

SRI YN COLLEGE (A) – NARSAPUR
(Affiliated to Adikavi Nannaya University)
Thrice Accredited by NAAC at 'A' Grade
I B.Sc Zoology – Semester – I - Paper – 1
Theory Syllabus for batch 2022 Onwards (w.e.f.2020-21)
ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES

Course Outcomes: By the completion of the course the graduate should be able to –

- Describe general taxonomic rules on animal classification
- Classify Protozoa to Coelenterata with taxonomic keys
- Classify Phylum Platyhelminthes to Annelida phylum using examples from parasitic adaptation and vermin composting
- Describe Phylum Arthropoda to Mollusca using examples and importance of insects and Molluscs
- Describe Echinodermata to Hemichordate with suitable examples and larval stages in relation to the phylogeny

Learning objectives

- To understand the taxonomic position of protozoa to helminthes.
- To understand the general characteristics of animals belonging to protozoa to hemichordate.
- To understand the structural organization of animal's phylum from protozoa to hemichordate.
- To understand the origin and evolutionary relationship of different phyla from protozoa to hemichordate.
- To understand the origin and evolutionary relationship of different phylum from annelids to hemichordates.

UNIT I:

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

Phylum Protozoa:

General Characters and classification of protozoa up to species level with suitable examples Locomotion, nutrition and reproduction in Protozoan's *Elphidium* (type study)

UNIT II:

Phylum Porifera:

General characters and classification up to species level with suitable examples **Skeleton in Sponges**, Canal system in sponges.

Phylum Coelenterate:

General characters and classification up to species level with suitable examples, Mutagenesis in Obelia, Polymorphism in coelenterates, **Corals and coral reefs formation**

Phylum Ctenophore:

General Characters and Evolutionary significance (affinities)

UNIT III:

Phylum Platyhelminthes:

General characters and classification up to species level with suitable examples, Life cycle and pathogenicity of *Fasciola hepatica*, Parasitic Adaptations in helminthes.

Phylum Nemathelminthes:

General characters and classification up to classes with suitable examples, Life cycle and pathogen city of *Ascaris lumbricoides*

UNIT IV:

Phylum Annelida:

General characters and classification up to species level with suitable examples, Evolution of Coelom and Coelomoducts, Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermin compost

Phylum Arthropoda :

General characters and classification up to species level with suitable examples Prawn- External characters, appendages, respiratory system and circulatory system Vision and respiration in Arthropoda, Metamorphosis in Insects Peripatus- Structure and affinities Social Life in Bees and Termites

UNIT V:

Phylum Mollusca: General characters and classification up to species level with suitable examples ,Pearl formation in Pelecypoda, Sense organs in Mollusca, Torsion in gastropods

Phylum Echinodermata: General characters and classification up to species level with suitable examples, Water vascular system in starfish, Larval forms of Echinodermata

Phylum Hemichordate: General characters and classification up to species level with suitable examples, Balanoglossus - Structure and affinities

Co-curricular activities (suggested)

Preparation of chart/model 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, spongespicules

Preparation of charts on life cycles of Fasciola and Ascaris

REFERENCE BOOKS:

L.H. Hyman 'The Invertebrates' Vol I, II and V. – M.C. Graw Hill Company Ltd.

Kotpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.

E.L. Jordan and P.S. Verma 'Invertebrate Zoology' S. Chand and Company.

R.D. Barnes 'Invertebrate Zoology' by: W.B. Saunders CO., 1986.

Barrington. E.J.W., 'Invertebrate structure and Function' by ELBS.

P.S. Dhami and J.K. Dhami. Invertebrate Zoology. S. Chand and Co. New Delhi.

Parker, T.J. and Haswell 'A text book of Zoology' by, W.A., Mac Millan Co. London.

Barnes, R.D. (1982). Invertebrate Zoology, V Edition"

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I B.Sc Zoology – Semester – II - Paper – II
Theory Syllabus for batch 2022 onwards (w.e.f.2020-21)
ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

Course Outcomes: By the completion of the course the graduate should able to –

- Describe general taxonomic rules on animal classification of chordates
- Classify Proto chordata to Mammalian with taxonomic keys
- Understand Mammals with specific structural adaptations
- Understand the significance of dentition and evolutionary significance
- Understand the origin and evolutionary relationship of different phyla from Prochordata to mammalian.

Learning objectives

- To understand the animal kingdom.
- To understand the taxonomic position of Protochordata to Mammalian.
- To understand the general characteristics of animals belonging to Fishes to Reptilians.
- To understand the body organization of Chordata.
- To understand the taxonomic position of Protherian mammals.

UNIT I:

General characters and classification of Chordata upto species level Protochordata- Salient features of Cephalochordate, Structure of *Branchiostoma* Affinities of Cephalochordate. Salient features of Urochordata Structure and life history of *Herdmania* Retrogressive metamorphosis Process and Significance.

UNIT II:

Cyclostomata, General characters, Comparison of *Petromyzon* and *Myxine* **Pisces:** General characters and classification of Fishes up to species level ***Scoliodon***: External features, Digestive system, Respiratory system, Structure and function of Heart, Structure and functions of the Brain. **Migration in Fishes** Types of Scales Dipnoi.

UNIT III:

General characters of Amphibian Classification of Amphibian up to species level with examples. ***Rana hexadactyla***: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and functions of the Brain

Reptilia: General characters of Reptilia, Classification of Reptilia up to species level with examples *Calotes*: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain **Identification of Poisonous snakes** and non- poisonous snakes and Skull in reptiles.

UNIT IV:

Aves: General characters and classification of Aves up to species level *Columba Livia*: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain **Migration in Birds** **Flight adaptation in birds.**

UNIT V:

General characters of Mammalian Classification of Mammalian up to species level with examples Comparison of Prototherians, Metatherians and Eutherians 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 local fish market and identification of local cartilaginous and bony fishes
- Maintaining of aquarium by students
- Thermocol model of fish heart and brain
- Preparation of slides of scales of fishes
- Visit to local/nearby river to identify migratory fishes and prepare study notes
- Preparation of Charts on above topics by students (Eg: comparative account of vertebrate heart/brain/lungs, identification of snakes etc.)
- Collecting and preparation of Museum specimens with dead frogs/snakes/lizards etc., and/or their skeletons
- Additional input on types of snake poisons and their antidotes (student activity).
- Collection of bird feathers and submission of report on Plumology
- Taxidermic preparation of dead birds for Zoology museum
- Map pointing of prototherian and metatherian mammals
- Chart preparation for dentition in mammals.

REFERENCE BOOKS:

1. J.Z. Young, 2006. The life of vertebrates. (The Oxford University Press, New Delhi).
2. Arumugam, N. Chordate Zoology, Vol. 2. Saras Publication.
3. A.J. Marshall, 1995. Textbook of zoology, Vertebrates. (The McMillan Press Ltd., UK). (Revised edition of Parker & Haswell, 1961).
4. M. Ekambaranatha Ayyar, 1973. A manual of zoology. Part II. (S. Viswanathan Pvt. Ltd., Madras).
5. P.S. Dhama & J.K. Dhama, 1981. Chordate zoology. (R. Chand & Co.)

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II B.Sc Zoology – Semester – III

Theory Syllabus for 2021 -24 batch (w.e.f.2021-22) Paper – 3

CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

Course Outcomes:

The overall course outcome is that the student shall develop deeper understanding of what life is and how it functions at cellular level. This course will provide students with a deep knowledge in Cell Biology, Animal Biotechnology and Evolution and by the completion of the course the graduate shall able to–

- To understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.
- Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.
- To understand the history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals
- Acquiring in-depth knowledge on various of aspects of genetics involved in sex determination, human karyo typing and mutations of chromosomes resulting in various disorder.
- Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins.
- Understand the principles and forces of evolution of life on earth, the process of evolution of new species and apply the same to develop new and advanced varieties of animals for the benefit of the society.

Learning Objectives

- To understand the origin of cell and distinguish between prokaryotic and eukaryotic cell.
- To understand the role of different cell organelles in maintenance of life activities.
- To provide the history and basic concepts of heredity, variations and gene interaction.
- To enable the students distinguish between polygenic, sex-linked, and multiple allelic modes of inheritance.
- To acquaint student with basic concepts of molecular biology as to how characters are expressed with a coordinated functioning of replication, transcription and translation in all living beings.
- To provide knowledge on origin of life, theories and forces of evolution.
- To understand the role of variations and mutations in evolution of organisms.

UNIT I:

Cell Biology: Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma Electron microscopic structure of animal cell. Plasma membrane – Models and transport functions of plasma membrane. Structure and functions of Golgicomplex, 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, Codominance, 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:

Origin of life Theories of Evolution: Lamarckism, Darwinism, Germ Plasm Theory, 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 centres 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
3. Bruce Alberts, Molecular Biology of the Cell
4. Rastogi, Cytology
5. Varma & Aggarwal, Cell Biology
6. C.B. Pawar, Cell Biology
7. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. Wiley India.
8. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc.
9. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cummings.
10. Russell, P. J. (2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.
11. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction to Genetic Analysis. IX Edition. W. H. Freeman and Co.
12. Ridley, M. (2004). Evolution. III Edition. Blackwell Publishing

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II B.Sc Zoology – Semester – IV

Theory Syllabus for 2021 -24 batch (w.e.f.2021-22) Paper – 4
Animal Physiology, Cellular Metabolism and Embryology

Course Outcomes:

This course will provide students with a deep knowledge in Physiology, Cellular metabolism and Molecular Biology and by the completion of the course the graduates shall be able to –

- Understand the functions of important animal physiological systems including digestion, cardiorespiratory and renal systems.
- Understand the muscular system and the neuro-endocrine regulation of animal growth, development and metabolism with a special knowledge of hormonal control of human reproduction.
- Describe the structure, classification and chemistry of Biomolecules and enzymes responsible for sustenance of life in living organisms
- Develop broad understanding the basic metabolic activities pertaining to the catabolism and anabolism of various Biomolecules
- Describe the key events in early embryonic development starting from the formation of gametes upto gastrula ion and formation of primary germ layers.

Learning Objectives

- To achieve a thorough understanding of various aspects of physiological systems and their functioning in animals.
- To instil the concept of hormonal regulation of physiology, metabolism and reproduction in animals.
- To understand the disorders associated with the deficiency of hormones
- To demonstrate a thorough knowledge of the intersection between the disciplines of Biology and Chemistry.
- To provide insightful knowledge on the structure and classification of carbohydrates, proteins, lipids and enzymes
- To demonstrate an understanding of fundamental biochemical principles such as the function of Biomolecules, metabolic pathways and the regulation of biochemical processes
- To make students gain proficiency in laboratory techniques in biochemistry and orient them to apply the scientific method to the processes of experimentation and hypothesis testing.

UNIT I: Animal Physiology -I:

Process of digestion and assimilation, Respiration - transport of oxygen and CO₂, (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:

Muscle contraction - Ultra structure of muscle, molecular and chemical basis of muscle contraction. Endocrine glands – Structure and 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.

UNIT IV: Cellular Metabolism –II:

Carbohydrate Metabolism - Glycolysis, Krebs cycle, Electron Transport Chain and Glycogen metabolism, Gluconeogenesis,

UNIT V: Embryology:

Gametogenesis Fertilization, Types of eggs Types of cleavages, Development of Frog upto 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 / Krebs'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.
12. Gilbert SF. 2006. Developmental Biology, 8th Edition. Sinauer Associates Inc., Publishers, Sunderland, USA.
13. Longo FJ. 1987. Fertilization. Chapman & Hall, London.
14. Rastogi VB and Jayaraj MS. 1989. Developmental Biology. Kedarnath Ram Nath Publishers, Meerut, Uttar Pradesh.
15. Schatten H and Schatten G. 1989. Molecular Biology of Fertilization. Academic Press, New York

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II B.Sc Zoology – Semester – IV
Theory Syllabus for 2021- 24 batch (w.e.f.2021-22) Paper – 5
Immunology and Animal Biotechnology

Course Outcomes:

This course will provide students with a deep knowledge in immunology, genetics, embryology and ecology and by the completion of the course the graduate shall be able to –

- To get knowledge of the organs of Immune system, types of immunity, cells and organs of immunity.
- To describe immunological response as to how it is triggered (antigens) and regulated (antibodies)
- Understand the applications of Biotechnology in the fields of industry and agriculture including animal cell/tissue culture, stem cell technology and genetic engineering.
- Get familiar with the tools and techniques of animal biotechnology.

Learning Objectives

- To trace the history and development of immunology
- To provide students with a foundation in immunological processes
- To be able to compare and contrast the innate versus adaptive immune systems and humoral versus cell-mediated immune responses
- Understand the significance of the Major Histocompatibility Complex in terms of immune response and transplantation
- To provide knowledge on animal cell and tissue culture and their preservation
- To empower students with latest biotechnology techniques like stem cell technology, genetic engineering, hybridoma technology, transgenic technology and their application in medicine and industry for the benefit of living organisms
- To explain in vitro fertilization, embryo transfer technology and other reproduction manipulation methodologies.
- To get insight in applications of recombinant DNA technology in agriculture, production of therapeutic proteins.
- To understand principles of animal culture, media preparation.

UNIT I: Immunology – I (Overview of Immune system):

Introduction to basic concepts in Immunology, Innate and adaptive immunity, Vaccines and Immunization programme, Cells of immune system, Organs of immune system

UNIT II: Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity) Antigens:

Basic properties of antigens, B and T cell epitopes and hapten Antibodies: Structure of antibody and functions of antibodies, Structure and functions of major histocompatibility complexes, Hypersensitivity – Classification and Types

UNIT III: Techniques:

Animal Cell, Tissue and Organ culture media: Natural and Synthetic media, Cell cultures: Establishment of cell culture (primary culture, secondary culture, types of cell lines; Organ culture; Cryopreservation of cultures Stem cells: Types of stem cells and applications and Monoclonal antibodies (mAb) .

UNIT IV: Applications of Animal Biotechnology: Genetic Engineering:

Basic concept, Vectors, Restriction Endo nucleases and **Recombinant DNA technology**
Gene delivery: Microinjection, electroporation.

Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, fish; applications
Manipulation of reproduction in animals.

UNIT V:

PCR: Basics of PCR.

DNA Sequencing:

Sanger's method of DNA sequencing- traditional and automated sequencing DNA fingerprinting: Procedure and applications.

Applications in Industry and Agriculture: Fermentation: Different types of Fermentation.

Agriculture: Monoculture in fishes, polyploidy in fishes

Co-curricular activities (suggested)

- Organizing awareness on immunization importance in local village in association with NCC and NSS teams.
- Charts on types of cells and organs of immune system
- Student study projects on aspects such as – identification of allergies among students (hypersensitivity), blood groups in the class (antigens and antibodies duly reported) etc., as per the creativity and vision of the lecturer and students
- Visit to research laboratory in any University as part of Zoological tour and exposure and/ or hands on training on animal cell culture.
- Visit to biotechnological laboratory in University or any central/state institutes and create awareness on PCR, DNA finger printing and blot techniques or Visit to a fermentation industry or Visit to a local culture pond and submit report on culture of fishes etc.

REFERENCE BOOKS:

1. Immunology by Ivan M. Riott
2. Immunology by Kubey
3. Sreekrishna V. 2005. Biotechnology –I, Cell Biology and Genetics. New Age International Publ. New Delhi, India

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III B.Sc Zoology – Semester – V
Theory Syllabus for 2020 -23 batch (w.e.f.2022-23) Paper – 6
SUSTAINABLE AQUACULTURE MANAGEMENT

Learning Outcomes:

Students at the successful completion of this course will be able to

- Evaluate the present status of aquaculture at the Global level and National level
- Classify different types of ponds used in aquaculture
- Demonstrate induced breeding of carps
- Acquire critical knowledge on commercial importance of shrimps
- Identify fin and shell fish diseases

Unit:1

1.1 Present status of Aquaculture–Global and National scenario

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

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

1.4 Design and construction of fish and shrimp farms

Unit:2

2.1 Functional classification of ponds–head pond, hatchery, nursery ponds

2.2 Functional classification of ponds-rearing, production, stocking and quarantine ponds

2.3 Need of fertilizer and manure application in culture ponds

2.4 Physio-chemical conditions of soil and water optimum for culture(Temperature, depth, turbidity, light, water, PH, BOD, CO₂and nutrients)

Unit:3

3.1. Induced breeding in fishes

3.2. Culture of Indian major carps: Pre-stocking management

(Dewatering, drying, ploughing/desilting; Predators, weeds and algal blooms and their control, Liming and fertilization)

3.3. Culture of Indian major carps-Stocking management

Unit:4

4.1 Commercial importance of shrimp &prawn

4.2 Macrobrachium rosenbergii-biology, seed production.

4.3 Culture of L.vannamei– hatchery technology and culture practices

4.4 Mixed culture of fish and prawns

Unit:5

5.1 Viral diseases of Fin Fish & shell fish

5.2 Fungal diseases of Fin & Shell fish

5.3 Bacterial diseases of Fin fish & Shell fish

References:

1. PillayTVR&M.A.Dill,1979.AdvancesinAquaculture.FishingNewsBooksLtd.,Lond on
2. StickneyRR1979.PrinciplesofWarmWaterAquaculture.JohnWiley&SonsInc.1981
3. BoydCE1982.WaterQualityManagementforPondFishCulture.ElsivierScientific Publishing Company.
4. Bose AN et.al. 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt. Ltd.

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III B.Sc Zoology – Semester – V
Theory Syllabus for 2020 -23 batch (w.e.f.2022-23) Paper – 7
POSTHARVESTTECHNOLOGYOFFISHANDFISHERIES

Learning Outcomes:

Students at the successful completion of this course will be able to

- Identify the types of preservation methods employed in aquaculture
- Choose the suitable Processing methods in aquaculture
- Maintain the standard quality control protocols laid down in aqua industry
- Identify the best Sea food quality assurance system

Unit-I Handling and Principles of fish Preservation

- 1.1 Handling of fresh fish, storage and transport of fresh fish, postmortem changes (rigormortis 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 Methods of fish Preservation

- 2.1 Traditional methods- sundrying, saltcuring, 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, Using glass, chitosan, pearl essence, shark fins, fish Leather and fish maws.

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—
ISO9000:2000 Series of Quality Assurance System, Codex Alimentarius.

1. Santharam R, N Sukumaran and P Natarajan 1987. A manual of aquaculture, Oxford-IBH, New Delhi
2. Lakshmi Prasad's, Fish Processing Technology 2012, Arjun Publishing House
3. Dr Sunitha Rai, Fish Processing Technology, 2015, Random Publications
4. Safety and Quality Issues in Fish Processing (Woodhead Publishing Series in Food Science, Technology and Nutrition) by H A Bremner