SRI A. S. N. M. GOVERNMENT COLLEGE(A), PALAKOL



DEPARTMENT OF ZOOLOGY

Semester –I

SRI A S N M GOVERNMENT COLLEGE, PALAKOL, W.G. DT

(Affiliated to AdikaviNannaya University, Rajahmundry)

(Accredited with NAAC "B" Grade with 2.61 CGPA points)

I B.Sc.

SEMESTER – I (Wef 2020-21 batch)

ZOOLOGY - PAPER - I

ANIMAL DIVERSITY-I-BIOLOGY OF NON-CHORDATES

Periods : 60

Max. Marks : 60

B. Sc	Semester: I	Credits:4
Paper: 1	Animal Diversity I – Biology of Nonchordates	Hrs/Wk:4

Course Outcomes:

By the completion of the course the graduate should able to – Describe general taxonomic rules on animal classification

- Classify Protozoa to Coelenterata with taxonomic keys
- Classify Phylum Platyhemninthes to Annelida phylum usingexamples from parasitic adaptation
- and vermin composting Describe Phylum Arthropoda to Mollusca using examples and importance of insects
- Molluscans 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 animalsbelonging to protozoa to hemichordate.
- To understand the structural organization of animal'sphylum 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 (typestudy)

UNIT II:

Phylum Porifera: General characters and classification up to species level with suitable examples Skelton 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 Platy helminthes: General characters and classification up to species level with suitable examples Life cycle and pathogen city of Fasciolahepatica Parasitic Adaptations in helminthes

Phylum Nemathelminthes: General characters and classification up to species level 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 Hirudinaria granulosa- External characters, digestive system, excretory system and reproductive system, 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 PrawnExternal characters, appendages, respiratory system and circulatory system Vision and respiration in Arthropoda, Metamorphosis in Insects Peripatus- Structure and affinitiesSocial Life in Bees and Termites

UNIT V:

Phylum Mollusca: General characters and classification up to species level with suitable examples ,**Pearlformation 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 phylogenic 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
- Clay models of canal system in sponges
- Preparation of charts on life cycles of Fasciola and Ascaris
- Visit to adopted village and conducting awareness campaign on diseases, to people as part of Socia
- 1• Responsibility. Plaster-of-Paris or Thermocol model of Periapt's
- Construction of a vermin compost in each college, manufacture of manure by students and donating to
- local farmers Models of compound eye, bee hive and terminarium (termitaria) by students
- Visit to apiculture centre and short-term training as part of apprenticeship programme of the govt. of
- Andhra Pradesh Chart on pearl forming layers using clay orThermocol

- Visit to a pearl culture rearing industry/institute
- Live model of water vascular system
- Phylogeny chart on echinoderm larvae and their evolutionary significance

• Preparation of charts depicting the feeding mechanism, 3coeloms, tornarialarvaetc., of Balanoglossus.

REFERENCE BOOKS:

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

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

- 3. E.L. Jordan and P.S. Verma 'Invertebrate Zoology' S. Chand and Company.
- 4. R.D. Barnes 'Invertebrate Zoology' by: W.B. Saunders CO., 1986.
- 5. Barrington. E.J.W., 'Invertebrate structure and Function' by ELBS.
- 6. P.S. Dhami and J.K. Dhami. Invertebrate Zoology. S. Chand and Co. New Delhi.
- 7. Parker, T.J. and Haswell'A text book of Zoology' by, W.A., Mac Millan Co.London.
- 8. Barnes, R.D. (1982). Invertebrate Zoology, VEdition"

SRI A.S.N.M.GOVERNMENTCOLLEGE(AUTONOMOUS),PALAKOLE (AFIILIATED TO ADIKAVI NANNAYYA UNIVERSITY) I B.SC.DEGREE MODEL QUESTION PAPER 2022-23 SEMESTER-I : SUBJECT-ZOOLOGY <u>ZOOLOGY - PAPER - I</u> ANIMAL DIVERSITY - NONCHORDATES

Time : 3 hrs

Max. Marks: 60

Part-A (5X4=20) Answer any five questions, each question carries Four marks, draw diagrams wherever necessary.

- 1. Spicules in sponges
- 2. Significance of Polymorphism.
- 3. Nematoblasts and statocyst
- 4. Annelia general characters
- 5. Nephron
- 6. Pearl Formation
- 7. Diptera
- 8. Balanoglossus structure

Part-B (5X8=40) Answer five questions, each question carries Eight marks, draw diagrams wherever necessary.

9 (a) Describe the life cycle of elphidium.

or

- (b) Explain in detail Canal system in sponges.
- 10 (a) Write in detail the life cycle of Aurelia
 - or (b) Write an essay of fasciola life cycle.
- 11 (a) Write an essay on processing of vermiculture.

or

- (b) Write the external characters of leech.
- 12 (a) write an essay on peripatus structure & affinities.
 - or
 - (b) Torsion in gastropoda-explain.
- 13 (a) Write an essay on water vascular system in star fish. Or
 - (b) General characters & classification of hemichordate

SRIA.S.N.M.GOVERNMENTCOLLEGE(AUTONOMOUS),PALAKOLE (AFIILIATED TO ADIKAVI NANNAYYA UNIVERSITY) ZOOLOGY PRACTICAL SYLLABUS FOR I SEMESTER

ZOOLOGY - PAPER - I ANIMAL DIVERSITY-I BIOLOGY OF NONCHORDATES Periods : 24 Max. Marks : 50

B. ScSemester: ICredits:1Paper: 1LAnimal Diversity I – Biology of
Nonchordates LABHrs/Wk:2

Learning Outcomes:

To understand the importance of preservation of museum specimens

- To identify animals based on special identifying characters
- To understand different organ systems through demo or virtual dissections
- To maintain a neat, labeled record of identified museum specimens

1. STUDY OF MUSEUM SLIDES / SPECIMENS / MODELS (CLASSIFICATION OF ANIMALS UP TO ORDERS)

PROTOZOA: Amoeba, Paramecium, Paramecium Binary Fission And Conjugation, Vorticella, Entamoebahistolytica, Plasmodium Vivax

COELENTERATA: Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatulav

PLATYHELMINTHES: Planaria, Fasciola Hepatica, Fasciolalarval Forms – Miracidium, Redia, Cercaria, Echinococcusgranulosus, Taeniasolium, Schistosomahaematobiumvii

NEMATHELMINTHES: Ascaris (Male & Female), Drancunculus, Ancylostoma, Wuchereria

ANNELIDA: Nereis, Aphrodite, Chaetopteurs, Hirudinaria, Trochophore Larva

ARTHROPODA: Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Periapt's, Larvae - Nauplius, Mysis, Zoea, Mouth Parts Of Male &Female Anopheles And Culex, Mouthparts Of Housefly And Butterfly. Xiii.

MOLLUSCA: Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium Larva

ECHINODERMATA: Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Ante Don, Bipinnaria Larva

HEMICHORDATA: Balanoglossus, Tornaria Larva.

2. Dissections: Prawn: Appendages, Digestive System, Nervous System, Mounting Of Statocyst Insect Mouth Parts

Laboratory Record Work Shall Be Submitted At The Time Of Practicalamination

An "Animal Album" Containing Photographs, Cut Outs, With Appropriate Write Up About The Above Mentioned Taxa. Different Taxa/ Topics May Be Given To Differentsets Of Students For Thispurpose Computer - Aided Techniques Should Be Adopted Or Show Virtual Dissections

RFERENCE MANUALS:

- 1. Practical Zoology- Invertebrates S.S.Lal
- 2. Practical Zoology Invertebrates P.S. Verma
- 3. Practical Zoology Invertebrates K.P.Kurl

4. Ruppert And Barnes (2006) Invertebrate Zoology,8th Edition, Holt Saundersinternational Edition

SRI A.S.N.M.GOVERNMENTCOLLEGE(AUTONOMOUS),PALAKOLE (AFIILIATED TO ADIKAVI NANNAYYA UNIVERSITY) ZOOLOGY PRACTICAL MODEL PAPER FOR I SEMESTER

ANIMAL DIVERSITY OF NON- CHORDATES

Time: 3hours

Marks: 50marks

 Draw a labelled diagram of virtual dissection/ dissected animal of ----- 1x8=8M
 Diagram -4M,Labelled-4M Unlabelled diagram carries no marks
 Identification 5x4=20M
 Museum Specimens/Models/Photographs

Identification-1M,Labelled diagram -1M,Identifying characters-2M

- 3. Identification 3x4=12M
 Slides/Photographs/Charts Identification-1M,Labelling diagram -1M,Identifying characters-2M
- 4. Certified Record and Viva-Voce 5+5=10M

SRI A.S.N.M.GOVERNMENTCOLLEGE(AUTONOMOUS),PALAKOLE (AFIILIATED TO ADIKAVI NANNAYYA UNIVERSITY) I B.SC.DEGREE SYLLABUS 2022-23. SEMESTER-II : SUBJECT-ZOOLOGY

ZOOLOGY - PAPER - II ANIMAL DIVERSITY II- CHORDATES

Periods : 60

Max. Marks: 60

B. Sc	Semester: I	Credits:4
Paper: 2	Animal Diversity II – Biology of Chardates	Hrs/Wk:4
	Unordates	

Course Outcomes:

By the completion of the course the graduate should able to - Describe general taxonomic rules on animal classification of chordates

- Classify Protochordata 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 upto 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 upto species level with examples. Ranahexadactyla: 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 upto species level with examples

Calotes: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain Identification of Poisonous and non-poisonous snakes and Skull in reptiles.

UNIT IV:

Aves: General characters and classification of Aves upto 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:

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). 646 pages. Reprinted 2. Arumugam, N. Chordate Zoology, Vol.

2. Saras Publication. 278 pages. 200 figs.

3. A.J. Marshall, 1995. Textbook of zoology, Vertebrates. (The McMillan PressLtd., UK). 852 pages. (Revised edition of Parker & Haswell, 1961).

4. M. Ekambaranatha Ayyar, 1973. A manual of zoology. Part II. (S. ViswanathanPvt. Ltd.,Madras).

SRIA.S.N.M.GOVERNMENTCOLLEGE(AUTONOMOUS), PALAKOLE (AFIILIATED TO ADIKAVI NANNAYYA UNIVERSITY) ZOOLOGY MODEL PAPER FOR II SEMESTER

ZOOLOGY - PAPER - II

ANIMAL DIVERSITY II – BIOLOGY OF CHORDATES

arks : 60 M

5x8=40

Time : 3 hrs	Max. Marks : (
I. Answer any FIVE of the following :	5x4=20
Draw labelled diagrams wherever necessary	
1. Amphioxus	
2. Placoid scale	
3. Quill feather	
4. Prototheria	
5. Anadromous migration	
6. Draco	
7. Emu	
8. Apoda	
II. Answer any FIVE of the following :	5
Draw labelled diagrams wherever necessary	
9. Explain the life history of Herdmania	
OR	
Explain the origin and general characters of chordates	
10. Compare the characters of <i>Petromyzon</i> and <i>Myxine</i>	
OR	
Describe the structure of heart of Scoliodon	
11. Describe the brain of Rana hexadactyla	
OR	
Explain the external features of <i>Calotes</i>	
12. Write an essay on flight adaptations in birds	
OR	
Explain the respiratory system of Columba livia	
13. Compare the characters of Metatheria and Eutheria	
OR	
Write an essay on dentition in mammals	
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SRI A.S.N.M.GOVERNMENTCOLLEGE(AUTONOMOUS),PALAKOLE (AFIILIATED TO ADIKAVI NANNAYYA UNIVERSITY) ZOOLOGY PRACTICAL SYLLABUS FOR II SEMESTER

ZOOLOGY - PAPER - II

ANIMAL DIVERSITY II – BIOLOGY OF CHORDATES LAB

Periods : 24

Max. Marks : 50

B. Sc	Semester: I	Credits:1
Paper: 2	Animal Diversity II – Biology of	Hrs/Wk:2
	Chordates lab	

Learning Outcomes:

To understand the Taxidermic and other methods of preservation of chordates

- To identify chordates based on special identifying characters
- To understand internal anatomy of animals through demo or virtual dissections, thus directing the student for "empathy towards the fellow living beings" To maintain a neat, labelled record of identified museum specimens
- Observation of the Following Slides / Spotters / Models Protochordata: Herdmania, Amphioxus, Amphioxus T.S through pharynx.
- Cyclostomata: Petromyzon and Myxine.
- Pisces: Pristis, Torpedo, Hippocampus, Exocoetus, Echeneis, Labeo, Catla,

• Claries, Channa, Anguilla. Amphibian: Ichthyophis, Amblystoma, Axolotl larva, Hyla,

- Reptilia: Draco, Chameleon, Uromastix, Testudo, Trionyx, Russels viper, Naja
- Krait, Hydrophis, Crocodile
- .• Aves: Psittacula, Eudynamis, Bubo, Alcedo.
- Mammalian: Ornithorhynchus, Pteropus, Funambulus.

Dissections-

- 1. Scoliodon IX and X, Cranial nerves
- 2. Scoliodon Brain
- 3. Mounting of fish scales

Note:

1. Dissections are to be demonstrated only by the faculty or virtual.

2. Laboratory Record work shall be submitted at the time of practical examination

. REFERENCE BOOKS:

- 1. S.S.Lal, Practical Zoology -Vertebrate
- 2. P.S.Verma, A manual of Practical Zoology Chordata

SRI A.S.N.M.GOVERNMENTCOLLEGE(AUTONOMOUS),PALAKOLE (AFIILIATED TO ADIKAVI NANNAYYA UNIVERSITY) ZOOLOGY PRACTICAL MODEL PAPER FOR II SEMESTER

ANIMAL DIVERSITY II -BIOLOGY OF CHORDATES

Time: 3hours

Marks: 50marks

- Draw a labelled diagram of virtual dissection/ dissected animal of ----- 1x8=8M
 Diagram -4M,Labelling-4M
 Unlabelled diagram carries no marks

 Identification 5x4=20M
 Museum Specimens/Slides/Models/Photographs
 Identification-1M, Labelled diagram -1M, Identifying characters-2M

 Identification 3x4=12M
 Osteology
 Identification-1M, Labelled diagram -1M, Identifying characters-2M
 - 4. Certified Record and Animal Album 5+5=10M

Sri A.S.N.M. GOVERNMENT COLLEGE (Autonomous)CBCS SYLLABUS SCHEDULE 2021-22. II B.SC. ZOOLOGY SYLLABUS FOR III SEMESTERZOOLOGY -PAPER - III Cell Biology, Genetics, Molecular Biology and Evolution

B. Sc	Semester: I	Credits:4
Paper: 3	Cell biology ,Genetics ,Molecular	Hrs/Wk:4
	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 Golgi complex,

Endoplasmic Reticulum and Lysosomes Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes

(Note: 1. General pattern of study of each cell organelle - Discovery, Occurrence, Number, Origin, Structure and Functions with suitable diagrams)

2. Need not study cellular respiration under mitochondrial functions

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 Haplodiploidy types of sex determination) Sex linked inheritance (X-linked, Y-linked & XYlinked 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 BiologyBasic 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 NeoDarwinism: 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/geneticcode

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

Sri A.S.N.M. GOVERNMENT COLLEGE (Autonomous)CBCS SYLLABUS SCHEDULE 2021-22 II B.SC. ZOOLOGY SYLLABUS FOR III SEMESTER ZOOLOGY – MODEL PAPER - III CYTOLOGY, GENETICS AND EVOLUTION

Time : 3 hrs

Max. Marks : 75

5x5=25M

I. Answer any FIVE of the following:

Draw labelled diagrams wherever necessary

- 1. Difference between Prokaryotes and Eukaryotes
- 2. Endoplasmic reticulum
- 3. Cuboidal epithelium
- 4. Bone
- 5. Epistasis
- 6. Pleiotropism
- 7. . Downs syndrome
- 8. Speciation

9. Answer any FIVE of the following: Draw labelled diagrams wherever necessary

9.a) Describe the ultra structure of a cell

(or)

b) Give an account on structure of plasma membrane and function

10. a) Write about the connective tissue

(or)

- b) Give an account of the cartilage
- 11 a) Give an account of Mendal's laws of laws of heredity and explain with suitable example.

(or)

b) Explain Incomplete dominance and Co dominance with example

12.a) What are sex chromosomes ? Explain their role in determination of sex.

(or)

b) What is sex linked inheritance and explain sex lined in heritance in man.

13. a) Write as essay on isolation.

(or)

b) What is macro evolution? Explain it with adoptive radiation in Darwin's finches(birds).

5x10=50M

Sri A.S.N.M. GOVERNMENT COLLEGE(Autonomous) CBCS SYLLABUS w.e.f 2022-23. II B.SC. ZOOLOGY PRACTICAL SYLLABUS FOR I SEMESTER ZOOLOGY - PAPER - III

B. Sc	Semester: I	Credits:1
Paper: 31	Cell biology ,Genetics	Hrs/Wk:2
	,Molecular Biology and	
	Evolution lab	

Learning Objectives:

Acquainting and skill enhancement in the usage of laboratory microscope Hands-on experience of different phases of cell division by experimentation Develop skills on human Karyo typing and identification of chromosomal disorders To apply the basic concept of inheritance for applied research To get familiar with phylogeny ad geological history of origin & evolution of animals

I. Cell Biology

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 and problems.

2. Problems on blood group inheritance and sex linked inheritance.

3. Study of human Karyo types (Down's syndrome, Edwards, syndrome, Patausyndrome,

Turner's syndrome and Klinefelter syndrome).

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. Study of Genetic Drift by using examples of Darwin's finches(pictures).

5. Visit to Natural History Museum and submission of report

REFERENCE BOOKS:

1. Burns GW. 1972. The Science of Genetics. An Introduction to Heredity. Mac MillanPubl.Co.Inc.

2. Gardner EF. 1975. Principles of Genetics. John Wiley & Sons, Inc. NewYork.

3. Harth and Jones EW. 1998. Genetics – Principles and Analysis. Jones and BarHett Publ.Boston.

4. Levine L. 1969. Biology of the Gene. Toppan.

5. Pedder IJ. 1972. Genetics as a Basic Guide. W. Norton & Company, Inc.

SRI A.S.N.M.GOVERNMENTCOLLEGE(AUTONOMOUS),PALAKOLE (AFIILIATED TO ADIKAVI NANNAYYA UNIVERSITY) ZOOLOGY PRACTICAL SYLLABUS FOR III SEMESTER

ZOOLOGY - PAPER - III

CYTOLOGY, GENETICS AND EVOLUTION LAB

Periods : 24

Max. Marks : 50

1.	Write the procedure for preparation of chiromonas salivary gland ch	hromosome 1x10=10M
2.	Write the human karyotyping of human Y chromosome	1x5=5M
3.	Identify ,draw neat labelled diagram with notes for the following	5x4=20M
	 A. Telophase B. Pachytene C. A cross is made between two different characters. By monohybrid cross fortwo F1 generations 38 red eyed and 13 white eyed Drosophila appeared. Proove whether it is phenotypically 3:1 true or not D. Describe the dihybrid ratio according to Mendel laws. 	
4.	Identify ,draw labelled diagram with notes for the followingA. Colour blindnessB. Macroevolution of Darwin finches	2x5=10M
5.	Certified Record	=5M

Sri A.S.N.M. GOVERNMENT COLLEGE (Autonomous) CBCS SYLLABUS w.e.f. 2022-23 II B.SC ZOOLOGY SYLLABUS FOR IV SEMESTER PAPER IV : ANIMAL PHYSIOLOGY,CELLULAR METABOLISM AND EMBRYOLOGY

B.Sc	Semester IV	Credits 4
Paper 4	Animal Physiology,Cellular	Hrs / Wk : 4
-	Metabolism And Embryology	

COURSE OUTCOMES;

This course will provide students with a deep knowledge in physiology,cellular metabolism and embryology and by the completion of the courses the graduate shall be able to –

- Understand the functions of important animal physiological systems including Digestion ,cardio Respiratory 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 sustainance of life in living organisms.
- Develop broad understanding the baqsic 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 andtheir 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 - Pulmonary ventilation, 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 currentMechanism

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, β -oxidation of palmitic acidProtein metabolism - Transamination, Deamination and Urea Cycle

UNIT V: Embryology: Gametogenesis Fertilization, Types of eggs Types of cleavages, Development of Frog upto formation of primary germ layers

Co-curricular activities (Suggested)

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 disorder

REFERENCE BOOKS:

1. Eckert H. Animal Physiology: Mechanisms and Adaptation. W.H. Freeman &Company.

2. Floray 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.

SRI A.S.N.M. GOVT (A) COLLEGE, PALAKOL

MODEL QUESTION PAPERS(Semester - End)

B .Sc DEGREE EXAMINATIONS SEMESTER - IV Course - 4: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY

Time: 3hrs.

Max. Marks: 75

Section - A Answer any FIVE of the following: 5x5=25

Draw labeled diagrams wherever necessary

- **1**. Assimilation
- 2. Cardiac cycle
- 3. Ultra structure of muscle
- 4. Pancreas
- 5. Structure of glucose
- 6. Lipids
- 7. Gluconeogenesis
- 8. Types of eggs

II.Section - B Answer any FIVE of the following: 5x10=50

Draw labeled diagrams wherever necessary

10.a. Explain the process of digestion.

OR

- b. Describe the structure and function of heart
- 10. a. Give an account of nerve impulse transmission.

OR

- b. Write an essay on the hormonal control of reproduction in mammals
- 11. a. Write an essay on the classification of carbohydrates OR
- b. Classify the enzymes. Discuss the mechanism of enzyme action.
- 12. a. Write an account on Kreb's cycle.

OR

- b. Explain B- oxidation of palmitic acid
- 13. a. Discuss the process of fertilization.

OR

b. Write an essay on gameto genesis.

Sri A.S.N.M. GOVERNMENT COLLEGE (Autonomous) CBCS SYLLABUS w.e.f. 2022-23 II B.Sc ZOOLOGY SYLLABUS FOR IV SEMESTER PAPER IV : ANIMALPHYSIOLOGY,CELLULAR METABOLISM AND EMBRYOLOGY LAB

B.Sc	Semester IV	Credits 1
Paper 4L	Animal Physiology, Cellular Metabolism And	Hrs / Wk : 2
_	Embryology Lab	

LEARNING OBJECTIVES

- Identification of an organ system with histological structure
- Deducing human health based on the information of composition of blood cells
- Demonstration of enzyme activity invitro
- Identification of various Biomolecules of tissues by simple colorimetric methods and also quantitative methods
- Identification of different stages of earl embryonic development in animals.

I. Animal physiology

1. Qualitative tests for identification of carbohydrates, proteins and fats

- 2. Study of activity of salivary amylase under optimum conditions
- 3. T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage
- 4. Differential count of human blood

II. Cellular metabolism

- 1. Estimation of total proteins in given solutions by Lowry's method.
- 2. Estimation of total carbohydrate by Anthrone method.

3. Qualitative tests for identification of ammonia, urea and uric acid

4. Protocol for Isolation of DNA in animal cells

III. 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. Construction of fate map of frog blastula

REFERENCE BOOKS: Harper's Illustrated Biochemistry,Cell and molecular biology: Concepts & experiments. VI Ed. John Wiley &sons. Inc.

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CBCS SYLLABUS w.e.f. 2022-23 II B.SC ZOOLOGY SYLLABUS FOR IV SEMESTER PAPER V- IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

B.Sc	Semester IV	Credits 4
Paper 5	Immunology and animal	Hrs / Wk : 4
	biotechnology	

OUT COMES;

This couuse will provide students with deep knowledge in immunology, genetics, embryology and ecology and by the completion of the course the graduate swhall beb able to -

- To get knowledge of the organs of the immunesystem, types of immunity, cells and organs of immunity.
- To describe immunological response as to how it is triggered (antigens) and regulated(antibodies)
- To understand the applications of biotechnology in the fields of industry and agriculture incliding animal cell/ tissue culture ,stem cell technology and genetic engineering.
- Get familiar with the toolsand 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, hyridoma technology, transgenic technology and their applicationin 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 or recombinant DNA technology .

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 epitomes, happens and adjuvant; Factors influencing immunogenicity

Antibodies: Structure of antibody, Classes and functions of antibodies Structure and functions of major his to compatibility complexes, Exogenous and Endogenous pathways of antigen presentation and processing 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; Protocols for Primary Cell Culture); Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures Stem cells: Types of stem cells and applications, Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb)

UNIT IV:

Applications of Animal Biotechnology: Genetic Engineering: Basic concept, Vectors, Restriction Endo nucleases andRecombinant DNA technology Gene delivery: Microinjection, electroportion, biolistic method (gene gun), liposome and viral-mediated gene delivery Transgenic Animals: Strategies of Gene transfer; **Transgenic - sheep, fish,** applications Manipulation of reproduction in animals: Artificial Insemination, Invitro fertilization, super ovulation, Embryo transfer, Embryo cloning

UNIT V:

PCR: Basics of PCR.

DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing (2hrs)

Hybridization techniques: Southern, Northern and Western blotting **DNA** fingerprinting: Procedure and applications

Applications in Industry and Agriculture: Fermentation: Different types of

Fermentation and Downstream processing; 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

• **REFERENCE BOOKS**:

- 1. Immunology by Ivan M.Riott
- 2. Immunology by Kubey
- 3. Sree krishna V. 2005. Biotechnology –I, Cell Biology and Genetics. New AgeInternational Publ. New Delhi, India

Sri A.S.N.M. GOVERNMENT COLLEGE (Autonomous)

CBCS SYLLABUS SCHEDULE 2022-23

II B.SC. ZOOLOGY SYLLABUS FOR IV SEMESTERZOOLOGY – MODEL PAPER - V

Time: 3 hrs

Max. Marks : 75

Section - A Answer any FIVE of the following: 5x5=25

Draw labeled diagrams wherever necessary

- 1. Vaccines
- 2. Primary lymphoid organs
- 3. Hapten
- 4. Hypersensitivity
- 5. Natural media
- 6. Cell lines
- 7. Endo nucleases
- 8. Polyploidy in fishes

Section - B Answer any FIVE of the following: 5x10=50

Draw labeled diagrams wherever necessary

- 6.a. Define immunity. Write in detail about innate immunity. OR
- b. Explain various cells of immune system
- 10. a. Describe the structure of antibody. Add a note on their functions.

b. Describe the structure of MHC molecules. Discuss their role in the mechanism of exogeneous and endogeneous pathway of antigen processing and presentation

11. a. Write an essay on different types of stem cells and their applications

OR

- b. Explain the production and applications of monoclonal antibodies.
- 12. a. Write an account on recombinant DNA technology.

OR

- b. Write an essay on transgenic animals
- 13. a. Explain hybridization techniques.

OR

b. Write an essay on PCR

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CBCS SYLLABUS w.e.f. 2022-23 II B.SC ZOOLOGY SYLLABUS FOR IV SEMESTER PAPER V- IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY LAB

B.Sc	Semester IV	Credits 1
Paper 5L	Immunology and animal	Hrs/Wk:2
	biotechnology LAB	

• Learning Objectives:

a. Acquainting student with immunological techniques vis-à-vis theory taught in the classroom

b. Interconnect the theoretical and practical knowledge of immunity with the outer world for the development of a healthier life.

c. Demonstrate basic laboratory skills necessary for Biotechnology research

d. Promoting application of the lab techniques for taking up research in higher studies.

• I. 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. Immune electrophoresis

• II. Animal biotechnology

1. DNA quantification using DPA Method.

2. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting

3. Separation, Purification of biological compounds by paper, Thin-layer and Column chromatography

4. Cleaning and sterilization of glass and plastic wares for cell culture.

5. Preparation of culture media.

• **REFERENCE BOOKS:**

1. Immunology Lab Biology 477 Lab Manual; Spring 2016 Dr. Julie Jameson

2. Practical Immunology A Laboratory Manual; LAP LAMBERT AcademicPublishing

3. Manual of laboratory experiments in cell biology by Edward

4. Laboratory Techniques by Plummer

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CBCS SYLLABUS w.e.f. 2022-23 II B.SC ZOOLOGY SYLLABUS FOR IV SEMESTER PAPER V- IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY LAB

Model question paper and scheme of valuation (w.e.f 2020-21 admited batch)

Duration :3 hrsMax.Marks:50

1. Identify the following slides 3x5=15M

A) B) C)

- 2. Identify the blood group in the given sample10M
- 3. Write briefly about DNA fingerprinting technique 15M
- 4. Vivavoice 05 M
- 5. Record

05 M

Sri A.S.N.M. GOVERNMENT COLLEGE (Autonomous) CBCS SYLLABUS w.e.f. 2022-23 II B.SC ZOOLOGY SYLLABUS FOR V SEMESTER Course6 A: SUSTAINABLE AQUACULTURE MANAGEMENT (Skill Enhancement Course (Elective), -Credits: 05)

I. COURSE 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

I. Syllabus: (Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

Unit: 1

1.1 Present status of Aquaculture - Global and National scenario

1.2 Major cultivable species for aquaculture: freshwater, 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, CO2 and 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

3.4. Culture of Indian major carps - post-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 Finfish & Shell fish

5.4 Prophylaxis in aquaculture

III. References:

1. Pillay TVR & M.A.Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London

2. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & Sons Inc.1981

3. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsivier Scientific Publishing Company.

4. Bose AN et.al. 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt. Ltd.

Web Links:

1.http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/Gener al/x6708e/x6708e06.htm

2. http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf

3. https://www.notesonzoology.com/india/fishery/fish-diseases-symptoms-and-control-fishery/871

Sri A.S.N.M. GOVERNMENT COLLEGE (Autonomous) CBCS SYLLABUS w.e.f. 2022-23 II B.SC ZOOLOGY

Course6 A: SUSTAINABLE AQUACULTURE MANAGEMENT PRACTICAL SYLLABUS

I.Learning Outcomes:

On successful completion of this practical course, student shall be able to:

- □ Identify the characaters of Fresh water cultivable species
- □ Etimate physico chemical characateristics of water used for aquaculture

Examine the diseases of fin and shell fish

□ Suggest measures to prevent diseases in aquaculture

II. Practical (Laboratory) Syllabus: (30hrs) (Max.50Marks)

1. Fresh water Cultivable species any (Fin & Shell Fish Specimens –

Observation of morphological characters by observation and drawings)-5

2. Brackish water cultivable species (Fin &Shell fish- Specimens- Observation of Morphological Character by observing drawing) -5

3. Hands on training on the use of kits for determination of water quality in aquaculture (DO, Salinity, pH, Turbidity- Testing kits to be used for the estimation of various parameters/ Standard procedure can be demonstrated for the same)

4. Demonstration of Hypophysation(Procedure of hypophysation to be demonstrated in the practical lab with any edible fish as model)

5. Viral diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of viral pathogens in fin/ shell fish – one edible specimen can be used for observation of same in the laboratory)

6. Bacterial diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)

7. Fungal diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)

III. Lab References

1. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company

2.http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/Gener al/x6708e/x6708e06.htm

IV. Co-Curricular Activities

a) Mandatory:(*Student training by teacher in field skills: Total 15 hrs., Lab:10* + *field 05*)

1. For Teacher: Training of students by the teacher in laboratory/field fornotlessthan15 hours on Breeding- Induced breeding in carps -hatchery technology of *L. Vennami*- Farming techniques- disease diagnostic techniques—concepts –Demonstration @ any aqua laboratory

2. For Student: Students shall (individually) visit a Hatchery/Farm/ Aqua diagnostic center and make careful observations of the process method and implements- protocols and report on the same in 10 pages hand written Fieldwork/Project work Report.

3. Max marks for Fieldwork/Project work Report: 05.

4. Suggested Format for Fieldwork/Project work: Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.

5. (IE).Unit tests.

b) Suggested Co-Curricular Activities

1. Preparation of Model/Charts of Cultivable species of fin fish shell fish

2. Preparation of Model/Chart of Ideal fish Pond- with the standards prescribed.

3. Observation of aquaculture activities in their area (Observation of any activity related to aquaculture in the vicinity of the college/village)

4. Preparation of Model – charts of Fin /Shell fish Diseases with eco-friendly material.

Sri A.S.N.M. GOVERNMENT COLLEGE (Autonomous) CBCS SYLLABUS w.e.f. 2022-23 II B.SC ZOOLOGY

Course 7 A: POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES

(Skill Enhancement Course (Elective), - Credits: 05)

I. Course 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 Seafood quality assurance system

II. **Syllabus:** *Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)*

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 Methods of fish Preservation

2.1 Traditional methods - sun drying, salt

- 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

3.1Fish 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 – ISO 9000: 2000 Series of Quality Assurance System, *Codex Aliment Arius*.

III. References:

1. Santharam R, N Sukumaran and P Natarajan 1987. A manual of aquaculture, Oxford- IBH, NewDelhi

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

5. K.A Mahanthy, Innovations in Fishing and Fish Processing Technologies, January 2021

Web Resources:

1. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=145743

2. https://ecourses.icar.gov.in/e-Leaarningdownload3_new.aspx?Degree_Id=03

Sri A.S.N.M. GOVERNMENT COLLEGE (Autonomous) CBCS SYLLABUS w.e.f. 2022-23 II B.SC ZOOLOGY Course 7 A: POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES

PRACICAL SYLLABUS

I. Course Outcomes:

On successful completion of this practical course, student shall be able to:

□ Identify the quality of aqua processed products.

□ Determine the quality of fishery by products by observation

□ Analyze the protocols of aqua processing methods

II. Practical(Laboratory) Syllabus:

1. Evaluation of fish/ fishery products for organo leptic, chemical and microbial quality.

2. Preparation of dried, cured and fermented fish products

For detailed procedure method visit sites:

3. Examination of salt, protein, moisture in dried / cured products

4. Examination of spoilage of dried / cured fish products, marinades, pickles, sauce.

5. Preparation of isinglass, collagen and chitosan from shrimp and crab shell.

6. Developing flow charts and exercises in identification of hazards – preparation of hazard analysis worksheet

7. Corrective action procedures in processing of fish-flow chart-work sheet preparation

(** Refer the following web sites for complete procedure method and estimations of above listed practicals)

III. References:

1. Dr Sunitha Rai, Fish Processing Technology, 2015, Random Publications

2. https://ecourses.icar.gov.in/e-Leaarningdownload3_new.aspx?Degree_Id=03

3. https://vikaspedia.in/agriculture/fisheries/post-harvest-and-

marketing/processing-in-fisheries/fermented-products

4.https://krishi.icar.gov.in/jspui/bitstream/123456789/20500/1/Fermentation%2 Otechnology%20for%20fish.pdf

5. http://jebas.org/00200620122014/Abujam%20et%20al%20JEBAS.pdf

6.https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Ma

nual_Hygienic%20drying%20and%20packing%20of%20fish.pdf

7.https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Ma

nual_Hygienic%20drying%20and%20packing%20of%20fish.pdf

- 8. https://agritech.tnau.ac.in/fishery/fish_byproducts.html
- 9. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5352841/

10. http://www.fao.org/3/i1136e/i1136e.pdf

11.http://www.fao.org/3/x5989e/X5989e01.htm#What%20is%20sensory%20as sessment) Web resources suggested by the teacher concerned and the college librarian including reading material

Co-Curricular Activities

a) Mandatory: (Lab/field training of students by teacher (lab 10 + field 05):

1. For Teacher: Training of students by the teacher in

laboratory/fieldfornotlessthan15hourson various steps of post-harvest techniques of fishes, on the advanced techniques in post-harvest technology – Training of students on other employability skills in the Post-harvest sector of Aquaculture Industry- like Processing, Packing, marketing of processed aqua products.

2. For Student: Students shall (individually) visit - Any fish/shrimp Processing

Plant/Packing industry and make observations on post harvesting techniques

and submit a brief handwritten Fieldwork/Project work Report with pictures

and data /survey in 10 pages