types of hyper sensitivities
- 5.2 Introduction to concepts of autoimmunity and immunodeficiency

VACCINES

- 5.3 General introduction to vaccines
- 5.4 Types of vaccines

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# DEPARTMENT OF ZOOLOGY

## ZOOLOGY SYLLABUS FOR VI SEMESTER ZOOLOGY – CLUSTER ELECTIVE PAPER: VIII - (A)

### PRINCIPLES OF AQUACULTURE

Periods: 60

Max. Marks: 75

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#### 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 Concept of Monoculture, Poly culture, Composite culture, Mono sex culture and Integrated fish farming
- 2.2 Ponds, Raceways, Cages, Pens, Rafts and water re-circulating systems
- 2.3 Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.

#### UNIT – III

##### 3.1 DESIGN AND CONSTRUCTION OF AQUA FARMS

- 3.1.1 Criteria 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

### 4.1 MANAGEMENT OF CARP CULTURE PONDS

- 4.1.1 Culture of Indian major carps: Pre-stocking management – Dewatering, drying, ploughing / de silting 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.
- 4.2 Culture of giant freshwater prawn, *Macrobrachium rosenbergii*

## UNIT – V

- 5.1 Culture 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.

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# DEPARTMENT OF ZOOLOGY

ZOOLOGY SYLLABUS FOR VI SEMESTER  
ZOOLOGY – CLUSTER ELECTIVE PAPER: VIII - (A) B

## AQUACULTURE MANAGEMENT

Periods: 60

Max. Marks: 75

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### UNIT – I

#### BREEDING AND HATCHERY MANAGEMENT:

- 1.1 Bundh Breeding and Induced breeding of carp by Hypophysation and use of synthetic hormones
- 1.2 Types of fish hatcheries; Hatchery management of Indian major carps
- 1.3 Breeding and Hatchery management of *Penaeus monodon*/ *Litopenaeus vannamei*
- 1.4 Breeding and Hatchery management of giant freshwater prawn.

### UNIT – II

#### WATER QUALITY MANAGEMENT:

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

### UNIT – III

#### FEED MANAGEMENT:

- 3.1 Live Foods and their role in shrimp larval nutrition.
- 3.2 Supplementary feeds, Principal foods in artificial diets, Types of feeds, feed additives and Preservatives, role of probiotics.
- 3.3 Feed formulation and manufacturing, Feed storage, feeding strategies. Feeding devices, feeding schedules and ration size, Feed Evaluation - feed conversion efficiencies and ratios

## UNIT – IV

### DISEASE MANAGEMENT:

- 4.1 Principles of disease diagnosis and health management
- 4.2 Prophylaxis, Hygiene and Therapy of fish diseases
- 4.3 Specific and non-specific defense systems in fish, Fish immunization and vaccination
- 4.4 Etiology, Symptoms, prophylaxis and therapy of common fish diseases in fish ponds and common shrimp diseases in shrimp ponds

## UNIT – V

### ECONOMICS AND MARKETING:

- 5.1 Principles of aquaculture economics – Capital costs, variable costs, cost-benefit analysis
- 5.2 Fish marketing methods in India. Basic concepts in demand and price analysis.  
Fisheries Extension
- 5.3 Fisheries training and education in India. Role of extension in community development.
- 5.4 Genetic improvement of fish stocks – Hybridization of fish.
- 5.5 Gynogenesis, Androgenesis, Polyploidy, Transgenic fish, Cryopreservation of gametes, Production of monosex and sterile fishes and their significance in aquaculture.

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# DEPARTMENT OF ZOOLOGY

## ZOOLOGY SYLLABUS FOR VI SEMESTER ZOOLOGY – CLUSTER ELECTIVE PAPER: VIII - (3)

### POST HARVEST TECHNOLOGY

Time: 3 Hrs.

Max. Marks: 75

#### UNIT – I

##### HANDLING AND PRINCIPLES OF FISH PRESERVATION:

- 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.
- 1.2 Principles of preservation– cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to low radiation of gamma rays.

#### UNIT – II

##### 2. Methods of fish Preservation:

- 2.1 Traditional methods - sun drying, salt curing, pickling and smoking.
- 2.2 Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, Irradiation and Accelerated Freeze drying (AFD).

#### UNIT – III

##### PROCESSING AND PRESERVATION OF FISH AND FISH BY-PRODUCTS:

- 3.1 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.
- 3.2 Fish by-products – fish glue, isinglass, chitosan, pearl essence, shark fins, fish leather and fish maws.
- 3.3 Seaweed Products: Preparation of agar, algin and carrageen. Use of seaweeds as food for human consumption, in disease treatment and preparation of therapeutic drugs.

#### UNIT – IV

##### SANITATION AND QUALITY CONTROL:

- 4.1 Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.
- 4.2 Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

## UNIT – V

### QUALITY ASSURANCE, MANAGEMENT AND CERTIFICATION:

- 5.1 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.
- 5.2 National and International standards – ISO 9000: 2000 Series of Quality Assurance System, *Codex Alimentarius*.

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