

**PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A)
KAKINADA**

Re-Accredited by NAAC with B++ Grade

**DEPARTMENT OF ZOOLOGY
&
AQUACULTURE**

BOARD OF STUDIES

B.Sc. AQUACULTURE
(Single Major System)



2026 - 2027

Choice Based Credit System
(Convened on 30-06-2026)

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B.Sc. AQUACULTURE • SINGLE MAJOR SYSTEM • 2026-2027

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PROCEEDINGS OF THE PRINCIPAL (FAC), PITHAPUR RAJAH'S GOVT. COLLEGE [A], KAKINADA
Present: Dr. Kandula Anjaneyulu, M.A, Ph.D.

Rc.No.4/A.C/BOS- UG & PG /2026-27

Dt.17 June 2026

Sub: P.R. Government College (Autonomous), Kakinada – Academic Cell – Conduct of Board of Studies (BoS) Meetings for UG and PG Programmes for the Academic Year 2026–27 – Communication of Guidelines – Regarding.

ORDER:

The autonomous colleges, in alignment with their vision, mission, stated objectives, and core values, are mandated to design and develop their own outcome-based curricula. This must be done with due consideration for societal, local, and global industry requirements, employability, and the development of industry-ready and transferable skills. Accordingly, every programme shall prescribe Course Outcomes (COs), Programme Outcomes (POs), and Programme Specific Outcomes (PSOs) along with a suitable learning outcome assessment management system, supported by a robust and transparent evaluation mechanism to measure attainment levels among students.

Further, the A.P. State Council of Higher Education (APSCHE) has introduced a revised curricular framework effective from the Academic Year 2025-26, incorporating Skill Enhancement Courses, Multi-Disciplinary courses, the Indian Knowledge System and a revised credit structure.

Our institution, from the Academic Year 2022–23 onwards, has defined a renewed vision and mission along with updated objectives and core values, necessitating the design and reorientation of its academic and research administration in line with these directives.

In light of the above responsibilities prescribed by the institution's vision and mission, NEP–2020, NAAC, NIRF, and the APSCHE's revised and new UG and P.G. curricular framework, it is imperative to customize, design, and re-orient our academic and research activities to meet the expectations of students, industries, and government stakeholders.

Accordingly, the Chairpersons of the U.G and P.G Boards of Studies (BoS) of various departments are hereby requested to make necessary arrangements to convene their BoS meetings from **25 June to 30 June 2026**.

The Chairpersons are further instructed to:

1. Prepare the curricula and extracurricular activities for the Academic Year 2026–27 in line with the institution's vision, mission, NEP–2020, and NIRF norms.
2. Devise an appropriate evaluation system to ensure effective learning outcomes and holistic student development.
3. Ensure that the curriculum design includes a **20% revision** of the syllabus each year without deviating from the APSCHE prescribed syllabus.

framed by the BOS committee concerned with duly following the mandate prescribed above.

5. Engage stakeholders viz employers, parents, and alumni, to obtain feedback on the existing curricula and to invite suggestions for improvements.
6. Invite the University nominee, subject experts, industry representatives, student representatives, and parent representatives well in advance. The meeting notice shall clearly specify the date, venue, and agenda, and a soft copy of the agenda and relevant documents shall be circulated for their perusal.
7. Ensure that the subject experts invited preferably hold a Doctorate with at least 10 years of teaching experience and have relevant expertise in designing industry-related, market- and job-oriented curricula.
8. Facilitate thorough deliberations on curriculum design, evaluation methods, incorporation of research components, measures to enhance learning experiences, and optimal utilization of existing human, physical, and ICT resources.
9. Conduct all BoS meetings in offline mode. Online participation shall be permitted only under exceptional circumstances.
10. Prescribe benchmarking and quality initiatives in pedagogy and learning, including strategies for curriculum design and teaching-learning processes, in collaboration with the IQAC Coordinator, prior to the BoS meeting.
11. Ensure that a minimum student attendance of **75%** shall be required for eligibility to appear for I & II Mid-Term Examinations under the CIA component; this shall be formally approved in the BoS meeting.
12. Approve any new programmes to be introduced for the Academic Year 2025–26, the number and frequency of certificate courses, and SWAYAM MOOCs courses.
13. Submit the approved BOS copies in the prescribed format, in **quadruplicate (hard copies)** to the Academic Cell for onward submission to the IQAC, Examination Cell, and Library, within **three days** of the meeting and upload the soft copy in their respective department web pages in the college website.
14. Ensure strict alignment of all recommendations and curriculum changes with the institution's vision and mission.
15. Submit a request to receive advance funds from the Examination cell through Principal for conducting BoS meetings.

Following contents shall be presented in the BOS document in the order

1. Proceedings of the Principal pertaining to BOS
2. Composition of BOS
3. Vision and Mission of the department
4. Agenda: It shall include ATR on the previous BOS meeting first, resolutions, etc., later.
5. Table showing the Allocation of Credits in the following table for both theory and Practicals' in case of science subjects

S. No	Semester	Title of the Course (Paper)	Hrs./week	Max. Marks (SEE)	Marks in CIA	Credits
1	III	Physical Chemistry-I	3	50	50	4

6. Resolutions adopted in the meeting with detailed discussion that took place during the meeting.
7. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made in the syllabus/ paper along with justification.
8. Attendance of Members present with signatures in the tabular form.
9. List of Examiners & Paper setters (Minimum 20 members and at least 02 members from other states)
10. Syllabus for each course (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical) and allocation of CIA (50marks) for each course with structure.
11. Each student (2025-26 AB) has to complete one MOOCS course from SWAYAM in any subject per year.

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- Mid examinations are to be conducted in offline mode at college level
- Mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **three short** answer questions with five marks each out of five questions
- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Seminar- 5M	Assignment- 5M	Viva on theory- 3M	Clean & green and Attendance- 2M
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The Chairpersons of all Boards of Studies are hereby instructed to comply with these directives in letter and spirit to ensure the highest standards of academic and administrative excellence.



PRINCIPAL
Pithapur Rajah's Government College(A)
Kakinada

Copy to:

1. Lecturers-in-Charge (BOS Chairmen) of all the departments
2. Academic Coordinator
3. IQAC coordinator
4. Controller of Examinations
5. Office

PR Government College (A), Kakinada

Department of Zoology & Aquaculture

Consolidated Report of Board of studies in UG Aquaculture convened on 11-08-2025

S.No	Name of the Person	Designation
1.	Sri.B. Chakravarthi	Chairman & Lecturer Incharge, Department of zoology & Aquaculture
2.	Dr. D. Kalyani	University Nominee, Adikavi nannaya University, Rajamahendravaram
3.	Dr. N. Sreenivas	Subject Expert: I, Lecturer in Zoology, GDC Ramachandrapuram
4.	Dr. M. Ramakrishna	Subject Expert: II, Lecturer in Zoology, ASNM GDC (A), Palakollu
5.	Sri. C. Adinarayana Chowdary	Representative from Industry, Aqua Entrepreneur
6.	Dr.P.Kiran Kumar .	Member
7.	Dr.B.Elia	Member
8.	Ms. M.S.V. Lakshmi	Member
9.	Sri.T.VenkateswaraRao	Member
10.	Y.Gowthami	Member
11.	B. Devi	Member
12.	T.Sushma	Member
13.	C. Smyrna	Member
14.	Ch. Sandeep Kumar	Alumni
15.	J. Naidu	Student Member III B.SC. Aquaculture
16.	V. Durga Prasad	Student Member II B.SC. Aquaculture

10/8/2025

Dr. P. Kiran Kumar
Dr. B. Elia
Ms. M. S. V. Lakshmi
Sri. T. Venkateswara Rao
Y. Gowthami
B. Devi
T. Sushma
C. Smyrna
Ch. Sandeep Kumar

V. Durgaprasad



PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
KAKINADA 533 001-ANDHRA PRADESH
An AUTONOMOUS and NAAC Accredited Institution (B++ Grade- 2.82 CGPA)
(Affiliated to ADI KAVI NANNAYA UNIVERSITY, Rajamahendravaram.)

ACADEMIC CELL

(Certificate to be issued by the University Nominee/Subject Expert/Member of BOS)

Department Name: *Zoology and Aquaculture*

Name of the BOS Member: *Dr. D. Kalyani*

(University Nominee / Subject Expert / Industrialist / Member)

I certify that the syllabus submitted by the*Aquaculture*..... Department is verified by me and I recommend the following suggestions:

1. *Field trip may be conducted regularly to have practical knowledge.*
2. *Students ~~may~~ encouraged to do survey on marketing strategies.*
- 3.
- 4.
- 5.

The syllabus is approved with the above suggested modification

D. Kalyani

Signature with Date

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus



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ACADEMIC CELL

(Certificate to be issued by the University Nominee/Subject Expert/Member of BOS)

Department Name: *Zoology & Aquaculture*

Name of the BOS Member : *Dr. N. Sreenivas*

(University Nominee /Subject Expert/Industrialist / Member)

I certify that the syllabus submitted by the *Aquaculture... (UG)* Department is verified by me and I recommend the following suggestions:

1. **Verified and approved the syllabus and model papers**
- 2.
- 3.
- 4.
- 5.

The syllabus is approved with the above suggested modification

30.07.2026

Signature with Date



PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
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ACADEMIC CELL

(Certificate to be issued by the University Nominee/Subject Expert/Member of BOS)

Department Name: Zoology & Aquaculture

Name of the BOS Member : Dr. Rama Krishna

(University Nominee /Subject Expert/Industrialist / Member)

I certify that the syllabus submitted by the Aquaculture (UG) Department is verified by me and I recommend the following suggestions:

1. conduct field visits to students near by Aqua ponds & Industries.
2. Take Experts suggestions.
3. Improve Area of Study in water quality management.
4. Why Choose Aquaculture? explain it in high Demand, Global opportunities etc.
5. Nil.

The syllabus is approved with the above suggested modification

M. Ramakrishna 30/6/26

Signature with Date

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus



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(Affiliated to ADI KAVI NANNAYA UNIVERSITY, Rajamahendravaram.)

ACADEMIC CELL

(Certificate to be issued by the University Nominee/Subject Expert/Member of BOS)

Department Name: *Zoology and Aquaculture*

Name of the BOS Member : *Sri. C. Adinarayana Chowdary*

(University Nominee /Subject Expert/Industrialist / Member)

I certify that the syllabus submitted by the*Aquaculture*..... Department is verified by me and I recommend the following suggestions:

- 1.
- 2.
- 3.
- 4.
- 5.

The syllabus is approved with the above suggested modification

K. Adinarayana
Signature with Date

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus

SEMESTER-I

COURSE 1: BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

SYLLABUS:

UNIT-I: Introduction

- 1.1. Definition, Significance and History of Aquaculture.
- 1.2. Concept of Blue Revolution and Pradhan Mantri Matsya Sampada Yojana (PMMSY)
- 1.3. Present status of Aquaculture at global, India and Andhra Pradesh level
- 1.4. Aquaculture versus Agriculture; Present day needs with special reference to A.P.

UNIT-II: Aquaculture Systems and Practices

- 2.1. Types of aquaculture: Freshwater aquaculture, Brackish water aquaculture and Mariculture
- 2.2. Culture Systems: Ponds, Raceways, Cages, Pens, Rafts, Water Recirculating Systems, Bio-floc technology and 3C system
- 2.3. Culture practices: Traditional, Extensive, Modified Extensive, Semi-Intensive, Intensive and Super Intensive systems of fish and shrimp.
- 2.4. Culture methods: Monoculture, Poly culture, Mono-sex culture and Integrated fish farming.

UNIT-III: Design and Construction of Aqua Farms

- 3.1. Functional classification of ponds – head pond, hatchery, nursery, rearing, production, stocking and quarantine ponds
- 3.2. Criteria for the selection of site for freshwater and brackish water pond farms
- 3.3. Design and construction of an ideal fish and shrimp farms.
- 3.4. Design and construction of fish and shrimp hatcheries.

UNIT-IV: Pond Culture Management-I

- 4.1. Water quality in freshwater fish ponds: Significance of physico-chemical (temperature, transparency, turbidity, light, pH, DO, CO₂, orthophosphates, NH₃, NO₂) and biological (plankton and benthos) characteristics and their management at optimal levels in ponds.
- 4.2. Water quality in shrimp culture ponds: Significance of physico-chemical and biological characteristics and their management at optimal levels in ponds.
- 4.3. Significance of soil characteristics and their optimal levels for culture
- 4.4. Liming and fertilization: Lime and Fertilizers (organic manures and chemical Fertilizers) - Types and need of their application in ponds

UNIT-V: Pond Culture Management-II

- 5.1. Common aquatic weeds- advantages and disadvantages and their control in culture ponds
- 5.2. Aquatic insects: Disadvantages of insects and their control
- 5.3. Unwanted fishes: Common weed and predatory fishes - Disadvantages and their control.
- 5.4. Algal blooms: Bloom forming algae and their control

REFERENCE BOOKS:

1. Jhingran VG 1998. *Fish and Fisheries of India*. Hindustan Publishing Corporation, New Delhi
2. Pillay TVR & Kutty MN. 2005. *Aquaculture- Principles and Practices*. 2nd Ed. Blackwell
3. Pillay TVR & Dill MA. 1979. *Advances in Aquaculture*. Fishing News Books Ltd., London
4. Stickney RR 1979. *Principles of Warm Water Aquaculture*. John Wiley & Sons Inc. 1981
5. Boyd CE 1982. *Water Quality Management for Pond Fish Culture*. Elsevier Scientific Publ.

SEMESTER I
COURSE 1: BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

BLUE PRINT

Time: 2 hrs | Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	2
IV	2	2
V	1	1
Total	6	7

- Out of 6, 3 questions should be answered ($3 \times 10 = 30$ M)
- Out of 7, 4 questions should be answered ($4 \times 5 = 20$ M)

SEMESTER I
COURSE I BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

MODEL QUESTION PAPER

Time: 2 hrs | Max. Marks: 50

SECTION- A

I. Answer any THREE questions choosing at least one question from each part. Draw the diagrams wherever necessary 3 X10 = 30

PART – I

1. Describe the Status of aquaculture in India.
2. Explain freshwater aquaculture, including its types and advantages
3. Describe the functional classification of ponds in aquaculture

Part II

4. Write an essay on Liming types and methods of in aquaculture ponds.
5. Describe common aquatic weeds in culture ponds and their control measures.
6. Discuss the significance of water quality parameters and their management in aquaculture ponds

SECTION B

II. Answer any Four of the following. Draw labeled diagrams wherever necessary 4x5=20

7. Site selection
8. Mono sex culture
9. Nursery pond
10. Soil Characteristics
11. Pond fertilization
12. Predatory fish
13. Shrimp Hatchery

SEMESTER I

COURSE I BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

QUESTION BANK

Essay Questions

UNIT – I

1. Describe the Status of aquaculture in India.
2. Explain the concept of the Blue Revolution and its impact on aquaculture development.
3. Write an essay on objectives and components of (Pradhan Mantri Matsya Sampada Yojana)
4. Discuss the present status of aquaculture in Andhra Pradesh.

UNIT – II

6. Explain Freshwater aquaculture, including its types and advantages.
7. Describe Brackish water aquaculture and its scope in India.
8. Explain Mariculture and its economic and ecological importance.
9. Explain Polyculture in aquaculture with examples and benefits.

UNIT – III

12. Explain the criteria for selecting a site for freshwater and brackish water farms.
13. Write an essay on the design and construction of an ideal fish farm.
14. Explain the design and construction of a shrimp hatchery with essential features.
15. Describe the functional classification of ponds in aquaculture.

UNIT – IV

15. Discuss the significance of water quality parameters and their management in aquaculture ponds.
16. Explain the importance of soil characteristics in aquaculture ponds.
17. Write an essay on types, methods of liming in aquaculture ponds.
18. Explain fertilization in aquaculture ponds, including types of fertilizers and application methods.

UNIT – V

19. Describe common aquatic weeds in culture ponds and their control measures.
20. Discuss aquatic insects in ponds, their impact on culture, and control methods.
21. Explain the problems caused by predatory and unwanted fishes in ponds.
22. Discuss algal blooms in aquaculture ponds.

Short Questions

UNIT – I

1. Blue Revolution.
2. PMMSY
3. Present status of aquaculture in India.

UNIT – II

5. Extensive culture system.

6. Semi-intensive culture system.
7. Intensive culture system.
8. Mono-sex culture.

UNIT – III

9. Head pond.
10. Hatchery pond.
11. Nursery pond.
12. Rearing pond.

UNIT – IV

13. Turbidity in ponds.
14. Dissolved Oxygen (DO) in ponds.
15. Ammonia (NH₃) in ponds.

UNIT – V

16. Examples of aquatic weeds.
17. Examples of predatory fishes.
18. Examples of bloom-forming algae.
19. Control of aquatic weeds.
20. Control of aquatic insects.

SEMESTER-I

COURSE 1: BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

PRACTICAL SYLLABUS

Practical Credits: 1 , 2 hrs/week

1. Estimation of Dissolved Oxygen in pond water.
2. Estimation of total alkalinity, Bicarbonates and Carbonates in water samples.
3. Estimation of total hardness of water sample.
4. Estimation of Ammonia in water.
5. Study of beneficial and harmful algal species.
6. Collection, identification and isolation of zooplankton and phytoplankton.
7. Collection and study of aquatic weeds, aquatic insects, weed, predatory and larvivorous fishes.
8. Field visit to hatchery, nursery, rearing and stocking ponds of aqua farms.

SEMESTER-I

COURSE I: BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

PRACTICAL MODEL PAPER

Time: 2 hrs | Max marks: 50

I. Estimation of DO - Major experiment	10 M
II. Identify the following. Draw diagram and write notes	4X5=20
a) Algae	
b) Zooplankton	
c) Aquatic weed	
d) Aquatic predator	
III Field Visit + Note book	10M
V.Record	5M
VI.Viva	5M
Total	-50M

SEMESTER-I

COURSE 2: BIOLOGY OF FINFISH & SHELLFISH

SYLLABUS:

UNIT-I: General characters, Classification, External Morphology and Digestive System

- 1.1. General characters of fishes and crustaceans
- 1.2. Classification of fish and crustaceans up to classes
- 1.3. External morphology of teleost fish and shrimp
- 1.4. Digestive system of fish and shrimp.

UNIT-II: Respiratory, Circulatory and Endocrine systems

- 2.1. Structure of gills, Mechanism of Respiration and gaseous exchange in fish and shrimp
- 2.2. Structure of heart in fishes
- 2.3. Physiology of Circulation in fish and Shrimp
- 2.4. Endocrine glands and their role in fish and shrimp.

UNIT-III: Excretory, Sensory and Reproductive Systems

- 3.1. Structure and function of kidneys in fishes.
- 3.2. Excretory organs in shrimp.
- 3.3. Sensory organs in fish and shrimp.
- 3.4. Reproductive structure in Fishes and Shrimp

UNIT-IV: Feeding and Growth

- 4.1. Natural food and feeding habits of commercially important fishes and shrimp.
- 4.2. Methods of determination of age and growth in fishes - scale method, otolith method, skeletal parts as age indicators
- 4.3. Factors affecting growth in fish and shrimp.
- 4.4. Molting and molting stages in shrimp.

UNIT-V: Reproductive and Developmental Biology

- 5.1. Breeding in fishes - breeding places and breeding habits
- 5.2. Parental care in fishes
- 5.3. Life cycle of carp and shrimp.
- 5.4. Larval forms of prawn and shrimp.

REFERENCE BOOKS:

- 1. Lagler KF, Bardach, JE, Miller, RR, Passino DRM. 2005. *Ichthyology*, John Wiley & Sons.
- 2. Nikolsky GV. 1963. *Ecology of Fishes*, Academic Press.
- 3. Hoar WS and Randall DJ. 1970. *Fish Physiology*, Vol. I-IX, AP.
- 4. Bond E. Carl. 1979. *Biology of Fishes*, Saunders.
- 5. Norman JR and Greenwood PH 1975. *A History of Fishes*, Halsted Press.
- 6. Moyle PB and Joseph J. Cech. *Fishes: An Introduction to Ichthyology*, Prentice Hall.
- 7. Bone Q et al., 1995. *Biology of fishes*, Blackie academic & professional, LONDON.

8. Barnes RD. *Invertebrates Zoology*, III edition, W.B. Saunders Co., Philadelphia.
9. Saxena AB 1996. *Life of Crustaceans*. Anmol Publications Pvt.Ltd., New Delh
10. Barrington EJW. 1971. *Invertebrates: Structure and Function*. ELBS.
11. Tandon KK & Johal MS 1996. *Age and Growth in Indian Freshwater Fishes*. Narendra Publishing House, New Delhi.
12. Raymond T et al., 1990. *Crustacean Sexual Biology*, Columbia University Press, New York
13. Guiland J.A (ed) 1984. *Penaeid shrimps- Their Biology and Management*.
14. Barrington FJW 1971. *Invertebrates: Structure and Function*
15. Parker TJ & Haswell WA 1992. *The text book of Zoology*, Vol I. Invertebrates (eds. Marshal AJ & WD Williams). ELBS & Mc Millan & Co.

SEMESTER-I
COURSE 2: BIOLOGY OF FIN FISH & SHELL FISH

I SEMESTER
Course No.: 2 – BIOLOGY OF FIN FISH & SHELL FISH

BLUE PRINT

Time: 2 1/2 hrs | Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	1
IV	1	2
V	2	2
Total	6	7

- Out of 6, 3 questions should be answered ($3 \times 10 = 30$ M)
- Out of 7, 4 questions should be answered ($4 \times 5 = 20$ M)

I SEMESTER

Course No. 2: BIOLOGY OF FIN FISH & SHELL FISH

MODEL QUESTION PAPER

Time: 2 hrs - Max. Marks :50

SECTION- A

I. Answer any THREE questions choosing at least one question from each section. Draw the diagrams wherever necessary **3 X10 = 30**

PART – I

Explain the digestive system of a fish

1. Explain the structure of gills in fishes and add a note on mechanism of respiration and gaseous exchange in fishes
2. Write an essay on sense organs in fishes

Part – II

4. What are the different methods of determination of age and growth in fishes? Explain
5. Write an essay on Parental care in fishes
6. Explain the Life cycle of shrimp with a neat labelled diagram

SECTION-B

Answer any Four of the following.

4x5=20

7. Chondrichthyes
8. Heart in fishes
9. Excretory organs in shrimp
10. Natural food of fishes
11. Moulting in shrimp
12. Breeding in fishes
13. Nauplius

I SEMESTER

Course No. 2: BIOLOGY OF FIN FISH & SHELL FISH

QUESTION BANK

I. ESSAY TYPE QUESTIONS

1. Explain the digestive system of a fish
2. Explain the external morphology of a teleost fish
3. Explain the general characters of fishes
4. Explain the external morphology of shrimp
5. Explain the structure of gills in fishes and add a note on mechanism of respiration and gaseous exchange in fishes
6. Write an essay on heart in fishes
7. Write an essay on Endocrine glands and their role in fishes.
8. Explain the Structure and function of kidneys in fishes.
9. Explain the Reproductive system in Fishes
10. Explain the Reproductive system in shrimp
11. Write an essay on sense organs in fishes
12. What are the different methods of determination of age and growth in fishes? Explain
13. Write an essay on the Natural food and the feeding habits of commercially important fishes
14. Write an essay on Parental care in fishes
15. Explain the Life cycle of shrimp with a neat labelled diagram
16. Explain the life cycle of a carp fish

II. SHORT ANSWER TYPE

1. Chondrichthyes
2. Osteichthyes
3. Crustaceans general characters
4. Shrimp external morphology
5. Structure of gills
6. Heart in fishes
7. Physiology of circulation in fishes
8. Pituitary gland
9. Adrenal gland
10. Corpuscles of stannius
11. Ultimobranchial gland
12. Sense organs in shrimp
13. Lateral line system
14. Swim bladder
15. Excretory organs in shrimp
16. Natural food of fishes
17. Factors affecting growth in fish

- 18.Scale method
- 19.Otolith Method
- 20.Moulting in shrimp
- 21.Breeding in fishes
- 22.Life cycle of shrimp
- 23. Nauplius
- 24.Zoea
- 25.Mysis

SEMESTER-I
COURSE 2: BIOLOGY OF FIN FISH & SHELLFISH

PRACTICAL SYLLABUS

1. External morphology of fish and shrimp.
2. Digestive system of herbivorous, carnivorous and predatory fishes, and in shrimp.
3. Gut content analysis in fish and shrimp
4. Mouth parts and appendages of cultivable prawn and shrimp.
5. Endocrine glands and its significance in fish and shrimp.
6. Study of eggs of fish, shrimp and prawn.
7. Study of maturity stages and fecundity in fish and shellfish
8. Life cycles of carp and shrimp.
9. Observation of crustacean larvae
10. Study of nest building and brooding of fishes

SEMESTER-I
COURSE 2: BIOLOGY OF FIN FISH & SHELLFISH

PRACTICAL MODEL PAPER

I. Digestive system of herbivorous, carnivorous and predatory fishes	10M
II. Draw neat labelled diagrams of mouth parts and appendages of cultivable prawn	10M
III.	
III. Identification of Crustacean larvae	4X5=20M
a) Nauplius	
b) Zoea	
c) Mysis	
d) Phyllosoma/ Alima	
V.Record	-5M
VI.Viva	-5M
Total	-50M

SEMESTER-II
COURSE 3: FRESHWATER AQUACULTURE

SYLLABUS:

UNIT-I: Introduction to Freshwater Aquaculture

- 1.1. Status, scope and prospects of freshwater aquaculture in the world, India and AP
- 1.2. Freshwater bodies suitable for culture in India – ponds, swamps, reservoirs and flood plain wetlands or beels.
- 1.3. Criteria for the selection of species for culture.
- 1.4. Major cultivable freshwater fish for aquaculture and their commercial importance.

UNIT-II: Carp Culture

- 2.1. Bundh breeding of Indian major carp
- 2.2. Induced breeding of Indian major car.
- 2.3. Types of hatcheries – traditional, chinese and jar hatcheries.
- 2.4. Preparation and Management of Indian major carp culture ponds.

UNIT-III: Culture of Exotic and Air-breathing fishes

- 3.1. Exotic fishes introduced into India and their impact on indigenous fishes
- 3.2. Culture of *Tilapia* and *Pangasius*.
- 3.3. Recent developments in the culture of murrels, magur and koi.
- 3.4. Advantages and constraints in the culture of air-breathing fishes.

UNIT-IV: Culture of freshwater prawns

- 4.1. Fresh water prawns of India - commercial value
- 4.2. *Macrobrachium rosenbergii* and *M. malcolmsonii* – biology and seed production.
- 4.3. Preparation and management of freshwater prawn culture ponds.
- 4.4. Morphotypes and harvesting techniques of prawns.

UNIT-V: Ornamental and sewage-fed fish culture 5.1. Common freshwater ornamental fishes.

- 5.2. Fabrication, setting up and maintenance of an aquarium.
- 5.3. Breeding and rearing of freshwater ornamental fishes.
- 5.4. Sewage-fed fish culture

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1. Jhingran VG 1998. *Fish and Fisheries of India*. Hindustan Publishing Corporation, New Delhi
2. MPEDA: *Handbooks on culture of carp, shrimp, etc.*
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10. Chakraborty C & Sadhu AK. 2000. *Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn*. Daya Publ. House.
11. Huet J. 1986. *A text Book of Fish Culture*. Fishing News Books Ltd.
12. Marcel H 1972. *Text book of fish culture*. Oxford fishing news books.

SEMESTER-II
COURSE 3: FRESHWATER AQUACULTURE

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Time: 2 hrs | Max. Marks: 50

Unit	Essay questions	Short answer questions
I	1	1
II	1	1
III	1	1
IV	1	2
V	2	2
Total	6	7

- Out of 6, 3 questions should be answered (3X10=30M)
- Out of 7, 4 questions should be answered (4X5=20M)

SEMESTER-II
COURSE 3: FRESHWATER AQUACULTURE

MODEL PAPER

Time: 2 hrs | Max Marks:50

SECTION-A

I. Answer any THREE questions choosing at least one question from each section.

Draw the diagrams wherever necessary

3X10 =30

PART-1

1. Describe the status, scope and prospects of freshwater aquaculture in India.
2. Explain the process and importance of Bundh breeding in Indian major carps
3. Describe the exotic fishes introduced into India and discuss their impact on indigenous fish species

Part-II

4. Write an essay on the culture of *Macrobrachium rosenbergii*
5. Discuss common fresh water ornamental fish
6. Explain sewage fed fish culture.

SECTION-B

II. Answer any FOUR questions. Draw the diagrams wherever necessary

4x5=20

7. Scope of freshwater aquaculture.
8. Bundh breeding
9. induced breeding of carps.
10. exotic fishes of India
11. commercially important freshwater prawn.
12. Maintenance of Aquarium
13. Rearing of ornamental f

SEMESTER-II
COURSE 3: FRESHWATER AQUACULTURE

QUESTION BANK

Essay Questions

1. Describe the status, scope and prospects of freshwater aquaculture in India.
2. Write an essay on the freshwater bodies suitable for fish culture in India.
3. Explain the criteria for selection of species for aquaculture.
4. Discuss the major cultivable freshwater fishes and their commercial importance.
5. Explain the process and importance of Bundh breeding in Indian major carps.
6. Describe the induced breeding techniques in Indian major carps.
7. Write an account of the types of hatcheries used in carp seed production.
8. Explain the preparation and management of Indian major carp culture ponds.
9. Describe the exotic fishes introduced into India and their impact on indigenous fishes.
10. Discuss the culture practices of *Tilapia* and *Pangasius* in India.
11. Write an essay on the recent developments in the culture of air-breathing fishes like murrels, magur and koi.
12. Explain the biology and seed production of *Macrobrachium rosenbergii* and *M. malcolmsonii*.
13. Describe the preparation and management of freshwater prawn culture ponds.
14. Write an essay on the fabrication, setting up and maintenance of an aquarium.
15. Explain the principles and advantages of sewage-fed fish culture.

Short Answer Questions

1. Write briefly on the scope of freshwater aquaculture.
2. List the types of freshwater bodies suitable for fish culture.
3. What are the criteria for selection of fish species for culture?
4. Name the major cultivable freshwater fishes of India.
5. Write short notes on Bundh breeding.
6. What is induced breeding? Mention its advantages.
7. Distinguish between traditional, Chinese and jar hatcheries.
8. Write short notes on pond preparation and management.
9. Mention some exotic fish species introduced into India.
10. Write a short note on the culture of *Tilapia*.
11. What are the advantages and constraints in the culture of air-breathing fishes?
12. Name any commercially important freshwater prawns of India.
13. What are prawn morphotypes?
14. Write short notes on ornamental fishes commonly reared in aquaria.
15. What is sewage-fed fish culture? Mention its import

SEMESTER-II
COURSE 3: FRESHWATER AQUACULTURE

PRACTICAL SYLLABUS

1. Identification of important cultivable carps.
2. Identification of exotic fishes.
3. Identification of important cultivable air-breathing fishes
4. Identification of important cultivable freshwater prawns.
5. Identification of different life history stages of fish.
6. Identification of different life history stages of freshwater prawn.
7. Identification of Phytoplankton and Zooplankton (any 5 each).
8. Pituitary gland – structure, collection, preparation of pituitary extract, dosage and injection for induced breeding of carp.
9. Morphotypes of prawn
10. Identification of important freshwater ornamental fishes
11. Fabrication, setting up and maintenance of an aquarium.
12. Field visit to fish hatchery.
13. Field visit to fish farm /culture ponds.

SEMESTER-II
COURSE 3: FRESHWATER AQUACULTURE

PRACTICAL MODEL PAPER

I. Collection and preparation of Pituitary extract	10M
II. Identify the following	4X5=20M
a) Labeo	
b) Ctenopharyngodon	
c) M. malcolmsonii	
d) Diatom	
IV. Field visit and field note book	5+5=10M
V.Record	-5M
VI.Viva	-5M
Total	-50M

SEMESTER-II

COURSE 4: BRACKISH WATER AQUACULTURE AND MARICULTURE

SYLLABUS:

UNIT-I: Introduction

- 1.1. Status, scope and prospects of brackish water aquaculture and mariculture in India and AP 1.2. Brackish water as a medium for aquaculture, ecological factors – Abiotic and biotic factors.
- 1.3. Brackish water resources for culture in India –Bheries, lagoons (Chilka lake, Pulicat Lake, Vembanad Lake), paddy/pokkali fields and coastal ponds.
- 1.4 Major cultivable species for brackish water aquaculture and their commercial importance.

UNIT-II: Culture of shrimps

- 2.1. Breeding and hatchery management of a typical penaeid shrimp (*Penaeus monodon* / *Litopenaeus vannamei*).
- 2.2. Transportation of shrimp seed and nursery management
- 2.3. Pond preparation and management of *P. monodon* or *L. vannamei* culture ponds.
- 2.4. Biofloc technology (BFT) in shrimp culture – Benefits and management practices.

UNIT-III: Culture of brackish water fishes

- 3.1. Breeding and culture of Milk fish, *Chanos chanos*
- 3.2. Breeding and culture of Asian sea bass, *Lates calcarifer*
- 3.3. Breeding and culture of Grey mullet, *Mugil cephalus*

UNIT-IV: Culture of crabs and ornamental fishes

- 4.1. Culture of mud crab, *Scylla serrata* – Biology and culture techniques.
- 4.2. Common marine ornamental fishes.
- 4.3. Setting up and maintenance of marine aquarium.
- 4.4. Breeding and rearing of marine ornamental fishes.

UNIT-V: Culture of oysters and seaweeds

- 5.1. Cultivable species of edible oysters and pearl oysters
- 5.2. Culture techniques for farming edible oysters.
- 5.3. Method of artificial pearl production.
- 5.4. Major commercial seaweed species; Methods of seaweed culture.

REFERENCE BOOKS:

1. Jhingran VG. 1991. *Fish and Fisheries of India*. Hindustan Publ. Corporation, India.
2. ICAR. 2006. *Hand Book of Fisheries and Aquaculture*. ICAR.
3. MPEDA: *Handbooks on culture of carp, shrimp, etc.*
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7. Guland JA (ed) 1984. *Penaeid Shrimps – Their Biology and Management*.
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SEMESTER-II

COURSE 4: BRACKISH WATER AQUACULTURE AND MARICULTURE

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MODULE NO.	ESSAY QUESTIONS	SHORT ANSWER QUESTIONS	MARKS ALLOTTED
Module -I	1	1	15
Module -II	1	1	10
Module -III	1	1	10
Module -IV	1	2	15
Module -V	2	2	20
TOTAL	6 (Answer 3)	7 (Answer 4)	50 marks to be answered

II SEMESTER

COURSE 4: BRACKISH WATER AQUACULTURE AND MARICULTURE

MODEL QUESTION PAPER

Time: 2 Hours | **Max. Marks:** 50

SECTION A

Answer any THREE questions choosing at least one question from each section.

Draw the diagrams wherever necessary

3X10 =30

PART-1

1. Describe the status, scope, and prospects of brackish water aquaculture in India.
2. Explain the abiotic and biotic factors influencing brackish water aquaculture
3. Describe the breeding and hatchery management *Penaeus monodon*

PART-1

4. Explain the pond preparation and management practices for shrimp culture
5. Write an essay on the breeding and culture techniques of *Chanos chanos*.
6. Discuss the culture practices of pearl oysters

SECTION B

Answer any Four of the following.

4x5=20

7. Brackish water resources
8. Major cultivable species for brackish water aquaculture
9. Bio floc Technology
10. culture of Asian sea bass
11. biology of mud crab (*Scylla serrata*).
12. marine ornamental fish aquarium.
13. commercial seaweed

II SEMESTER

COURSE 4: BRACKISH WATER AQUACULTURE AND MARICULTURE

QUESTION BANK

UNIT – I

ESSAY QUESTIONS.

1. Discuss the status, scope, and prospects of brackish water aquaculture and mariculture in India, with special reference to Andhra Pradesh.
2. Explain the ecological factors influencing brackish water aquaculture.
- 3.. List the major cultivable species used in brackish water aquaculture in India and explain their commercial importance.

SHORT QUESTIONS

1. What are the major abiotic and biotic factors influencing brackish water aquaculture productivity?
2. Name any three important brackish water resources in India suitable for aquaculture and mention one characteristic feature of each.
3. List any four major cultivable species in brackish water aquaculture and state their commercial importance.

UNIT – II

ESSAY QUESTIONS

1. Describe the breeding and hatchery management practices of a typical penaeid shrimp (*Penaeus monodon* or *Litopenaeus vannamei*).
2. Explain the principles and benefits of Biofloc Technology (BFT) in shrimp culture. Discuss its management practices and role in sustainable aquaculture.

SHORT QUESTIONS

1. What are the main steps involved in the transportation and nursery management of shrimp seed in *Litopenaeus vannamei* culture?
2. What is Biofloc Technology (BFT) in shrimp culture, and mention two major benefits of using it?

UNIT – III

ESSAY QUESTIONS

1. Describe the breeding and culture practices of milkfish (*Chanos chanos*). Discuss its seed production, pond management, feeding, and harvesting methods.
2. Explain the breeding and culture techniques of Asian sea bass (*Lates calcarifer*). Highlight its hatchery operations, larval rearing, grow-out systems, and market potential.
3. Discuss the breeding and culture methods of grey mullet (*Mugil cephalus*). Describe seed collection, rearing practices, feeding, and significance in brackish water aquaculture.

SHORT QUESTIONS

1. Write a short essay on the breeding and culture practices of milkfish (*Chanos chanos*).
2. Explain briefly the breeding and culture techniques of Asian sea bass (*Lates calcarifer*).

3. Give a short account of the breeding and culture of grey mullet (*Mugil cephalus*) in brackish water environments.

UNIT-IV

ESSAY QUESTIONS

1. Explain in detail the culture techniques used for farming edible oysters. 1. Describe the biology and culture techniques of the mud crab (*Scylla serrata*).
2. Explain the characteristics and importance of common marine ornamental fishes cultured in India.
3. Discuss the procedure for setting up and maintaining a marine aquarium for ornamental fish culture.

SHORT QUESTIONS

1. What are the main steps involved in the culture of mud crab (*Scylla serrata*)?
2. Name any four common marine ornamental fishes and mention one characteristic of each.
3. What are the basic requirements for setting up and maintaining a marine aquarium?

UNIT-V

ESSAY QUESTIONS

1. Describe the cultivable species of edible and pearl oysters found in India and discuss their biological and economic importance.
3. Discuss the methods of artificial pearl production and give an account of major commercial seaweed species and their culture methods.

SHORT QUESTIONS

1. Name two cultivable species each of edible oysters and pearl oysters commonly found in India.
2. What are the main steps involved in the culture of edible oysters?
3. Mention any two major commercial seaweed species and state one common method used for their culture.

II SEMESTER

COURSE 4: BRACKISH WATER AQUACULTURE AND MARICULTURE

PRACTICAL SYLLABUS

1. Identification of cultivable brackish water fish and shrimp (any 3 each)
2. Identification of crabs, and edible & pearl oysters of commercial importance (any 2 each)
3. Identification of different live feed organisms for shrimp larvae (any 4)
4. Identification of larval stages of shrimp.
5. Demonstration of eye stalk ablation in *Penaeus monodon*.
6. Identification and mounting of appendages of shrimp.
7. Field visit to shrimp hatchery. 8. Field visit to shrimp culture ponds / farm

II SEMESTER

COURSE 4: BRACKISH WATER AQUACULTURE AND MARICULTURE

PRACTICAL MODEL PAPER

1. Identify any two cultivable brackish water fishes.	2X5=10
2. Identify any two crabs of commercial importance.	2X5=10
3. Identify larval stages of shrimp	2X5=10
4. Identification of any two Plankton	2X5=10
5. field visit to shrimp hatchery and pond + field Note Book	5+5=10
6. record + viva	5+5=10
TOTAL MARKS	50

SEMESTER II
MULTI DISCIPLINARY COURSE
PRINCIPLES OF BIOLOGICAL SCIENCES

SYLLABUS

UNIT-I Diversity of Life

- 1.1 Introduction to Biology, Branches of Biology, Basic Principles of Biology
1.2 Biological Classification-Two kingdom and Five kingdom classification, Viruses, Viroid's and Lichens
1.3 Diversity in the living world, Taxonomic categories, Taxonomic aids 1.4 Plant organization-The form, structure and function of plant vegetative and reproductive organs, Classification of Plant Kingdom, 1.5 Basis of Animal Classification, Classification of Animal Kingdom

UNIT-II Biomolecules and metabolism

- 2.1 Ultra structure of cell and Cell organelles (Structure and Functions), Plant cell vs Animal cell 2.2 Plant Physiology: Photosynthesis, Respiration, Transportation, Mechanisms of Nitrogen fixation. 2.3 Plant growth and development, physiology of flowering. 2.4 Human Physiology: Digestion, Respiration, Circulation 2.5 Male and female reproductive organs, gametogenesis, fertilization.

UNIT-III Principles of Biology

- 3.1 Genetics: Mendel's laws of inheritance, Genetic disorders- Colour blindness, Sickle cell anaemia.
3.2 Evolution: Geological time scale for evolution of plants and vertebrates, Origin and evolution of plants and man 3.3 Common Human Diseases: causing organism, prevention and treatment- malaria, dengue, AIDS, cancer, corona. 3.4 Common Plant Diseases: causing organism, prevention and treatment- Black spot, Leaf spots, Powdery mildew, Blight, Canker. 3.5 Biotechnology: Tools and process of recombinant DNA technology, Applications of biotechnology in agriculture, food industry, medicine and transgenic animals

SEMESTER II

MULTI DISCIPLINARY COURSE: PRINCIPLES OF BIOLOGICAL SCIENCES

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MODULE	ESSAY QUESTIONS	SHORT ANSWER QUESTIONS	MARKS ALLOTTED
MODULE – I	1	2	20
MODULE – II	2	2	30
MODULE – III	2	3	35
Total	5 (Answer 3)	7 (Answer 4)	50 Marks to be answered

SEMESTER II
MULTI DISCIPLINARY COURSE
PRINCIPLES OF BIOLOGICAL SCIENCES

MODEL QUESTION PAPER

Time: 2 hrs. | Max.Marks: 50

SECTION- A

Answer any THREE of the following questions (3X10=30)

1. Write an overview on five kingdom classification?
2. Discuss the ultrastructure of a cell and the functions of cell organelles. Compare the structure of plant cells and animal cells?
3. Explain the physiology of photosynthesis, respiration, and transportation in plants.
4. Discuss Mendel's laws of inheritance and their significance in understanding genetic traits.
5. Examine common plant diseases. Describe the causal preventive measures, and treatment methods.

SECTION- B

Answer any FOUR of the following questions (4X5=20)

6. Viroid
7. Plant Reproductive organs
8. Plant cell structure
9. Fertilization
10. Geological time scale
11. Applications of Biotechnology
12. Photosynthesis
13. Transgenic animals

REFERENCES AND PROJECTS

Text Books

1. Pandey, B.P. (2013) College Botany, Volume-I, S. Chand Publishing, New Delhi.
2. Kotpal, R.L.2022. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut).
3. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolution and Ecology. S. Chand publishers, New Delhi, India.

Reference Books

4. Sreekrishna V. 2005. Biotechnology –I, Cell Biology and Genetics. New Age International Publ. New Delhi, India.
5. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.

SEMESTER II
MULTI DISCIPLINARY COURSE
PRINCIPLES OF BIOLOGICAL SCIENCES

QUESTION BANK

SECTION – A

ESSAY QUESTIONS – 10 MARKS

1. Write an overview on five kingdom classification.
2. Discuss the ultrastructure of a cell and the functions of cell organelles. Compare the structure of plant cells and animal cells.
3. Explain the physiology of photosynthesis, respiration, and transportation in plants.
4. Discuss Mendel's laws of inheritance and their significance in understanding genetic traits.
5. Examine common plant diseases. Describe the causal organisms, preventive measures, and treatment methods.
6. Explain the basic principles of biology and describe the major branches of biology.
7. Describe the classification of the Plant Kingdom and explain the basis of classification.
8. Explain the basis of animal classification and give an account of the major groups of the Animal Kingdom.
9. Describe the mechanisms of nitrogen fixation and explain their significance in plant growth and development.
10. Explain human digestion, respiration, and circulation with suitable details.

SECTION – B

SHORT ANSWER QUESTIONS – 5 MARKS

11. Viroid
12. Plant Reproductive organs
13. Plant cell structure
14. Fertilization
15. Geological time scale
16. Applications of Biotechnology
17. Photosynthesis
18. Lichens
19. Taxonomic categories and taxonomic aids
20. Viruses
21. Male and female reproductive organs
22. Gametogenesis
23. Genetic disorders – Colour blindness and Sickle cell anaemia
24. Common human diseases – Malaria, Dengue, AIDS, Cancer and Corona

SEMESTER-III

COURSE 5: FISH HEALTH MANAGENENT

SYLLABUS

UNIT I: Pathology and parasitology

- 1-1 Introduction to fish diseases –Definition and categories of diseases – Disease and environment
- 1-2 Disturbance in cell structure – changes in cell metabolism, progressive and retrogressive tissue changes, types of degeneration, infiltration, necrosis, cell death and causes
- 1-3 Atrophy, hypertrophy, neoplasms, inflammation, healing and repair

UNIT II: Fungal and viral Diseases of fin fish.

- 2-1 Fungal diseases (both of shell and finfish) – Saprolegniosis, brachiomycosis, ichthyophorus diseases – Lagenidium diseases – Fusarium disease, prevention and therapy
- 2-2 Viral diseases – Emerging viral diseases in fish, haemorrhagic septicemia, spring viremia of carps, infectious hematopoietic necrosis in trout, infectious pancreatic necrosis in salmonids, swim-bladder inflammation in cyprinids, channel cat fish viral disease, prevention and therapy

UNIT III: bacterial Diseases of fin fish.

- 3.1 Baterial diseases – Emerging bacterial diseases, aeromonas, pseudomonas and vibrio infections, columnaris, furunculosis, epizootic ulcerative syndrome, infectious abdominal dropsy, bacterial gill disease, enteric red mouth, bacterial kidney disease, proliferative kidney disease, prevention and therapy

UNIT IV: Protozoan Diseases of fin fish.

- 4.1 Protozoan diseases: Ichthyophthiriasis(White spot Disease), Costiasis, Whirling disease

UNIT V: Nutritional diseases

- 5.1 Nutritional pathology – lipid liver degeneration, Vitamin and mineral deficiency diseases. Aflatoxin and dinoflagellates.
- 5.2 Antibiotic and chemotherapeutics. Nutritional cataract. Genetically and environmentally induced diseases.

SEMESTER-III

COURSE 5: FISH HEALTH MANAGENENT

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Time: 2 hrs | Max.Marks:50

Unit	Essay	Short	Marks allotted
I	01	02	20
II	02	01	25
III	01	02	20
IV	01	01	15
V	01	01	15
TOTAL	06 Of which 3to be answered	07 Of which 5 to be answered	95 marks including choice Of which 50 marks to be answered

SEMESTER-III

COURSE 5: FISH HEALTH MANAGENENT

MODEL QUESTION PAPER

Time: 2 hrs | Max. Marks :50

SECTION- A

I. Answer any THREE questions choosing at least one question from each section.

Draw the diagrams wherever necessary

3 X10 = 30M

PART I

1. Explain about the progressive and retrogressive tissue changes
2. Write an essay on different fungal diseases in fin fish
3. Explain different viral diseases and its prevention methods in fin fish

PART II

4. Explain columnaris, diseases and its prevention
5. Write an essay on Protozoan diseases
6. Illustrate Antibiotic and chemotherapeutic practices

SECTION- B

II. Answer any Four questions

4x5=20M

7. Differentiate infiltration and necrosis
8. Types of degeneration
9. Neoplasms
10. Define IHN Epizootic ulcerative syndrome and their symptoms
11. Dinoflagellates
12. Nutritional cataract

SEMESTER-III

COURSE 5: FISH HEALTH MANAGENENT

QUESTION BANK

MODULE -I

Essay Questions

1. Explain different categories of diseases
2. Explain about the progressive and retrogressive tissue changes
3. Write an essay on Atrophy, hypertrophy

Short Answer Question

4. Types of degeneration
5. Difference between infiltration, necrosis
6. Neoplasms
7. Environmental diseases in fishes
8. healing Mechanism of cell

MODULE II

Essay Questions

9. Explain about Fusarium disease, prevention and therapy
10. Write an essay on different fungal diseases in finfish
11. Explain the different viral diseases and its prevention methods in fin fish

Short Answer Questions

12. Furunculosis disease symptoms and prevention
13. epizootic ulcerative syndrome and their symptoms
14. essay

Module III

15. infectious pancreatic necrosis in salmonids,
16. Define IHN

Short questions

17. Describe the aeromonas, pseudomonas and vibrio infections
18. Summarize the infectious abdominal dropsy, bacterial gill disease, enteric red mouth, bacterial kidney disease their symptoms

MODULE -IV

Essay Question

19. Illustrate the Antibiotic and chemotherapeutics
20. Explain about environmentally induced diseases in fishes.
21. Describe the Vitamin and mineral deficiency diseases in fin fish

Short Answer Questions

22. Aflatoxin
23. Dinoflagellates
24. Nutritional cataract

25. Lipid liver regeneration

MODULE V

Essay Questions

26. Explain nutritional pathology with reference to fatty liver (lipid liver degeneration), nutritional cataract, and diseases caused by vitamin and mineral deficiencies.

27. Describe the major causes and effects of genetically and environmentally induced diseases.

Add an account of aflatoxin and dinoflagellates as environmental health hazards, and discuss the role of antibiotics and chemotherapeutic agents in disease management.

Short Answer Questions

28. Write a short note on aflatoxin and its effects on human health.

29. Explain nutritional cataract and mention its causes and preventive measures.

SEMESTER-III

COURSE 5: FISH HEALTH MANAGENENT

PRACTICAL SYLLABUS

- a. Enumeration of Bacteria by TPC Method
- b. Enumeration of total Coli forms
- c. Observation of gross pathology and external lesions of fish with reference to the common diseases in aquaculture
- d. Examination of pathological changes in gills and gut lumen, lymphoid organ, muscles and nerves offish
- e. Collection, processing and analysis of data for epidemiological investigations of viral diseases
- f. Bacterial pathogens – isolation, culture and characterization
- g. Identification of parasites in fishes: Protozoan, Helminths, Crustaceans
- h. Estimation of dose, calculation of concentration, methods of administration of various chemo therapeutics to fish and shell fish
- i. Estimation of antibiotics used in aquaculture practices

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SEMESTER-III

COURSE 5: FISH HEALTH MANAGENENT

PRACTICAL MODEL PAPER

Time: 2hrs | Max.Marks:50

1. Enumeration of Bacteria by TPC Method	12M
2. Estimation of antibiotics used in aquaculture practices	8 M
3. Identification of Parasites in fishes	5X4=20M
A. Protozoan,	
B. Protozoan,	
C. Helminths	
D. Helminths	
E. Crustaceans	
4. Record	05 M
5. Viva	05 M
Total	50M

SEMESTER – III
COURSE 6 SHRIMP HEALTH MANAGEMENT CORE

SYLLABUS

UNIT I: Viral Diseases of shell fish (Symptoms, Treatment and Prophylaxis)

- 1.1 Major shrimp viral diseases –Baculovirus penaeii, Monodon Baculovirus,
- 1.2 Baculoviral midgut necrosis, Infectious hypodermal and haematopoietic necrosis virus, Hepatopancreatic parvo like virus,
- 1.3 Yellow head baculovirus, white spot baculovirus.

UNIT II: Bacterial Diseases of shell fish (Symptoms, Treatment and Prophylaxis)

- 2.1 Bacterial diseases of shell fish –aeromonas, pseudomonas and vibrio infections,
- 2.2 Luminous bacterial disease, filamentous bacterial disease. Prevention and therapy

UNIT III: Protozoan Diseases of shell fish (Symptoms, Treatment and Prophylaxis)

- 3-1 Protozoan diseases-Ichthyophthiriasis, Costiasis,
- 3-2 Whirling diseases, trypanosomiasis

UNIT IV: Health management

- 4.1 Diagnostic tools –immune detection-DNA/RNA techniques,
- 4.2 General preventive methods and prophylaxis.
- 4.3 Application and development of vaccines.
- 4.5 Quarantine –Significance, methods and regulations for transplants.

UNIT V: Production of disease-free seeds.

- 5.1 Production of disease-free seeds.
- 5.2 Evaluation criteria of healthy seeds.
- 5.3 Good Feed management for healthy organisms, Zero water exchange, Probiotics
- 5.4 General preventive methods and prophylaxis.
- 5.5 Methods of pathological examination of Shrimp and infectious diseases.

SEMESTER – III
COURSE 6 SHRIMP HEALTH MANAGEMENT

BLUE PRINT

Time: 2 hrs | Max.Marks:50

Unit	Essay	Short	Marks allotted
I	02	01	25
II	01	02	20
III	01	01	15
IV	01	01	15
V	01	02	20
Total	06 Of which 3 to be answered	07 Of which 5 to be answered	95 marks including choice95 marks including choice Of which 50 marks to be answered

SEMESTER – III
COURSE 6 SHRIMP HEALTH MANAGEMENT

MODEL QUESTION PAPER

Time: 2 hrs Max. Marks :50

SECTION- A

I. Answer any THREE questions choosing at least one question from each section.

Draw diagrams wherever necessary

3X10 = 30

PART – 1

1. Write an essay on Major shrimp viral diseases
- 2 Explain Yellow head and white spot baculoviral diseases.
3. Describe the common bacterial diseases and their treatment in shell fish.

PART – II

4. Describe the Discussion about the Ichthyophthiriasis, Costakis.
5. Write an essay on vaccines development and their applications.
6. Discuss about the Production of disease-free seeds.

SECTION-B

II. Answer any Four questions

4x5=20

7. Baculoviral midgut necrosis
- 8 Prevention and therapy of Bacterial diseases.
9. filamentous bacterial disease
10. trypanosomiasis.
11. Good Feed management
12. Quarantine.
13. Disease Diagnostic tools (PCR)

SEMESTER – III
COURSE 6 SHRIMP HEALTH MANAGEMENT

QUESTION BANK

UNIT:I

ESSAY QUESTIONS

- 1 Write an essay on Major shrimp viral diseases
- 2 Discuss the Yellow head and white spot baculoviral diseases
- 3 Describe the Baculoviral midgut necrosis, Infectious hypodermal and haematopoietic necrosis virus

Shorts

1. Baculoviral midgut necrosis
2. Hepatopancreatic parvo like virus
3. Treatment and prophylaxes of viral diseases

UNIT:II

ESSAY QUESTIONS

1. Describe the common bacterial diseases and treatment in shell fish
2. Describe the aeromonas, pseudomonas and vibrio infections and their prevention
3. Prevention and therapy of bacterial diseases

Shorts

- 1 Luminous bacterial disease.
2. filamentous bacterial disease
3. Aeromonas infections
4. pseudomonas infections
3. Vibrio infections.

UNIT:III

ESSAY QUESTIONS

1. Describe the Discussion about the Ichthyophthiriasis, Costiasis
2. Write an essay on Whirling diseases and trypanosomiasis
3. Describe the protozoan diseases and their treatment in shell fish

Shorts

1. Ichthyophthiriasis.
2. Costiasis.
3. Whirling diseases
4. Trypanosomiasis.
5. Preventions of protozoan diseases.

UNIT:IV

ESSAY QUESTIONS

1. Write an essay on vaccines development and their Applications

2. Discuss about the Immunological techniques used in disease diagnosis

Shorts

1. Quarantine.
2. Disease Diagnostic tools.
3. Vaccines

UNIT:IV

ESSAY QUESTIONS

1. Discuss about the Production of disease-free seeds
2. Explain Good Feed management for healthy organisms
3. Define probiotics. Elaborate probiotics used for shell fish growth

Shorts:

1. Probiotics.
2. Good feed management for shell fish growth.
3. Diseases -free seeds.
4. Evaluation criteria of healthy seeds.

SEMESTER – III
COURSE 6 SHRIMP HEALTH MANAGEMENT

PRACTICAL SYLLABUS

1. Enumeration of Bacteria by TPC Method
2. Observation of gross pathology and external lesions of fish and prawn with reference to the common diseases in aquaculture
3. Examination of pathological changes in gut lumen, hepatopancreas, lymphoid organ, muscles and nerves of prawn and shrimp
4. Collection, processing and analysis of data for epidemiological investigations of viral diseases
5. Bacterial pathogens – isolation, culture and characterization
6. Antibigrams – preparation and evaluation
7. Molecular and immunological techniques; Biochemical tests; PCR; ELISA;
8. Agglutination test; Challenge tests; Purification of virus for development of vaccines (Demonstration at institutes/labs)
9. Estimation of dose, calculation of concentration, methods of administration of various chemotherapeutics to fish and shell fish
10. Estimation of antibiotics used in aquaculture practices
11. Estimation of probiotics used in aquaculture

SEMESTER – III
COURSE 6 SHRIMP HEALTH MANAGEMENT

PRACTICAL MODEL PAPER

SHRIMP HEALTH MANAGEMENT

1. Enumeration of Bacteria by TPC Method	12 M
2. Estimation of antibiotics used in aquaculture practices	8 M
Identification of Parasites in fishes	5 X4=20M
3. Protozoan, Protozoan, Helminths, Helminths ,Crustaceans	
4. Record	05 M
	05 M
5. Viva	-----
Total	50M

SEMESTER – III
COURSE.: 7 FISH NUTRITION & FEED TECHNOLOGY

SYLLABUS

UNIT-I: Nutritional requirements of cultivable fish

- 1.1 Requirements for energy, proteins, carbohydrates, lipids, fiber, micronutrients for different stages of cultivable fish and prawns
1-2 Essential amino acids and fatty acids, protein to energy ratio, nutrient interactions and protein sparing effect
1.3 Dietary sources of energy, effect of ration on growth, determination of feeding rate, check tray

UNIT-II: Forms of feeds & Feeding methods

- 2-1 Feed conversion efficiency, feed conversion ratio and protein efficiency ratio
2-2 Wet feeds, moist feeds, dry feeds, mashes, pelleted feeds, floating and sinking pellets, advantages of pelletization
2-3 Manual feeding, demand feeders, automatic feeders, surface spraying, bag feeding and tray feeding

UNIT-III: Feed manufacture & Storage

- 3-1 Feed ingredients and their selection, nutrient composition and nutrient availability of feed ingredients
3-2 Feed formulation – extrusion processing and steam pelleting, grinding, mixing and drying, pelletization, and packing
3-3 Water stability of feeds, farm made aqua feeds, micro-coated feeds, micro-encapsulated feeds and micro-bound diets
3-4 Microbial, insect and rodent damage of feed, chemical spoilage during storage period and proper storage methods.

UNIT-IV: Feed additives & non-nutrient ingredients

- 4-1 Binders, anti-oxidants, probiotics
4-2 Feed attractants and feed stimulants
4-3 Enzymes, hormones, growth promoters and pigments
4-4 Anti-metabolites, aflatoxins and fiber.

UNIT-V: Nutritional Deficiency in Cultivable fish

- 5-1 Protein deficiency, vitamin and mineral deficiency symptoms
5-2 Nutritional pathology and anti-nutrients
5-3 Importance of natural and supplementary feeds, balanced diet.

REFERENCE BOOK(S):

1. HALVER JE 1989. Fish nutrition. Academic press, San diego
2. Lovell rt 1998. Nutrition and feeding of fishes, Chapman & Hall, New York
3. Sena de silva, Trevor a anderson 1995. Fish nutrition in aquaculture. Chapman & Hall,
4. Guiland J.A (ed) 1984. Penaeid shrimps- Their Biology and Management.
5. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi

SEMESTER – III
COURSE.: 7 FISH NUTRITION & FEED TECHNOLOGY

BLUE PRINT

Time: 2 hrs | Max.Marks:50

Unit	Essay	Short	Marks allotted
I	02	01	25
II	01	02	20
III	01	01	15
IV	01	01	15
V	01	02	20
Total	06 Of which 3 to be answered	07 Of which 5 to be answered	95 marks including choice95 marks including choice Of which 50 marks to be answered

SEMESTER – III
COURSE.: 7 FISH NUTRITION & FEED TECHNOLOGY

MODEL QUESTION PAPER

TIME: 2Hrs | Max. Marks: 50

Section - A

I. Answer any three questions choosing at least one question from each section.

Draw diagrams where ever necessary.

Marks: 3X10=30

Part - I

1. Nutritional requirements for different stages of cultivable Prawns
2. Explain Feed conversion ratio (FCR) in Aquaculture
3. Write an essay on feed ingredients and their selection.

Part - II

4. Describe the process of feed formulation.
5. Write an essay on Binders & anti-oxidants
6. Explain the importance of natural & supplementary feeds & balanced diet.

Section - B

II. Answer any four of the following questions. Draw diagrams where ever necessary.

Marks: 4X5=20

7. Essential Amino acids
8. Protein to energy ratio
9. Automatic feeders
10. Dry Feeds
11. Causes of spoilage
12. Fibers
13. Alkaloids

SEMESTER – III

COURSE.: 7 FISH NUTRITION & FEED TECHNOLOGY

QUESTION BANK

MODULE - I

ESSAY QUESTIONS

1. Nutritional requirements for different stages of cultivable fish
2. Nutritional requirements for different stages of cultivable Prawns
3. Explain the dietary factors effecting the ratio on growth

SHORT QUESTIONS

1. Essential Amino acids
2. Fatty acids
3. Protein to energy ratio

MODULE - II

ESSAY QUESTIONS

1. Write a essay on types of dry feeds
2. Explain Feed conversion ratio (FCR) in Aquaculture
3. Decribe non dry feeds in Aquaculture

SHORT QUESTIONS

Dry Feeds
Automatic feeders
Mechanised feeding

MODULE - III

ESSAY QUESTIONS

1. Write a essay on feed ingredients and their selection.
2. Explain nutrient composition & nutrient availability of feed ingredients.
3. Decribe the process of feed formulation

SHORT QUESTIONS

1. Water stability of feeds
2. Farm made feeds
3. Causes of spoilage

MODULE - IV

ESSAY QUESTIONS

1. Write a essay on Binders & anti oxidents
2. Explain feed attractants and feed stimulants.
3. Decribe the Groth promortes & pigments

SHORT QUESTIONS

1. Probiotics
2. Anti-metabolites
3. Fiber

MODULE - V

ESSAY QUESTIONS

1. Write a essay on protein deficiency symptoms in cultivable fishes
2. Write a essay on vitamin deficiency symptoms in cultivable fishes
3. Explain the importance of natural & supplementary feeds

SHORT QUESTIONS

1. Mineral deficiency symptoms
2. Alkaloids
3. Benefits of using supplementary feed

SEMESTER – III

COURSE.: 7 FISH NUTRITION & FEED TECHNOLOGY

PRACTICAL SYLLABUS

1. Estimation of protein content in aquaculture feeds
2. Estimation of carbohydrate content in aquaculture feeds
- 3 Estimation of lipid content in aquaculture feeds
4. Estimation of ash in aquaculture feed
5. Study of water stability of pellet feeds
6. Feed formulation and preparation in the lab
7. Study of binders used in aquaculture feeds
8. Study of feed packing materials
9. Study of physical and chemical change during storage
10. Study on physical characteristics of floating and sinking feeds
11. Visit to a aqua-feed production unit

REFERENCES:

1. HALVER JE 1989. Fish nutrition. Academic press, San diego Lovell rt 1998.
2. Nutrition and feeding of fishes, Chapmann & Hall, New York Sena de silva, trevor a anderson 1995.
3. Fish nutrition in aquaculture. Chapmann & Hall, New York.

SEMESTER – III

COURSE.: 7 FISH NUTRITION & FEED TECHNOLOGY

Practical Model question paper

I. Estimate protein content in the given feed sample	1X 15=15 M
II. Feed formulation in the lab	1X10=10 M
III. Preparation of floating feed	1X10=10 M
IV. Field note book	5M
V. Viva voce	5M
VI. Record	5M
Total	50 M

SEMESTER-III
MULTIDISCIPLINARY COURSE
HEALTH AND HYGIENE

SYLLABUS

Unit I: Basics of Nutrition 10 Hrs.

1. Nutrition – definition, importance, good nutrition and mal nutrition; Balanced Diet: Basics of Meal Planning
2. Carbohydrates –functions, dietary sources, effects of deficiency.
3. Lipids –functions, dietary sources, effects of deficiency.
4. Proteins –functions, dietary sources, effects of deficiency.
5. Brief account of Vitamins- functions, food sources, effects of deficiency,
6. Macro and micro minerals –functions, effects of deficiency; food sources of Calcium, Potassium and Sodium; food sources of Iron, Iodine and Zinc
7. Importance of water– functions, sources, requirement and effects of deficiency.

Unit II: Health 10 Hrs.

8. Health - Determinants of health, Key Health Indicators, Environment health & Public health; Health-Education: Principles and Strategies
9. Health Policy & Health Organizations: Health Indicators and National Health Policy of Govt. of India-2017; Functioning of various nutrition and health organizations in India viz., NIN (National Institution of Nutrition), FNB (Food and Nutrition Board), ICMR (Indian Council of Medical Research), IDA (Indian Dietetics Association), WHO-India, UNICEF-India
10. National Health Mission: National Rural Health Mission (NRHM) Framework, National Urban Health Mission (NUHM) Framework
11. Women & Child Health Care Schemes: Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+); Janani Shishu Suraksha Karyakaram (JSSK); Rashtriya Bal Swasthya Karyakram (RBSK); India Newborn Action Plan (INAP); Adolescent Health- Rashtriya Kishor Swasthya Karyakram (RKSK)
12. Disaster Management – Containment, Control and Prevention of Epidemics and Pandemics – Acts, Guidelines and Role of Government and Public

Unit III: Hygiene 10 Hrs.

13. Hygiene – Definition; Personal, Community, Medical and Culinary hygiene; WASH (Water, Sanitation and Hygiene) programme
14. Rural Community Health: Village health sanitation & Nutritional committee (Roles & Responsibilities); About Accredited Social Health Activist (ASHA); Village Health Nutrition Day, Rogi Kalyan Samitis
15. Community & Personal Hygiene: Environmental Sanitation and Sanitation in Public places
16. Public Awareness through Digital Media - An Introduction to Mobile Apps of Government of India: NHP, Swasth Bharat, No More Tension, Pradhan Mantri Surakshit Mantritva Abhiyan (PM Suman Yojana), My Hospital (Mera aspaatal), India fights Dengue, JSK Helpline, Ayushman Bhava, Arogya Setu, Covid 19AP

REFERENCES

Bamji, M.S., K. Krishnaswamy & G.N.V. Brahman (2009)

Textbook of Human Nutrition (3rd edition) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi Swaminathan (1995) Food & Nutrition (Vol I, Second Edition) The Bangalore Printing & Publishing Co Ltd., Bangalore

Vijaya Khader (2000) Food, nutrition & health, Kalyan Publishers, New Delhi Srilakshmi, B., (2010) Food Science, (5th Edition) New Age International Ltd., New Del

SEMESTER-III
MULTIDISCIPLINARY COURSE
HEALTH AND HYGIENE

MODEL PAPER

Time: 2 Hours Maximum Marks: 50

Section–A

I. Answer any THREE questions. Choosing at least 1 question from each part $3 \times 10 = 30$ Marks

PART I

1. Explain the functions, dietary sources and deficiency effects of carbohydrates, lipids and proteins.
2. Discuss the National Health Mission frameworks – NRHM and NUHM – and their key objectives.
3. Describe the types of Hygiene and elaborate on the WASH programme.

PART II

4. Give a detailed account of vitamins – their functions, sources and deficiency disorders.
5. Write an essay on the Women and Child Health Care Schemes in India.
6. Explain the role of digital media and important mobile apps of Government of India in creating public awareness of health and hygiene.

Section–B

II. Answer any Four questions. $4 \times 5 = 20$ Marks

7. Define balanced diet. What are the basics of meal planning?
8. Write the functions and deficiency effects of iron, iodine and zinc.
9. List the key health indicators and determinants of health.
10. Briefly describe the functioning of NIN and ICMR.
11. What are the roles and responsibilities of Village Health Sanitation & Nutritional Committee?
12. Write short notes on environmental sanitation and sanitation in public places.
13. Explain the role of an Accredited Social Health Activist (ASHA) in rural health.

SEMESTER-III
MULTIDISCIPLINARY COURSE
HEALTH AND HYGIENE

QUESTION BANK

MODULE – I: BASICS OF NUTRITION

A. ESSAY QUESTIONS – 10 MARKS

1. Explain the functions, dietary sources and deficiency effects of carbohydrates, lipids and proteins.
2. Define Nutrition and explain good nutrition, malnutrition and balanced diet.
3. Give a detailed account of vitamins – their functions, sources and deficiency disorders.
4. Explain macro-minerals and micro-minerals.

B. SHORT ANSWER QUESTIONS – 5 MARKS

1. Define balanced diet. What are the basics of meal planning?
2. Write the functions and deficiency effects of iron, iodine and zinc.
3. Write a short note on Kwashiorkor and Marasmus.
4. What are RDA and RDI? Explain their significance.

MODULE – II: HEALTH, HEALTH POLICY AND HEALTH PROGRAMMES

A. ESSAY QUESTIONS – 10 MARKS

1. Discuss the National Health Mission frameworks – NRHM and NUHM – and their key objectives.
2. Write a detailed account of the National Health Policy, 2017, including its goal, objectives, health-status goals, health-system performance and policy thrust.
3. Write an essay on the Women and Child Health Care Schemes in India.
4. Explain Health Education, its principles, roles, strategies and purposes.

B. SHORT ANSWER QUESTIONS – 5 MARKS

1. List the key health indicators and determinants of health.
2. Briefly describe the functioning of NIN and ICMR.
3. Write a short note on Health Education – principles, roles and strategies.
4. Write a short note on the Rashtriya Bal Swasthya Karyakram (RBSK) and its 4 Ds.

MODULE – III: HYGIENE, SANITATION, COMMUNITY HEALTH AND DIGITAL HEALTH

A. ESSAY QUESTIONS – 10 MARKS

1. Describe the types of Hygiene and elaborate on the WASH programme.
2. Explain the role of digital media and important mobile apps of Government of India in creating public awareness of health and hygiene.
3. Define environmental sanitation and explain the basic rules for sanitation in public places.
4. Explain the roles and responsibilities of the Village Health, Sanitation and Nutrition Committee (VHSNC).

B. SHORT ANSWER QUESTIONS – 5 MARKS

1. Write short notes on environmental sanitation and sanitation in public places.
2. Explain the role of an Accredited Social Health Activist (ASHA) in rural health.
3. Explain the Village Health and Nutrition Day (VHND) and mention its major activities.
4. What are epidemics and pandemics? Briefly explain the measures for their prevention and control.

IV SEMESTER
COURSE 08 – FISH IMMUNOLOGY

SYLLABUS

UNIT I:

- 1.1 Immunity and types of immunity.
- 1.2 Fundamental concepts and anatomy of the immune system, components of innate and acquired immunity, Phagocytosis, Complement and inflammatory responses,
- 1.3 Organs and Cells of the immune system-primary and secondary lymphoid organs

UNIT II

- 2.1 Lymphatic system, Lymphocyte circulation, Lymphocyte homing, Mucosal and Cutaneous associated Lymphoid tissue (MALT & CALT); Mucosal immunity.
- 2.2 Antigens: Types and properties. Major Histocompatibility Complex (MHC) - MHC genes,
- 2.3 Immune responsiveness and disease susceptibility and HLA typing.

UNIT III

- 3.1 Immunoglobulins: Structure, types and functions.
- 3.2 Immunogenetics: Genetic basis of antibody diversity. Molecular biology of B and T cells.
- 3.3 Complement proteins and cytokines.

UNIT IV:

- 4.1 Disorders of immune system: autoimmunity- types of autoimmune diseases.
- 4.2 Immunodeficiency- Primary immuno deficiencies, Acquired or secondary immuno deficiencies.
- 4.3 Hypersensitivity.
- 4.4 Hybridoma technology- mono and polyclonal antibodies.

UNIT V

- 5.1 Vaccines- Live, killed, attenuated, sub unit vaccines.
- 5.2 Non-specific immunity of shellfish.
- 5.3 Active and passive immunization; ELISA, RIA and Immuno electrophoresis applications.
- 5.4 Transplantation- Immunological basis of graft rejection. Tumor immunology- Tumor antigens; immune response to tumors and tumors evasion of the immune system, Cancer immunotherapy.

REFERENCES BOOKS:

References:

- 1. Eli Benjamini Immunology – a short course Riott Essentials of immunology Blackwell
- 2. I Riott et al Immunology Molsby
- 3. Aruna B Manual of practical immunology Palaniparamount

IV SEMESTER
COURSE NO.: 08 – FISH IMMUNOLOGY

BLUE PRINT

Time: 2 hrs | Max. Marks: 50

Unit	Essay 10M	Short 5M	Marks allotted
I	1	1	15
II	1	1	15
III	1	2	20
IV	2	1	25
V	1	2	20
Total	6 (Answer 3)	7 (Answer 4)	50 Marks to be answered

IV SEMESTER
COURSE NO.: 08 – FISH IMMUNOLOGY

MODE QUESTION PAPER

Time: 2 hrs | Max. Marks :50

SECTION- A

I. Answer any THREE questions choosing at least one question from each section. Draw the diagrams wherever necessary 3 X10 = 30

PART - I

1. What is Immunity? Explain the different types of immunity with suitable examples. -
2. What are Antigens? What are the types of Antigens? Explain their properties-
3. What are Immunoglobulins? What are the types of Immunoglobulins? Explain their structure and functions. -

PART - II

4. What is Autoimmunity? Discuss the types of Autoimmune diseases-
5. Write an essay on Hybridoma Technology-
6. What are Vaccines? Explain the different types of vaccines

SECTION-B

II. Answer any Four of the following. 4x5=20

7. Primary lymphoid organs-
8. Lymphocyte Homing-
9. T-Cells
10. Cytokines
11. Hypersensitivity
12. Active Immunization
13. ELISA

IV SEMESTER
COURSE NO.: 08 – FISH IMMUNOLOGY

QUESTION BANK

I. ESSAY TYPE QUESTIONS

1. What is Immunity? Explain the different types of immunity with suitable examples.
2. What are the different components of innate and acquired immunity
3. Write an essay on the various cells of immune system
4. What are lymphoid organs? Write in detail about Primary and secondary lymphoid organs
5. What are Antigens? What are the types of Antigens? Explain their properties
6. Write an essay on Major Histocompatibility Complex (MHC)
7. What are Immunoglobulins? What are the types of Immunoglobulins? Explain their structure and functions
8. Discuss in detail about the molecular biology of B-cells and T-cells
9. What is Autoimmunity? Discuss the types of Autoimmune diseases
10. What is a secondary immune deficiency disorder? Explain it with an example
11. Write an essay on Hybridoma Technology
12. What are Vaccines? Explain the different types of vaccines
13. Write an essay on Immunoelectrophoresis and its applications
14. What is ELISA? Explain the different types of ELISA techniques
15. Discuss in detail about Tumor immunology

II. SHORT ANSWER TYPE

1. Primary lymphoid organs
2. Innate Immunity
3. Acquired Immunity
4. Phagocytosis
5. Bone marrow
6. Thymus
7. Spleen
8. MALT
9. CALT
10. Lymphocyte Homing
11. T-Cells
12. B-Cells
13. Antigens
14. MHC
15. HLA typing
16. Immunoglobulins
17. IgG Antibody
18. IgM Antibody
19. Complements
20. Cytokines
21. Autoimmunity
22. Hypersensitivity
23. Monoclonal Antibodies
24. Hybridoma Technology
25. Non specific immunity of shell fish
26. Active Immunization
27. ELISA
28. RIA
29. Graft Rejection
30. Tumor Immunology
31. Cancer Immunotherapy

IV SEMESTER

COURSE NO.: 08 – FISH IMMUNOLOGY

PRACTICALS SYLLABUS

1. Preparation of antigens, Immunization and methods of bleeding, serum separation and storage.
2. Antibody titre by ELISA method.
3. Isolation and purification of Ig G from serum or Ig Y from chicken egg.
4. Blood smear identification of leucocytes by Giemsa stain.
5. Separation of leucocytes by dextran method.
6. Demonstration of phagocytosis.
7. Immuno electrophoresis, Isolation of antibody from serum, Nonspecific immune response

IV SEMESTER

Course No.: 08 – FISH IMMUNOLOGY Credits :1

PRACTICALS:

MODEL PAPER

Time: 2hrs

Max Marks: 50

1. Blood smear identification of leucocytes by Giemsa stain-	10M
2. Antibody titre by ELISA method. -	10M
3. Separation of leucocytes by dextran method. -	10M
4.Immunoelectrophoresis or Isolation and purification of IgG from serum or Demonstration of Phagocytosis-	10M
4.Record	05M
5. Viva	05M
Total	50M

PR GOVERNMENT COLLEGE (A): KAKINADA DEPARTMENT OF ZOOLOGY
FISH PROCESSING TECHNOLOGY

B.SC. HONOURS IN AQUACULTURE (MAJOR)

SEMESTER-IV
COURSECODE 9 FISH PROCESSING TECHNOLOGY

SYLLABUS

UNIT 1: Introduction

- 1.1 Principles of fish preservation.
- 1.2 Quality of water and ice in fish handling and processing.
- 1.3 Preparation of ice. Different types of ice used in the seafood industry and their merits.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 2: Freezing and Canning:

- 2.1 Fundamental principles involved in chilling and freezing of fish and fishery products.
- 2.2 Various freezing methods. Freezing of shrimps and fishes.
- 2.3 Changes during the cold storage of fish and fishery products.
- 2.4 Principles involved in canning of fish. Different types of containers.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 3: Drying, Smoking and Freeze-drying:

- 3.1 Different types of drying, Factors affecting drying.
- 3.2 Packing and storage of dried products. Spoilage of dried products. Preventive measures
- 3.3 Smoking of fish, Salting of fish
- 3.4 Principles of freeze drying. Accelerated freeze drying and packing of freeze dried products. Modern methods of preservation by irradiation and modified atmospheric storage.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 4: Packing, Cold Storage and Export of Fishery Products:

- 4.1 Functions of packing. Different types of packing materials and its quality evaluation.
- 4.2 Packing requirements for frozen and cured products.
- 4.3 Statutory requirements for packing.
- 4.4 Labelling requirements. Different types of cold storages, Insulated and refrigerated vehicles.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 5: Export of fishery products

- 5.1 Export of Fishery products from India - major countries, important products, export documents and procedures.
- 5.2 Prospects and constraints in export including tariff and non- tariff barriers, marine insurance, export incentives, registered exporters

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

REFERENCES:

- 1 □ "Fish Processing: Sustainability and New Opportunities" Edited by George M. Hall
 - Covers sustainable practices, new product development, and advanced processing methods.
 - **"Seafood Processing: Technology, Quality and Safety"** Edited by Ioannis S. Boziaris
 - Focuses on preservation techniques, quality control, and safety standards

Web Resources

Website: <https://www.fao.org/fishery/en>

Website: <https://www.journals.elsevier.com/food-control>

Website: <https://www.seafoodsource.com>

Co-Curricular Activities

Mandatory:

Workshops & Hands-on Training: Fish filleting and deboning techniques

Fish preservation methods (salting, drying, smoking, freezing)

- o Packaging and labeling techniques

Field Visits & Industrial Tours:

- o Visits to fish processing plants or seafood industries
- o Exposure to commercial fish markets and cold storage facilities

Competitions & Exhibitions:

- o Fish product innovation contests (e.g., developing new fish-based products)
- o Participating in food technology fairs or exhibitions

Research Projects & Surveys:

- o Conducting studies on fish spoilage or preservation methods
- o Market surveys on consumer preferences for processed fish products

Seminars & Guest Lectures:

- o Inviting industry experts to talk about trends and challenges in fish processing
- o Organizing awareness programs on food safety and hygiene

SEMESTER-IV
COURSECODE 9 FISH PROCESSING TECHNOLOGY

BLUE PRINT

Time: 2 hrs | Max. Marks: 50

Unit	Essay 10M	Short 5M	Marks allotted
I	1	2	20
II	1	1	15
III	1	2	20
IV	2	1	25
V	1	1	15
Total	6 (Answer 3)	7 (Answer 4)	50 Marks to be answered

SEMESTER-IV
COURSECODE 9 FISH PROCESSING TECHNOLOGY

MODEL QUESTION PAPER

Time: 3 hrs. | Max Marks: 50

SECTION –A

I. Answer Any THREE of the following by choosing at least one question in each section (Draw labelled diagrams wherever necessary) 3X10=30

PART- I

- 1 Explain Principles of Fish Preservation, Quality of Water and Ice in Fish Handling and Processing
- 2 Describe Various Freezing Methods: Freezing of Shrimps and Fishes .
- 3 Write about Modern Methods of Preservation:

PART- II

- 4 Explain different types of packing materials used for frozen and cured products
- 5 Describe the different types of cold storage facilities and the role of insulated and refrigerated vehicles in maintaining product quality.
- 6 Describe Important Fishery Products

SECTION - B

II. Answer any FOUR of the following: Draw labeled diagrams wherever necessary 4x5=20 M

- 8 Write Types of Ice in the Seafood Industry
- 9 Explain about principles of preservation
- 10 Write Types of Containers used in canning
- 11 What are two factors that affect the drying process of fish products?
- 12 Smoking ,salting
- 13 Write Statutory requirements for packing

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SEMESTER-IV
COURSECODE 9 FISH PROCESSING TECHNOLOGY

Question Bank

UNIT: I

Essay questions

- 1 Explain Principles of Fish Preservation, Quality of Water and Ice in Fish Handling and Processing
- 2 Write Different types of ice used in the seafood industry and their merits

Short Answer Questions

- 1 Explain about Quality of water in fish handling and processing.
- 2 ice quality in fish handling and processing.
- 3 Write the types of ice used in seafood industry

UNIT-II

Essay questions

- 1 Fundamental Principles Involved in Chilling and Freezing of Fish and Fishery Products
- 2 Different Types of Containers Used in Fish Canning.
- 3 Various Freezing Methods: Freezing of Shrimps and Fishes
- 4 Principles Involved in Canning of Fish

Short answer question

- 1 What is the primary difference between chilling and freezing ?
- 2 Discuss about two freezing methods commonly used for shrimps.
- 3 Physicochemicals changes in fish during the cold storage of fish
- 4 Why is heat treatment necessary during the canning of fish products?

UNIT – III

Essay questions

- 1 Explain Types of Drying and Factors Affecting Drying in Food Preservation
- 2 Write Modern Methods of Food Preservation
- 3 Write about Packing, Storage, and Spoilage of Dried Products

Short answer

- 1 Freez drying
 - 2 Smoking of fish
 - 3 Salting of fish
 - 4 Packaging of freeze dried fishery products
 - 5 Accelerated freeze drying
- RT ANSWER QUESTIONS:

UNIT – IV

Essay questions

- 1 Explain about Functions of Packing & Types of Packing Materials,
- 2 What are the Packing Requirements for Frozen and Cured Products
- 3 Explain Types of Cold Storages, and Insulated Vehicles

Short answer questions:

- 1 Functions of packaging in the food industry?
- 2 Different types of packaging materials used in fisheries
- 4 Different types of cold storages in fisheries
- 5 Labelling requirements for fishery by products

UNIT – V

Essay questions

1. Explain about Export of Fishery Products from India – Major Countries.
2. Write about Prospects and Constraints in Export of Fishery Products .essay questions

Short answer questions:

- 1 Major countries importing fishery products from India.
- 2 Important fishery products exported from India.
- 3 Define tariff and non-tariff barriers.

SEMESTER-IV
COURSECODE 9 FISH PROCESSING TECHNOLOGY

PRACTICAL SYLLABUS

Experiments:

1. Determination of moisture content in fish and fishery products
2. General description –freezing
3. Processing shrimp
4. Filleting of fish
5. Drying of fish
6. Organoleptic analysis of fish
7. Preparation of fishery by products
8. Preparation of shark fin rays fish maws, chitin, fish wafer
9. Fish pickling
10. Value added fishery products, fish curry, cutlets fish finger.
11. Preparation of surimi

Filed visit: 1. Visit to sea food pre-processing plants

Text books:

- K.Gopakumar, Fish Processing Technology, ICAR, New Delhi
- T.K. Govindan, Fish Processing Technology Oxfor & IBH Publication Co.
- K.K. Balachandran Fish Canning – Principles & Practices.
- Borgstrom,G. Fish as Food.
- K.K. Balachandran, Postharvest Technology in Fish and Fishery Products.
- Moorjani,M.V. Fish Processing in India.
- Connell,J.J. Advances in Fishery science and Technology.
- CIFT. Manual of Quality Control in Fish and Fishery Products.
- Gopakumar,K. Fish Packaging Technology

Reference Books: 1. A.M.Martin, Fisheries – Processing Chapman & Hall, Madras 2. Ed.G.M.Hall – Fish Processing Technology Chopra & Hall. Madras.

SEMESTER-IV
COURSECODE 9 FISH PROCESSING TECHNOLOGY

PRACTICAL MODEL QUESTION PAPER - MAX MARKS-50

I Answer any two (Each carries 13 marks)

(2 × 13 = 26 marks)

1. Moisture Content Determination:

Demonstrate the procedure for determining the moisture content in fish or a fishery product using the oven drying method. Record your observations and calculate the moisture percentage.

2. Shrimp Processing:

Perform shrimp processing, including washing, de heading, peeling, deveining, and grading.

Explain each step with proper hygiene protocols.

3. Preparation of Surimi:

Prepare surimi from fresh fish. List all the steps involved in the process and mention quality control measures.

II. Answer any TWO of the following:

2 × 7 = 14 marks

1. Fish Pickling:

Prepare a simple fish pickle. Mention the ingredients used and outline the process.

2. Organoleptic Analysis:

Conduct organoleptic analysis of a fish sample. Record observations based on color, texture, odor, and taste.

3. Preparation of Fishery By-products:

Demonstrate the preparation of Isin glass. Briefly describe its applications.

III,Viva Voce

5 Marks

IV.Record and Observation Book

5 Marks

TOTAL-

50 MARKS

SEMESTER-IV

COURSECODE: 10 EXTENSION, ECONOMICS & MARKETING

PRACTICAL SYLLABUS

UNIT – 1

Introduction

- 1-1 Meaning and scope of economics with reference to fisheries
 - 1-2 Basic concepts of economics – goods, services, wants and utility, demand and supply, value price, market demand and individual demand, elasticity of demand.
 - 1-3 Theory of production, production function in fisheries
 - 1-4 Various factors influencing the fishery product's price
-

UNIT – II

Fisheries marketing

- 2-1 Basic marketing functions, consumer behavior and demand, fishery market survey and test marketing a product
 - 2-2 Fish marketing – prices and price determination of fishes
 - 2-3 Marketing institutions- primary (producer fishermen, fishermen cooperatives, and fisheries corporations) and secondary (merchant/agent/speculative middlemen)
 - 2-4 Preparation of project and project appraisal
-

UNIT-III

Fisheries economics

- 3-1 Aquaculture economics- application of economics principles to aquaculture operations
 - 3-2 Cost and earnings of aquaculture systems – carp culture, shrimp farming systems, hatcheries, Cost and earnings of fishing units and freezing plants
 - 3-3 Socio-economic conditions of fishermen in Andhra Pradesh, Role of Matsyafed and NABARD in uplifting fishermen's conditions, fishermen cooperatives
 - 3-4 Contribution of fisheries to the national economy
-

UNIT-IV

Fisheries extension

- 4-1 Fisheries extension – scope and objectives, principles and features of fisheries extension education
 - 4.2 Fisheries extension methods and rural development
 - 4-3 Adoption and diffusion of innovations
-

UNIT-V

Transfer of technology

- 5-1 ICAR programs – salient features of ORP, NDS, LLP, IRDP, ITDA, KVK, FFDA, FCS, FTI, TRYSEM
 - 5-2 Training – meaning, training vs. education and teaching
 - 5-3 DAATT centres and their role in tot programs, video conferencing, education of farmers through print and electronic media
-

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

REFERENCES:

1. Dewwett KK and Varma JD 1993. Elementary economic theory. S.chand, New Delhi
2. Korakandy R 1996. Economics of Fisheries Mangement. Daya Publishing House, Delhi
3. Tripathi SD 1992. Aquaculture Economics. Asian Fisheries Society, Mangalore.
4. Adivi Reddy sv 1997. An introduction to extension education. Oxford & IBH Co.Pvt. Ltd. New Delhi 2. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal Science University. Tuticorn
5. 5. Subba Rao N 1986. Economics of Fisheries. Daya publishing house, Delhi

Co-Curricular Activities

Mandatory:

1. **For Teacher:** Training of students by the teacher to get data steps of extension, economics, marketing procedures of Aquaculture – Training of students on other employability skills in the fishery sector.
2. **For Student:** Students shall (individually) visit – various types of fishery extension systems. Observe the different education modules and make observations on procedures practiced there and submit a brief handwritten Fieldwork/Project work Report with pictures and data /survey in 10 pages.
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

SEMESTER-IV

COURSECODE: 10 EXTENSION, ECONOMICS & MARKETING

BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10M	SHORT ANSWER QUESTIONS 5M	MARKS ALLOTTED
MODULE-1	1	1	15
MODULE-2	1	1	20
MODULE-3	2	2	15
MODULE-4	1	2	25
MODULE-5	1	1	15
TOTAL	6 (Answer 3)	7 (Answer 5)	50 Marks to be answered

SEMESTER-IV
COURSECODE: 10 EXTENSION, ECONOMICS & MARKETING

MODEL QUESTION PAPER

Time: 2 hrs. | Max Marks: 50

SECTION - A

I. Answer Any THREE of the following questions by choosing at least one question in each section
(Draw labelled diagrams wherever necessary) 3X10=30

PART I

- 1 Write a detailed note on Market demand, individual demand & elasticity demand
- 2 Write an essay on consumer behavior & demand in relation to fishery marketing.
3. Write an essay application of economic principles to aquaculture operations.

PART – II

- 4 Describe the socio economic conditions of fisher men in AP.
5. Give a detailed note on various Fisheries extension methods and their role in rural development.
6. Write a detailed note on DAATT centers and role in TOT programs

SECTION - II

II. Answer any FOUR of the following: Draw labeled diagrams wherever necessary 4x5=20 M

7. Demand & supply
- 8 Middle men
- 9 NABARD
- 10 Freezing plant
- 11 Fisheries extension
- 12 Rural development
- 13 ITDA & KVK.

SEMESTER-IV

COURSECODE: 10 EXTENSION, ECONOMICS & MARKETING

QUESTION BANK

UNIT: I

ESSAY QUESTIONS

1. Discuss the basic concepts of fish economics in detail.
- 2 Write a detailed note on Market demand, individual demand & elasticity demand-
- 3 Describe the various factors influencing the fishery products price.

SHORT ANSWER QUESTIONS:

- | | |
|-----------|---------------------|
| 1 Goods - | 2 Elasticity demand |
| 3 Price | 4 Demand & supply |

UNIT-II

ESSAY QUESTIONS

1. Write an essay on consumer behavior & demand in relation to fishery marketing. -
2. Discuss the importance of price & price determination of fish marketing. -
3. Describe various types of marketing institutions in fishery sector with special reference to primary & secondary institutions.

SHORT ANSWER QUESTIONS

1. Fishermen cooperatives
2. Merchant
3. Agent -
4. Middle men **UNIT – III**

ESSAY QUESTIONS

1. Write an essay application of economic principles to aquaculture operations. -
2. Describe the cost & earning system in aquaculture with spl ref to shrimp farming systems.
3. Describe the socio-economic conditions of fisher men in AP.-
4. Write an essay on emu farming and its economic importance –

SHORT ANSWER QUESTIONS:

1. Freezing plants.-
2. Matshya fed –
3. NABARD-
4. Hatchery -

UNIT – IV

ESSAY QUESTIONS

1. Write an essay on the scope, objectives, principles and features of fisheries extension.
2. Give a detailed note on various Fisheries extension methods and their role in rural development .
3. List out the various innovations in adoption & diffusion?

SHORT ANSWER QUESTIONS:

1. Fisheries extension -
2. Fishery education.
3. Adoption.
4. Rural development.

UNIT – V

ESSAY QUESTIONS

1. Define ICAR and list out the various types of activities carried out by ICAR.
2. Differentiate Training & education with spl reference to teaching. –
3. Write a detailed note on DAATT centers and role in TOT programs-

SHORT ANSWER QUESTIONS:

1. ORP & NDS.
2. ITDA & KVK.
3. FFDA & FCS.
4. Print & electronic media.

SEMESTER-IV

COURSECODE: 10 EXTENSION, ECONOMICS & MARKETING

PRACTICAL SYLLABUS

1. Basic marketing functions
2. Prices and price determination of fishes
3. Fisheries extension
4. Education of Fish farmers
5. Field notes and necessary inputs –should be focused in the practicals

Prescribed Books:

1. Adivi Reddy sv 1997. An introduction to extension education. Oxford & IBH Co.Pvt. Ltd. New Delhi
2. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal Science University. Tuticorn
3. Subba Rao N 1986. Economics of Fisheries. Daya publishing house, Delhi

References:

1. Dewwett KK and Varma JD 1993. Elementary economic theory. S.chand, New Delhi
 2. Korakandy R 1996. Economics of Fisheries Mangement. Daya Publishing House, Delhi
 3. Tripathi SD 1992. Aquaculture Economics. Asian Fisheries Society, Mangalore.
-

SEMESTER-IV

COURSECODE: 10 EXTENSION, ECONOMICS & MARKETING

PRACTICA MODEL PAPER

Part A — Major Exercise	20 Marks
1. Different types of basic marketing functions.	
Part B — Minor Exercise	15 Marks
Role of fishery education in rural development - case study	
Part C — Field visit report	(5 Marks)
Part D — Viva Voce	(5 Marks)
Part E — Record and Observation Book	(5 Marks)
TOTAL-	50 MARKS

SEMESTER V

COURSE CODE: 12 EXTENSION, ECONOMICS & MARKETING (OLD PATTERN)

SYLLABUS

UNIT – I Introduction

- 1-1 Meaning and scope of economics with reference to fisheries
- 1-2 Basic concepts of economics – goods, services, wants and utility, demand and supply, value price, market demand and individual demand, elasticity of demand.
- 1-3 Theory of production, production function in fisheries
- 1-4 Various factors influencing the fishery product's price

UNIT – II Fisheries marketing

- 2-1 Basic marketing functions, consumer behavior and demand, fishery market survey and test marketing a product
- 2-2 Fish marketing – prices and price determination of fishes
- 2-3 Marketing institutions- primary(producer fishermen, fishermen cooperatives, and fisheries corporations) and secondary (merchant/agent/speculative middlemen) 2-4 Preparation of project and project appraisal

UNIT-III Fisheries economics

- 3-1 Aquaculture economics- application of economics principles to aquaculture operations 3-2 Cost and earnings of aquaculture systems – carp culture, shrimp farming systems, hatcheries, Cost and earnings of fishing units and freezing plants
- 3-3 Socio-economic conditions of fishermen in Andhra Pradesh, Role of Matsyafed and NABARD in uplifting fishermen's conditions, fishermen cooperatives 3-4 Contribution of fisheries to the national economy

UNIT-IV Fisheries extension

- 4-1 Fisheries extension – scope and objectives, principles and features of fisheries extension education
- 4.2 Fisheries extension methods and rural development
- 4-3 Adoption and diffusion of innovations

UNIT-V Transfer of technology

- 5-1 ICAR programs – salient features of ORP, NDS, LLP, IRDP, ITDA, KVK, FFDA, FCS, FTI, TRYSEM
- 5-2 Training – meaning, training vs. education and teaching
- 5-3 DAATT centres and their role in tot programs, video conferencing, education of farmers through print and electronic media

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

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3. Tripathi SD 1992. Aquaculture Economics. Asian Fisheries Society, Mangalore.
4. Adivi Reddy sv 1997. An introduction to extension education. Oxford & IBH Co.Pvt. Ltd. New Delhi
2. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal Science University. Tuticorn
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Co-Curricular Activities Mandatory:

1. **For Teacher:** Training of students by the teacher to get data steps of extension, economics, marketing procedures of Aquaculture – Training of students on other employability skills in the fishery sector.
2. **For Student:** Students shall (individually) visit – various types of fishery extension systems. Observe the different education modules and make observations on procedures practiced there and submit a brief handwritten Fieldwork/Project work Report with pictures and data /survey in 10 pages.
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

SEMESTER V

COURSE CODE: 12 EXTENSION, ECONOMICS & MARKETING (OLD PATTERN)

BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10M	SHORT ANSWER QUESTIONS 5M	MARKS ALLOTTED
MODULE-1	1	1	15
MODULE-2	1	1	15
MODULE-3	2	2	30
MODULE-4	1	2	20
MODULE-5	1	1	15
TOTAL	6 (Answer 3)	7 (Answer 5)	50 Marks to be answered

SEMESTER V

COURSE CODE: 12 EXTENSION, ECONOMICS & MARKETING (OLD PATTERN)

MODEL QUESTION PAPER Time: 2 hrs.

2 hrs. | Max Marks: 50

SECTION - A

I. Answer Any THREE of the following questions by choosing at least one question in each section
(Draw labelled diagrams wherever necessary) 3X10= 30M

PART- I

- 1 Write a detailed note on Market demand, individual demand & elasticity demand
- 2 Give a clear picture on preparation of project & project appraisal.
3. Describe the cost & earning system in aquaculture with spl ref to shrimp farmin systems.

PART – II

- 4 Give a detailed note on contribution of fisheries to national economy.
- 5 IGive a detailed note on various Fishries extension methods and their role in rural development.
- 6 Write a detailed note on DAATT centres and role in TOT programmes

SECTION - B

II. Answer any FOUR of the following:

4x5=20 M

Draw labeled diagrams wherever necessary

- 7 Demand & supply
- 8 Middlemen
- 9 NABARD
- 10 Freezing plant
- 11 Fisheries extension
- 12 Rural development
- 13 ITDA & KVK.

**P.R. Govt. College (Autonomous),
Kakinada**

SEMESTER V

COURSE CODE: 12 EXTENSION, ECONOMICS & MARKETING (OLD PATTERN)

QUESTION BANK

UNIT: I

ESSAY QUESTIONS

1. Discuss the basic concepts of fish economics in detail.
- 2 Write a detailed note on Market demand, individual demand & elasticity demand-
- 3 Explain the theories of production and its function in fisheries.
- 4 Describe the various factors influencing the fishery products price.

SHORT ANSWER QUESTIONS:

- 1 Scope of economics -
- 2 Goods -
- 3 Elasticity demand -
- 4 Price
- 5 Demand & supply

UNIT-II

ESSAY QUESTIONS

1. Write an essay on consumer behaviour & demand in relation to fishery marketing. -
2. Discuss the importance of price & price determination of fish marketing.
3. Give a clear picture on preparation of project & project appraisal
4. Describe various types of marketing institutions in fishery sector with special reference to primary & secondary institutions.

SHORT ANSWER QUESTIONS

1. Producer fishermen –
2. Fish market survey –
3. Fishermen cooperatives –
4. Merchant –
5. Agent -
6. Middlemen

UNIT – III

ESSAY QUESTIONS

1. Write an essay application of economic principles to aquaculture operations.-
2. Describe the cost & earning system in aquaculture with spl ref to shrimp farmin systems.
3. Describe the socio-economic conditions of fisher men in AP.-
4. Write an essay on emu farming and its economic importance –
5. Give a detailed note on contribution of fisheries to national economy. –

SHORT ANSWER QUESTIONS:

1. Aquaculture operations.-
2. Carp culture –
3. Freezing plants.-
4. Matsyafed
- 5 NABARD
6. Hatchery -

UNIT – IV

ESSAY QUESTIONS

1. Write an essay on the scope, objectives, principles and features of fisheries extention. 1
2. Give a detailed note on various Fishries extension methods and their role in rural development .
3. List out the various innovations in adoption & diffusion ?

SHORT ANSWER QUESTIONS:

1. Fisheries extention -
2. Fishery education.
3. Adoption
4. Diffusion.
5. Rural development.

UNIT – V

ESSAY QUESTIONS

1. Define ICAR and list out the various types of activities carried out by ICAR.
2. Differentiate Training & education with spl reference to teaching.
3. Write a detailed note on DAATT centres and role in TOT programmes

SHORT ANSWER QUESTIONS:

1. ORP & NDS.
2. ITDA & KVK.
3. FFDA & FCS.
4. Video conferencing
5. Print & electronic media.

SEMESTER V

COURSE CODE: 12 EXTENSION, ECONOMICS & MARKETING (OLD PATTERN)

PRACTICAL SYLLABUS

1. Basic marketing functions
2. Prices and price determination of fishes
3. Fisheries extension
4. Education of Fish farmers
5. Field notes and necessary inputs –should be focused in the practicals

Prescribed Books:

1. Adivi Reddy sv 1997. An introduction to extension education. Oxford & IBH Co.Pvt. Ltd. New Delhi
2. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal Science University. Tuticorn
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 2. Korakandy R 1996. Economics of Fisheries Mangement. Daya Publishing House, Delhi
 3. Tripathi SD 1992. Aquaculture Economics. Asian Fisheries Society, Mangalore.
-

SEMESTER V

COURSE CODE: 12 EXTENSION, ECONOMICS & MARKETING (OLD PATTERN)

PRACTICAL MODEL QUESTION PAPER -

2 Hrs. | [Max Marks-50](#)

Part A — Major Experiment 20 Marks

1. Different types of basic marketing functions.

Part B — Minor Experiment 15 Marks

1. Role of fishery education in rural development - case study

Part C — Field visit report (5 Marks)

Part D — Viva Voce (5 Marks)

Part E — Record and Observation Book (5 Marks)

TOTAL- 50 MARKS

V SEMESTER

COURSE NO.: 13 - ORNAMENTAL FISHERY (OLD PATTERN)

SYLLABUS

UNIT I: Introduction

- 1-1 Aquarium and ornamental fishes – introduction
- 1-2 Present status of Aquarium trade in the world and India
- 1-3 Aquarium accessories – aerators, filters, lighters and heaters
- 1-4 Water quality needs and different kinds of feeds

UNIT II: Fresh water ornamental fishes

- 2-1 Live bearers, gold fish, koi, gourami, barbs abd tetras, angel fish and cichlid fish
- 2-2 Brood stock development, breeding, larval rearing and grow out
- 2-3 Larval feeds and feeding

UNIT III: Marine ornamental fishes

- 3-1 Varieties and habitat of marine ornamental fishes
- 3-2 major marine ornamental fish resources of India
- 3-3 Collection and transportation of live fish, use of anaesthetics
- 3-4 Breeding of marine ornamental fish
- 3-5 Other aquarium animals – sea anemones, lobsters, worms, shrimps, octopus and starfish

UNIT IV: Aquarium management

- 4-1 Setting up fresh water, marine and reef aquariums
- 4-2 Water quality management for different types of aquariums 4-3 Common diseases of aquarium fish, diagnosis and treatment
- 4-4 Temperature acclimatization and oxygen packing for aquarium fish

UNIT V: Commercial production of aquarium fish and plants

- 5-1 Commercial production units of ornamental fish- requirements and design
- 5-2 Commercial production of goldfish, live bearers, gourami's, barbs, angels and tetras
- 5-3 Mass production of aquarium plants
- 5-4 Retail marketing and export of ornamental fish

V SEMESTER

COURSE NO.: 13 - ORNAMENTAL FISHERY (OLD PATTERN)

MODEL QUESTION PAPER

Time: 2 hrs | Max. Marks :50

SECTION- A

Answer any THREE questions choosing at least one question from each section.

Draw diagrams wherever necessary 3 X10 = 30

PART – I

1. Write an essay on the present status of Aquarium trade in the world and India
2. Write about brood stock development of aquarium fishes and their breeding
3. Explain breeding of marine Ornamental fish

Part – II

4. Explain the management of water quality for different types of Aquariums
5. What are the common diseases affecting aquarium fishes? Write their diagnosis and treatment.
6. What are the requirements and design for the commercial production units of ornamental fish?

SECTION-B

Answer any Four of the following.

4x5=20

7. Kinds of Aquarium feeds
8. Gold Fish & Gourami
9. Lobsters
10. Oxygen packing for Aquarium fish
11. Reef Aquariums
12. Aquarium plants
13. Export of Ornamental fish

V SEMESTER

COURSE NO.: 13 - ORNAMENTAL FISHERY (OLD PATTERN)

BLUE PRINT

Time: 21/2 hrs

Max. Marks: 50

MODULE NO.	ESSAY QUESTIONS 10M	SHORT ANSWER QUESTIONS 5M	MARKS ALLOTTED
MODULE-1	1	1	15
MODULE-2	1	1	20
MODULE-3	1	1	20
MODULE-4	2	2	25
MODULE-5	1	2	15
TOTAL	6 (Answer 3)	7 (Answer 4)	50 Marks to be answered

V SEMESTER

COURSE NO.: 13 - ORNAMENTAL FISHERY (OLD PATTERN)

QUESTION BANK

I. ESSAY TYPE QUESTIONS

1. Write an essay on the present status of Aquarium trade in the world and India
2. Write an essay on various aquarium accessories
3. Write about brood stock development of aquarium fishes and their breeding
4. Explain the features of any 5 live bearers
5. Explain breeding of marine Ornamental fish
6. Write an essay on Collection and transportation of live ornamental fish
7. Explain the management of water quality for different types of Aquariums
8. What are the common diseases affecting aquarium fishes? Write their diagnosis and treatment.
9. Explain the setting up of a fresh water aquarium
10. What are the requirements and design for the commercial production units of ornamental fish?
11. Write an essay on Retail marketing and export of ornamental fish

II. SHORT ANSWER TYPE

1. Kinds of Aquarium feeds
2. Aquarium aerators & heaters
3. Angel fish
4. Koi & Abdominal Tetras
5. Larval feeds
6. Gold Fish & Gourami
7. Lobsters
8. Sea anemone
9. Anaesthetics in ornamental fish transport
10. Fin rot and tail rot
11. Abdominal dropsy
12. Oxygen packing for Aquarium fish
13. Temperature acclimatization
14. Reef Aquariums
15. Aquarium plants
16. Export of Ornamental fish

V SEMESTER

COURSE NO.: 13 - ORNAMENTAL FISHERY (OLD PATTERN)

1

PRACTICALS SYLLABUS

1. Study of aerators – types and structures
2. Water circulation methods in aquarium and filtration
3. Collection and identification of aquarium plants
4. Identification of common marine aquarium fishes
5. Identification of common fresh water aquarium fishes
6. Breeding of egg layers
7. Breeding of live bearers
8. Evaluation of significance of aquaria for commercial and domestic use.

PRESCRIBED BOOK(S):

1. Dick Mills 1998. Aquarium fishes, Dorling Kindersly Ltd, London
2. Van Ramshort JD 1978. The complete aquarium encyclopedia, Elsevier

REFERENCES:

1. Jameson JD and Santhanan R 1996. Manual of ornamental fishes and farming technologies, Fisheries College and research institute, Tuticorn
2. Stephen Spotte 1993. Marine aquarium keeping. John wiley and sons, USA

V SEMESTER

COURSE NO.: 13 - ORNAMENTAL FISHERY (OLD PATTERN)

PRACTICALS MODEL PAPER

Time: 2hrs | Max Marks: 50

1. Identification and write notes on the following with a neat labelled diagram 4X5=20M

- A. Aquarium Plant
- B. Marine Aquarium Fish
- C. Freshwater Aquarium Fish
- D. Marine/Fresh water Aquarium Fish

2. Breeding of egg layers/live bearers	10M
3. Types of aerators or water circulation methods in Aquarium	10M
4. Record	05M
5. Viva	05M
Total	50M

V SEMESTER

COURSE 14: FISHERY ENGINEERING (OLD PATTERN)

SYLLABUS

UNIT I: Fishing crafts

- 1-1 Different types of fishing crafts in India- inland and marine– traditional, motorized and mechanized.
- 1-2 Classification of fishing craft.
- 1-3 Boat building materials - wood, steel, FRP, ferro-cement, aluminum etc.,
- 1-4 Mechanization of fishing craft and its impact

UNIT II: Fishing gear

- 2-1 Design of fishing gear and fish catching methods
- 2-1 Fishing accessories, Netting materials – natural and synthetic fishing gear materials and yarn numbering system
- 2.3 Active fishing gear - classification and description of modern fishing gears. -
- 2.4 Design and operation of –trawls, purse seines, ring seines, beach / shore seine, boat seine, pole and line, squid jigs, trolling.

UNIT III: Anchors, Fish Finding & Navigational Equipment (Introductory)

- 3-1 Types of Anchors – Chains, ropes, blocks, leads and drogues
- 3-2 Echo sounders, fish finders, sonar and net sonde
- 3-3 Chronometer, gyro compass, radar, Decca, omega etc. **UNIT IV: Exploration of fish and Conservation**
- 4.2 Remote sensing applications in fish finding and catching.
- 4-2 Turtle exclusion devices
- 4.3 By-catch reduction devices
- 4.4 Destructive and prohibited fishing practices

UNIT V: Fish Processing Equipment

- 5-1 Ice making machinery, Brine tank
- 5-2 Arrangements for leak detection
- 5-3 Operation of various freezing machinery
- 5.4 Special equipment for freez rying, irradiation and cryogenics

Reference Books

- 1. Fridman AI 1992. Calculations for fishing gear designs. FAO, USA. Ltd, England
- 2. Gerhard Klust 1982. Netting material for fishing gears. FAO, USA. Ltd, England
- 3. Jan-Olf- Traung 1992. Fishing boats of the world- Volumes – 1, 2, & 3. FAO, USA. Fishing news books Ltd, England

V SEMESTER

COURSE 14: FISHERY ENGINEERING (OLD PATTERN)

BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10M	SHORT ANSWER QUESTIONS 5M	MARKS ALLOTTED
MODULE-1	1	01	15
MODULE-2	1	02	20
MODULE-3	2	01	25
MODULE-4	1	02	20
MODULE-5	1	01	15
TOTAL	6 (Answer 3)	7 (Answer 4)	50 Marks to be answered

V SEMESTER
COURSE 14: FISHERY ENGINEERING (OLD PATTERN)

MODEL QUESTION PAPER

SECTION-A

I. Answer any THREE questions choosing at least one question from each section. Draw the diagrams wherever necessary 3X10 =30

PART-I

1. Describe the different types of fishing crafts used in India, both in inland and marine fisheries
2. Describe the design of fishing gear and discuss various fish catching
3. Explain the different types of anchoring equipment used in fishing operations.

Part-II

4. Describe the working principles and uses of modern fish detecting equipment
5. Explain the applications of remote sensing in fish finding and fishing operations
6. Explain the working of ice-making machinery and describe the function of a brine tank.

SECTION-B

II. Answer any 4 questions 4x5=20

7. List any four materials commonly used in boat building
8. Explain in detail about different fishing accessories and netting
9. Mention the difference between natural and synthetic materials
10. Anchoring Equipments
11. How does a TED work?
12. Mention any two advantages of TEDs.
13. Name any two methods of detecting gas leaks in cold storage units

V SEMESTER
COURSE 14: FISHERY ENGINEERING (OLD PATTERN)

QUESTION BANK FOR FISHERY ENGINEERING

Module I

Essay Questions

1. Describe the different types of fishing crafts used in India, both in inland and marine fisheries.
2. Explain the classification of fishing crafts with suitable examples
3. Discuss various materials used in the construction of fishing boats.
4. Explain the concept of mechanization of fishing crafts.
5. Evaluate its impact on fishing efficiency, fish stock sustainability, and the socio-economic conditions of fishermen.

Short Answer Questions

1. Differences between traditional and mechanized fishing crafts?
2. List any four materials commonly used in boat building.
3. Define motorized fishing crafts and give two examples.
4. What is FRP, and why is it popular in modern boat construction?

Module II

Essay Questions

1. Describe the design of fishing gear and discuss various fish catching
2. Explain in detail about different fishing accessories and netting
3. Mention the difference between natural and synthetic materials.
4. Classify active fishing gears and describe the modern fishing gears used in the present fishing industry.
5. Explain the design and operation of the fishing gears and its types

Short Questions

1. Write any two commonly used fish catching methods.
2. Brief note on natural and synthetic netting materials.
3. What is the purpose of yarn numbering in net making?
4. Mention two modern fishing gears used in marine fisheries.
5. What is a trawl net? How does it operate?
6. Differentiate between purse seine and ring seine.
7. Write a short note on squid jigs and their use in squid fishing.
8. What is trolling in fishing? How is it operated?

Module III

Essay Questions:

1. Explain the different types of anchoring equipment used in fishing operations.
2. Describe the working principles and uses of modern fish detecting equipment.
3. Discuss the role and importance of navigational instruments in marine fishing.

Short Questions:

1. Anchoring Equipment's
2. What is the function of drogues in fishing?
3. Define the role of chain and rope in anchoring.
4. What are blocks and leads used for in gear operation?
5. What is the principle of an echo sounder?
6. How does a fish finder help in locating fish shoals?
7. Differentiate between sonar and net sonde.
8. Name two advantages of using sonar in deep sea fishing.
9. What is the function of a gyro compass in marine navigation?
10. Mention any two differences between radar and sonar.
11. What is the use of Decca navigation system in fishing vessels?

MODULE IV

Essay Questions:

1. Explain the applications of remote sensing in fish finding and fishing operations.
2. Describe the working, design, and importance of Turtle Exclusion Devices (TEDs).
3. What are By-Catch Reduction Devices (BRDs)? Explain their significance in fisheries.
4. Discuss various destructive and prohibited fishing practices.

Short Questions:

1. How is sea surface temperature useful in fish finding?
2. Name two satellites used for fishery remote sensing.
3. What does chlorophyll concentration indicate in fishing?
4. Why are TEDs used in trawl fisheries?
5. How does a TED work?
6. Mention any two advantages of TEDs.
7. Define by-catch in fisheries.
8. Why is poisoning water to catch fish banned?
9. Mention any two prohibited fishing methods in India.

MODULE V

1. Explain the working of ice-making machinery and describe the function of a brine tank.
2. Describe different arrangements for detecting leaks in refrigeration systems.
3. Explain the operation of various types of freezing machinery used in fish preservation.
4. Write a detailed note on special equipment used for freeze-drying, irradiation, and cryogenic preservation.

Short Questions:

1. What is the role of ice in fish preservation?
2. Name two types of ice-making machines.
3. What is a brine tank used for?
4. Mention one advantage of flake ice over block ice

5. What is the importance of leak detection in refrigeration?
6. Name any two methods of detecting gas leaks in cold storage units.
7. What is the soap bubble method?
8. Mention one electronic device used for refrigerant leak detection.
9. Differentiate between blast freezing and tunnel freezing.
10. What is the working principle of a spiral freezer?
11. What is freeze-drying?
12. Name any one advantage of cryogenic freezin

V SEMESTER

COURSE 14: FISHERY ENGINEERING (OLD PATTERN)

PRACTICALSYLLABUS

PRACTICALS:

1. Site survey: preparation of site map and contour map
2. Ice making and harvesting
3. Testing different netting materials- natural and synthetic
4. Estimation of buoyancy and de-buoyancy of different floating and sinking materials
5. Designing trawl net by conducting survey
6. Solving problems on finding position of gravity, flotation and buoyancy
7. Visit to fishing harbor to study deck machinery
8. Visit to fishing harbor to study hull equipment
9. Visit to boat building yard and dry-docking yard
10. Visit to a fish processing unit to study the equipment used in fish processing

PRESCRIBED BOOKS:

1. Fridman Al 1992. Calculations for fishing gear designs. FAO, USA. Fishing news books Ltd, England
2. Gerhard Klust 1982. Netting material for fishing gears. FAO, USA. Fishing news books Ltd, England
3. Jan-Olf- Traung 1992. Fishing boats of the world- Volumes – 1, 2, & 3. FAO, USA. Fishing news books Ltd, England

REFERENCES:

1. Dag Pike 1992. Fishing boats and their equipment. FAO, USA. Fishing news books Ltd, England

V SEMESTER

COURSE 14: FISHERY ENGINEERING (OLD PATTERN)

PRACTICALMODEL PAPER

Max. Marks 50 | Time: 2Hours

Identify the following spotters/Charts/Photographs (6x5) 30M

1. Site survey: preparation of site map and contour map Ice making and harvesting
2. Estimation of buoyancy and de-buoyancy of different floating and sinking materials
3. Solving problems on finding position of gravity, flotation and buoyancy
4. Visit to fishing harbor to study hull equipment
5. Visit to a fish processing unit to study the equipment used in fish processing.
6. Designing trawl net by conducting survey

1. Record -----	05M
2. Field note book/project work report -----	10M
3. Viva voce -----	05M
TOTAL	50 MARKS

V SEMESTER

COURSE 15: FISH PROCESSING TECHNOLOGY (OLD PATTERN)

SYLLABUS

UNIT 1:

Introduction

1.1 Principles of fish preservation.

1.2 Quality of water and ice in fish handling and processing. 1.3 Preparation of ice. Different types of ice used in the seafood industry and their merits.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 2: Freezing and Canning:

2.1 Fundamental principles involved in chilling and freezing of fish and fishery products.

2.2 Various freezing methods. Freezing of shrimps and fishes.

2.3 Changes during the cold storage of fish and fishery products.

2.4 Principles involved in canning of fish. Different types of containers.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 3: Drying, Smoking and Freeze-drying:

3.1 Different types of drying, Factors affecting drying.

3.2 Packing and storage of dried products. Spoilage of dried products. Preventive measures 3.3 Smoking of fish, Salting of fish

3.4 Principles of freeze drying. Accelerated freeze drying and packing of freeze dried products. Modern methods of preservation by irradiation and modified atmospheric storage.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 4: Packing, Cold Storage and Export of Fishery Products:

4.1 Functions of packing. Different types of packing materials and its quality evaluation.

4.2 Packing requirements for frozen and cured products.

4.3 Statutory requirements for packing.

4.4 Labeling requirements. Different types of cold storages, Insulated and refrigerated vehicles.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 5: Export of fishery products

5.1 Export of Fishery products from India - major countries, important products, export documents and procedures. 5.2 Prospects and constraints in export including tariff and non- tariff barriers, marine insurance, export incentives, registered exporters

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

REFERENCES:

1. "Fish Processing: Sustainability and New Opportunities" Edited by George M. Hall
2. Covers sustainable practices, new product development, and advanced processing methods.
3. "Seafood Processing: Technology, Quality and Safety" Edited by Ioannis S. Bozaris
4. Focuses on preservation techniques, quality control, and safety standards

Web Resources

Website: <https://www.fao.org/fishery/en>

Website: <https://www.journals.elsevier.com/food-control>

Website: <https://www.seafoodsource.com>

Co-Curricular Activities Mandatory:

1. Workshops & Hands-on Training:
2. Fish filleting and deboning techniques
3. Fish preservation methods (salting, drying, smoking, freezing) o Packaging and labeling techniques
4. Field Visits & Industrial Tours:
5. Visits to fish processing plants or seafood industries o Exposure to commercial fish markets and cold storage facilities
6. Competitions & Exhibitions:
7. Fish product innovation contests (e.g., developing new fish-based products) of Participating in food technology fairs or exhibitions
8. Research Projects & Surveys:
9. Conducting studies on fish spoilage or preservation methods of Market surveys on consumer preferences for processed fish products
10. Seminars & Guest Lectures:
11. Inviting industry experts to talk about trends and challenges in fish processing of Organizing awareness programs on food safety and hygiene

V SEMESTER

COURSE 15: FISH PROCESSING TECHNOLOGY (OLD PATTERN)

BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10M	SHORT ANSWER QUESTIONS 5M	MARKS ALLOTTED
MODULE-1	1	2	20
MODULE-2	1	1	15
MODULE-3	1	2	20
MODULE-4	2	1	25
MODULE-5	1	1	15
TOTAL	6 (Answer 3)	7 (Answer 4)	50 Marks to be answered

**PITHAPUR RAJA'S GOVT. COLLEGE (AUTONOMOUS),
KAKINADA**

V SEMESTER

COURSE 15: FISH PROCESSING TECHNOLOGY (OLD PATTERN)

MODEL QUESTION PAPER

Time: 2 hrs. | Max Marks: 50

SECTION –I

Answer Any THREE of the following by choosing at least one question in each section (Draw labelled diagrams wherever necessary) 3X10=30

PART- I

- 1 Explain Principles of Fish Preservation, Quality of Water and Ice in Fish Handling and Processing
- 2 Describe Various Freezing Methods: Freezing of Shrimps and Fishes .
3. Write about Modern Methods of Preservation:

PART- II

- 4 Explain different types of packing materials used for frozen and cured products
- 5 Describe the different types of cold storage facilities and the role of insulated and refrigerated vehicles in maintaining product quality.
- 6 Describe Important Fishery Products

SECTION - B

I. Answer any FOUR of the following: Draw labeled diagrams wherever necessary 4x5=20 M

- 7 Write Types of Ice in the Seafood Industry
- 8 Explain about principles of preservation
- 9 Write Types of Containers used in canning
- 10 What are two factors that affect the drying process of fish products?
- 11 Smoking ,salting
- 12 Write Statutory requirements for packing
- 13 Name any two major fishery products exported from India and two major importing countries

P.R. Govt. College (A), Kakinada

V SEMESTER

COURSE 15: FISH PROCESSING TECHNOLOGY (OLD PATTERN)

PAPER: 15 - Question Bank

UNIT: I

ESSAY QUESTIONS

1. Explain Principles of Fish Preservation, Quality of Water and Ice in Fish Handling and Processing
2. Write Different types of ice used in the seafood industry and their merits

SHORT ANSWER QUESTIONS

1. List three common products derived from fish apart from fresh fish.
2. What is the main purpose of freezing fishery products?
3. Mention two by-products obtained from fish processing. Bottom of Form

UNIT-II

ESSAY QUESTIONS

1. Fundamental Principles Involved in Chilling and Freezing of Fish and Fishery Products-
2. Different Types of Containers Used in Fish Canning. -
3. Various Freezing Methods: Freezing of Shrimps and Fishes-
4. 4. Principles Involved in Canning of Fish

SHORT ANSWER QUESTION

1. What is the primary difference between chilling and freezing of fish?
2. Name two freezing methods commonly used for shrimps.
3. What is lipid oxidation, and how does it affect frozen fish?
4. Why is heat treatment necessary during the canning of fish products?

UNIT – III

ESSAY QUESTIONS

6. Explain Types of Drying and Factors Affecting Drying in Food Preservation
7. Write Modern Methods of Food Preservation
8. Write about Packing, Storage, and Spoilage of Dried Products

SHORT ANSWER QUESTIONS:

- 1.Fish Pickling
- 2.Smoking
- 3.Freezing

UNIT – IV

ESSAY QUESTIONS

1. Explain about Functions of Packing & Types of Packing Materials,
2. What are the Packing Requirements for Frozen and Cured Products
3. Explain Types of Cold Storages, and Insulated Vehicles

SHORT ANSWER QUESTIONS:

1. What are two main functions of packaging in the food industry?
2. . Name any two materials used for vacuum packaging.
3. Why is moisture barrier important in frozen food packaging?
4. Mention two types of cold storage based on temperature.
5. What is the role of labeling in consumer protection?

6. UNIT – V

ESSAY QUESTIONS

1. Explain about Export of Fishery Products from India – Major Countries,
2. Describe about Export of Marine Products from India – Opportunities and Challenges
3. Write about Prospects and Constraints in Export of Fishery Products

SHORT ANSWER QUESTIONS:

1. Name any three major countries importing fishery products from India.
2. List two important fishery products exported from India.
3. Define tariff and non-tariff barriers.

V SEMESTER

COURSE 15: FISH PROCESSING TECHNOLOGY (OLD PATTERN)

PRACTICAL SYLLABUS

Experiments:

1. Determination of moisture content in fish and fishery products
2. General description –freezing
3. Processing shrimp
4. Filleting of fish
5. Drying of fish
6. Organoleptic analysis of fish
7. Preparation of fishery by products
8. Preparation of shark fin rays fish maws, chitin, fish wafer
9. Fish pickling
10. Value added fishery products, fish curry, cutlets fish finger.
11. Preparation of surimi

Field visit: 1. Visit to sea food pre-processing plants

Text books:

1. K.Gopakumar, Fish Processing Technology, ICAR, New Delhi
2. T.K. Govindan, Fish Processing Technology Oxford & IBH Publication Co.
3. K.K. Balachandran Fish Canning – Principles & Practices.
4. Borgstrom, G. Fish as Food.
5. K.K. Balachandran, Postharvest Technology in Fish and Fishery Products.
6. Moorjani, M.V. Fish Processing in India.
7. Connell, J.J. Advances in Fishery science and Technology.
8. CIFT. Manual of Quality Control in Fish and Fishery Products.
9. Gopakumar, K. Fish Packaging Technology

Reference Books: 1. A.M.Martin, Fisheries – Processing Chapman & Hall, Madras 2. Ed.G.M.Hall – Fish Processing Technology Chopra & Hall. Madras.

V SEMESTER

COURSE 15: FISH PROCESSING TECHNOLOGY (OLD PATTERN)

PRACTICAL MODEL QUESTION PAPER -

Max marks-50

Answer any two (Each carries 13 marks)

(2 × 13 = 26 marks)

1. Moisture Content Determination:

Demonstrate the procedure for determining the moisture content in fish or a fishery product using the oven drying method. Record your observations and calculate the moisture percentage.

2. Shrimp Processing:

Perform shrimp processing, including washing, de heading, peeling, deveining, and grading.

Explain each step with proper hygiene protocols.

3. Preparation of Surimi:

Prepare surimi from fresh fish. List all the steps involved in the process and mention quality control measures.

Answer any TWO of the following:

2 × 7 = 14 marks

4. Fish Pickling:

Prepare a simple fish pickle. Mention the ingredients used and outline the process.

5. Organoleptic Analysis:

Conduct organoleptic analysis of a fish sample. Record observations based on color, texture, odor, and taste.

6. Preparation of Fishery By-products:

Demonstrate the preparation of Isin glass. Briefly describe its applications.

III, Viva Voce

5 Marks

IV. Record and Observation Book

5 Marks

TOTAL-

50 MARKS

V SEMESTER

COMMON VALUE-ADDED COURSE ENVIRONMENTAL EDUCATION

SYLLABUS

Unit 1: Environment and Natural Resources

1. Multidisciplinary nature of environmental education; scope and importance.
2. Man as an integral product and part of the Nature.
3. A brief account of land, forest and water resources in India and their importance.
4. Biodiversity : Definition; importance of Biodiversity – ecological, consumptive, productive, social, ethical and moral, aesthetic, and option value.
5. Levels of Biodiversity: genetic, species and ecosystem diversity.

Unit-2: Environmental degradation and impacts

1. Human population growth and its impacts on environment; land use change, land degradation, soil erosion and desertification.
2. Use and over-exploitation of surface and ground water, construction of dams, floods, conflicts over water (within India).
3. Deforestation: Causes and effects due to expansion of agriculture, firewood, mining, forest fires and building of new habitats.
4. Non-renewable energy resources, their utilization and influences.
5. A brief account of air, water, soil and noise pollutions; Biological, industrial and solid wastes in urban areas. Human health and economic risks.
6. Green house effect - global warming; ocean acidification, ozone layer depletion, acid rains and impacts on human communities and agriculture.
7. Threats to biodiversity: Natural calamities, habitat destruction and fragmentation, over exploitation, hunting and poaching, introduction of exotic species, pollution, predator and pest control.

Unit 3: Conservation of Environment

1. Concept of sustainability and sustainable development with judicious use of land, water and forest resources; afforestation.
2. Control measures for various types of pollution; use of renewable and alternate sources of energy.
3. Solid waste management: Control measures of urban and industrial waste.
4. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
5. Environment Laws: Environment Protection Act; Act; Wildlife Protection Act; Forest Conservation Act.
6. International agreements: Montreal and Kyoto protocols; Environmental movements: Bishnois of Rajasthan, Chipko, Silent valley.

Suggested activities to learner:

1. Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc
2. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural site.
3. Study of common plants, insects, birds and basic principles of identification.
4. Study of simple ecosystems-forest, tank, pond, lake, mangroves etc.
5. Case study of a Forest ecosystem or a pond ecosystem.

Suggested text book :

- 1 ErachBarucha (2004) Text book of Environmental Studies for Undergraduate courses
- 2 (Prepared for University Grants Commmission) Universities Press.
- 3 PurnimaSmarath (2018) Environmental studies Kalyani Publishers, Ludhiana

Reference books :

- 1 Odum, E.P., Odum, H.T. & Andrews, J. (1971) Fundamentals of Ecology. Philadelphia:Saunders.
- 2 Pepper, I.L., Gerba, C.P. &Brusseau, M.L. (2011).
- 3 Environmental and Pollution Science.Academic Press.
- 4 Raven, P.H., Hassenzahl, D.M. & Berg, L.R. (2012)
- 5 Environment. 8th edition. JohnWiley & Sons.
- 6 Singh, J.S., Singh, S.P. and Gupta, S.R. (2014) Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
- 7 Sengupta, R. (2003) Ecology and economics: An approach to sustainable development.OUP.
- 8 Wilson, E. O. (2006) The Creation: An appeal to save life on earth. New York: Norton.
- 9 Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll (2006) Principles of Conservation Biology. Sunderland: Sinauer Associates

V SEMESTER

COMMON VALUE-ADDED COURSE ENVIRONMENTAL EDUCATION

Model Paper

Time :2 hrs | Max Marks: 50

SECTION - A

Answer any four question. Each question carries 5 marks

(4x5=20 marks)

1. Explain about the land resources and their use in daily life.
2. Describe about Greenhouse effect.
3. Write briefly about the water pollution.
4. Chipko Movement and Silent valley movements.
5. Natural calamities or disasters
6. Describe Wild life protection Act.
7. What is Ex-situ conservation of biodiversity?
8. Write a short note on Bishnoi's of Rajasthan

SECTION B

Answer any three questions. Each question carries 10 marks

(3x10=30 marks)

9. Define Biodiversity and explain value of biodiversity.

(or)

Explain the water resources in India and their importance

- 10.: Explain the Causes and effects of Deforestation

(or)

What is pollution? Give a brief account on soil pollutions

11. Explain the environmental protection act 1986.

(or)

Write an essay on Solid waste management

V SEMESTER

COMMON VALUE-ADDED COURSE ENVIRONMENTAL EDUCATION

QUESTION BANK

UNIT-1

ESSAY QUESTIONS

1. Explain the Multidisciplinary nature of environmental education
2. Define environmental education. Write the scope and importance of the environmental education.
3. Explain the water resources in India and their importance
4. Define the biodiversity. Explain the value of biodiversity.

SHORT ANSWER QUESTIONS

1. Soil erosion and causes for soil erosion.
2. write a short note on Water cycle.
3. write short note on Chipko movement.
4. Jhum or Podu cultivation.
5. Forest mining.

UNIT-2 ESSAY QUESTION

1. Discuss about human population growth and its impacts on environment.
2. Write about renewable and non –renewable energy resources ,their utilization
3. What is pollution? Give a brief account on soil pollutions.
4. Explain the Causes and effects of Deforestation

SHORT ANSWER QUESTIONS

1. Conflicts over water.
2. Depletion of ozone layer. .
3. water pollution.
4. Air pollution.
5. Natural calamities or disasters.

UNIT-3 ESSAY QUESTIONS

1. Write about the Montreal and Kyoto protocols on environment
2. Write an essay on Solid waste management
3. Explain the environmental protection act 1986.
4. What are the salient features of forest conservation 1980.

SHORT ANSWER QUESTIONS

1. Ex-situ conservation of biodiversity
2. Wild life protection act. 1972.
3. Write a short note on Bishnoi's of Rajasthan.
4. Write a short note on Silent valley movement.

SEMESTER-VI
INTERNSHIP

DEPARTMENT OF ZOOLOGY LIST OF EXAMINERS			
S. No	Name of the Examiner	Subject	Name of the College
1.	Dr. N. Sreenivas	Zoology	GDC Ramachandrapuram
2.	B. Ahmad Ali Baba	Zoology	GDC Pithapuram
3.	Dr. P John Kiran	Zoology	GDC Perumallapuram
4.	Dr.M. Vijaya Kumar	Zoology	SRR GDC Vijayawada
5.	Dr.P. Jaya Bharathi	Zoology	VSK College, Vizag
6.	N. Suneetha	Zoology	SRR GDC, Vijayawada
7.	V. Sandhya	Zoology	GDC, Kaikaluru
8.	Dr. R P Dattu	Zoology	GDC, Tiruvuru.
9.	Dr. K Rama Rao	Zoology	VSK College, Vizag
10.	Dr. T Samuel David Raj	Zoology	VSK College, Vizag
11.	Dr. P R Vani	Zoology	VSK College, Vizag
12.	Dr Y. Poli Naidu	Zoology	GDC, Srikakulam
13.	A. Arjuna Apparao	Zoology	GDC, Yellamanchili
14.	Dr G. Mani	Zoology	GDC (M), Srikakulam
15.	P.S.C.H.P Deepika Rani	Zoology	SKR College (W), Rajahmundry
16.	Dr G. Vijay Prathap	Zoology	VSK College, Vizag
17.	Dr. Y. Shantiprabha	Zoology	VSK College, Vizag
18.	M. Hima Sridevi	Zoology	SKR College(W), Rajahmundry

Lecturer in charge
Dept of Zoology & Aquaculture

DEPARTMENT OF ZOOLOGY
LIST OF QUESTION PAPER SETTERS

S. No	Name of the Examiners	Subject	Name of the College
1.	Dr. N. Sreenivas	Zoology	GDC Ramachandrapuram 9912760880 zoonsreenivas4@gmail.com
2.	B. Ahmad Ali Baba	Zoology	9849320443 bollojubaba@gmail.com
3.	Dr. P John Kiran	Zoology	7799161783 Johnzool75@gmail.com
4.	Dr.M. Vijaya Kumar	Zoology	9490086886 mekalavkumar@gmail.com
5.	Dr.P. Jaya Bharathi	Zoology	8978494740
6.	N. Suneetha	Zoology	9703332851
7.	V. Sandhya	Zoology	9666033718 Sandijosh777@gmail.com
8.	Dr. R P Dattu	Zoology	9441348194 praveendathurajula@gmail.com
9.	Dr. K Rama Rao	Zoology	9010705687 drkarriramarao@gmail.com
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11.	Dr. P R Vani	Zoology	9866886992 vaniprupa@yahoo.co.in
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13.	A. Arjuna Apparao	Zoology	9949449941 Arjunaadari@gmail.com
14.	Dr G. Mani	Zoology	9247872648 drgmani@gamil.com
15.	P.S.C.H.P Deepika Rani	Zoology	6301476184 drpedapati@gmail.com
16.	Dr G. Vijay Prathap	Zoology	9949611243 Pratapgv504@gmail.com
17.	Dr. Y. Shanthiprabha	Zoology	9441269003 santhiprabhay@gmail.com
18.	M. Hima Sridevi	Zoology	9849320443 bollojubaba@gmail.com



Lecturer in charge Dept of Zoology & Aquaculture

DEPARTMENT OF ZOOLOGY & AQUACULTURE

BOARD OF STUDIES – 2026-2027

B. Sc AQUACULTURE

WITH

1.BOS COMMITTEE RESOLUTIONS

2.DEPARTMENT ACTION PLAN

3.CURRICULAR FRAME WORK

4.PROGRAMME OUTCOMES

5.COURSE OUT COMES FOR EACH COURSE

6. CO PO MAPPING

PITHAPURRAJAH'S GOVT COLLEGE(A), KAKINADA
Re-Accredited by NAAC with B++ Grade

**DEPARTMENT OF ZOOLOGY
&
AQUACULTURE**

BOARD OF STUDIES

B.Sc. AQUACULTURE

(Single Major System)

2026-2027



**CHOICE BASED CREDIT SYSTEM
(Convened on 300 -2026)**

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PROCEEDINGS OF THE PRINCIPAL (FAC), PITHAPUR RAJAH's GOVT. COLLEGE [A], KAKINADA
Present: Dr. Kandula Anjaneyulu, M.A, Ph.D.

Rc.No.4/A.C/BOS- UG & PG /2026-27

Dt.17 June 2026

Sub: P.R. Government College (Autonomous), Kakinada – Academic Cell – Conduct of Board of Studies (BoS) Meetings for UG and PG Programmes for the Academic Year 2026–27 – Communication of Guidelines – Regarding.

ORDER:

The autonomous colleges, in alignment with their vision, mission, stated objectives, and core values, are mandated to design and develop their own outcome-based curricula. This must be done with due consideration for societal, local, and global industry requirements, employability, and the development of industry-ready and transferable skills. Accordingly, every programme shall prescribe Course Outcomes (COs), Programme Outcomes (POs), and Programme Specific Outcomes (PSOs) along with a suitable learning outcome assessment management system, supported by a robust and transparent evaluation mechanism to measure attainment levels among students.

Further, the A.P. State Council of Higher Education (APSCHE) has introduced a revised curricular framework effective from the Academic Year 2025-26, incorporating Skill Enhancement Courses, Multi-Disciplinary courses, the Indian Knowledge System and a revised credit structure.

Our institution, from the Academic Year 2022–23 onwards, has defined a renewed vision and mission along with updated objectives and core values, necessitating the design and reorientation of its academic and research administration in line with these directives.

In light of the above responsibilities prescribed by the institution's vision and mission, NEP–2020, NAAC, NIRF, and the APSCHE's revised and new UG and P.G. curricular framework, it is imperative to customize, design, and re-orient our academic and research activities to meet the expectations of students, industries, and government stakeholders.

Accordingly, the Chairpersons of the U.G and P.G Boards of Studies (BoS) of various departments are hereby requested to make necessary arrangements to convene their BoS meetings from **25 June to 30 June 2026**.

The Chairpersons are further instructed to:

1. Prepare the curricula and extracurricular activities for the Academic Year 2026–27 in line with the institution's vision, mission, NEP–2020, and NIRF norms.
2. Devise an appropriate evaluation system to ensure effective learning outcomes and holistic student development.
3. Ensure that the curriculum design includes a **20% revision** of the syllabus each year without deviating from the APSCHE prescribed syllabus.

- framed by the BOS committee concerned with duly following the mandate prescribed above.
5. Engage stakeholders viz employers, parents, and alumni, to obtain feedback on the existing curricula and to invite suggestions for improvements.
 6. Invite the University nominee, subject experts, industry representatives, student representatives, and parent representatives well in advance. The meeting notice shall clearly specify the date, venue, and agenda, and a soft copy of the agenda and relevant documents shall be circulated for their perusal.
 7. Ensure that the subject experts invited preferably hold a Doctorate with at least 10 years of teaching experience and have relevant expertise in designing industry-related, market- and job-oriented curricula.
 8. Facilitate thorough deliberations on curriculum design, evaluation methods, incorporation of research components, measures to enhance learning experiences, and optimal utilization of existing human, physical, and ICT resources.
 9. Conduct all BoS meetings in offline mode. Online participation shall be permitted only under exceptional circumstances.
 10. Prescribe benchmarking and quality initiatives in pedagogy and learning, including strategies for curriculum design and teaching-learning processes, in collaboration with the IQAC Coordinator, prior to the BoS meeting.
 11. Ensure that a minimum student attendance of **75%** shall be required for eligibility to appear for I & II Mid-Term Examinations under the CIA component; this shall be formally approved in the BoS meeting.
 12. Approve any new programmes to be introduced for the Academic Year 2025–26, the number and frequency of certificate courses, and SWAYAM MOOCs courses.
 13. Submit the approved BOS copies in the prescribed format, in **quadruplicate (hard copies)** to the Academic Cell for onward submission to the IQAC, Examination Cell, and Library, within **three days** of the meeting and upload the soft copy in their respective department web pages in the college website.
 14. Ensure strict alignment of all recommendations and curriculum changes with the institution's vision and mission.
 15. Submit a request to receive advance funds from the Examination cell through Principal for conducting BoS meetings.

Following contents shall be presented in the BOS document in the order

1. Proceedings of the Principal pertaining to BOS
2. Composition of BOS
3. Vision and Mission of the department
4. Agenda: It shall include ATR on the previous BOS meeting first, resolutions, etc., later.
5. Table showing the Allocation of Credits in the following table for both theory and Practicals' in case of science subjects

S. No	Semester	Title of the Course (Paper)	Hrs./week	Max. Marks (SEE)	Marks in CIA	Credits
1	III	Physical Chemistry-I	3	50	50	4

6. Resolutions adopted in the meeting with detailed discussion that took place during the meeting.
7. Each BOS Chairman shall, immediately after syllabus, tabulate the changes made in the syllabus/ paper along with justification.
8. Attendance of Members present with signatures in the tabular form.
9. List of Examiners & Paper setters (Minimum 20 members and at least 02 members from other states)
10. Syllabus for each course (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical) and allocation of CIA (50marks) for each course with structure.
11. Each student (2025-26 AB) has to complete one MOOCS course from SWAYAM in any subject per year.

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- Mid examinations are to be conducted in offline mode at college level
- Mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **three short** answer questions with five marks each out of five questions
- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Seminar- 5M	Assignment- 5M	Viva on theory- 3M	Clean & green and Attendance- 2M
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The Chairpersons of all Boards of Studies are hereby instructed to comply with these directives in letter and spirit to ensure the highest standards of academic and administrative excellence.



PRINCIPAL

Pithapur Rajah's Government College(A)
Kakinada

Copy to:

1. Lecturers-in-Charge (BOS Chairmen) of all the departments
2. Academic Coordinator
3. IQAC coordinator
4. Controller of Examinations
5. Office

**PROCEEDINGS OF THE PRINCIPAL, P.R. GOVERNMENT COLLEGE(A),
KAKINADA - A.P.**

Present: Dr. Kandula Anjaneyulu M.A., Ph.D.

Sub: P.R. Government College(A), Kakinada-UG Board of Studies (BOS)-Program/Course-
B.Sc., Aquaculture - Nomination of Members - Orders issued.

Ref: Rc.No.4/A.C/BOS- UG & PG /2026-27 Dt.17 June 2026 of the Principal, PRGC (A), Kakinada
Order:

The Principal, P.R. Government College(A), Kakinada is pleased to constitute UG Board of Studies in B.SC. Aquaculture- for framing the syllabi in respective Subject for all Semesters duly following the norms of theUGC Autonomous guidelines for the AY 2026-27

S. No	Name of the Person	Designation
1	Sri. B. Chakravarthi	Chairman & Lecturer In charge, Department of Zoology & Aquaculture
2	Dr. D. Kalyani	University Nominee, Professor Dept. of Zoology Adikavi Nannaya University, Rajamahendravaram
3	Dr. N. Sreenivas	Subject Expert -I, Lecturer in Zoology, GDC, Ramachandrapuram
4	Dr. M. Ramakrishna	Subject Expert – II, Lecturer in Zoology ASNM GDC (A), Palakollu
5	Sri. C. Adinarayana chowdary	Aqua entrepreneur, Korangi
6	Dr. Kiran Kumar Pappu	Member
7	Dr. B. Elia	Member
8	M. Satya Vara Lakshmi	Member
9	Dr. T. Venkateswara Rao	Member
10	T. Sushma	Member
11	C. Smyrna	Member
12	J. M. Naidu	Student Alumni Member
13	V. Durga prasad	Student Member II. B.Sc.
14	K. Mahima	Student Member I B.Sc

The above members are requested to attend the BoS meeting on 30-06-2026 and share their valuable reviews, and suggestions on the following.

- Prepare syllabi for the subject keeping in view the objectives of the college, interest of the stake holders and National requirement for consideration and approval of the IQAC and Academic Council.
- Suggested methodologies for innovative teaching and evaluation techniques.
- Suggest the panel of Names to the academic council for appointment of Examiners.
- Coordinate research, teaching, extension and other activities in the Department of the college.


PRINCIPAL
PRINCIPAL
P.R. Govt. College (Autonomous)
KAKINADA-533 001.

PR Government College (A), Kakinada

Department of Zoology & Aquaculture

Consolidated Report of Board of studies in UG Aquaculture convened on 11-08-2025

S.No	Name of the Person	Designation
1.	Sri.B. Chakravarthi	Chairman & Lecturer Incharge, Department of zoology & Aquaculture
2.	Dr. D. Kalyani	University Nominee, Adikavi nannaya University, Rajamahendravaram
3.	Dr. N. Sreenivas	Subject Expert: I, Lecturer in Zoology, GDC Ramachandrapuram
4.	Dr. M. Ramakrishna	Subject Expert: II, Lecturer in Zoology, ASNM GDC (A), Palakollu
5.	Sri. C. Adinarayana Chowdary	Representative from Industry, Aqua Entrepreneur
6.	Dr.P.Kiran Kumar .	Member
7.	Dr.B.Elina	Member
8.	Ms. M.S.V. Lakshmi	Member
9.	Sri.T.VenkateswaraRao	Member
10.	Y.Gowthami	Member
11.	B. Devi	Member
12.	T.Sushma	Member
13.	C. Smyrna	Member
14.	Ch. Sandeep Kumar	Alumni
15.	J. Naidu	Student Member III B.SC. Aquaculture
16.	V. Durga Prasad	Student Member II B.SC. Aquaculture

10/8/2025

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PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
KAKINADA 533 001-ANDHRA PRADESH
An AUTONOMOUS and NAAC Accredited Institution (B⁺⁺ Grade- 2.82 CGPA)
(Affiliated to ADI KAVI NANNAYA UNIVERSITY, Rajamahendravaram.)

ACADEMIC CELL

(Certificate to be issued by the University Nominee/Subject Expert/Member of BOS)

Department Name: *Zoology and Aquaculture*

Name of the BOS Member: *Dr. D. Kalyani*

(☒ University Nominee / Subject Expert / Industrialist / Member)

I certify that the syllabus submitted by the*Aquaculture*..... Department is verified by me and I recommend the following suggestions:

1. *Field trip may be conducted regularly to have practical knowledge.*
2. *Students ~~may~~ encouraged to do survey on marketing strategies*
- 3.
- 4.
- 5.

The syllabus is approved with the above suggested modification

D. Kalyani

Signature with Date

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus



PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
KAKINADA 533 001-ANDHRA PRADESH
An AUTONOMOUS and NAAC Accredited Institution (B++ Grade- 2.82 CGPA)
(Affiliated to ADI KAVI NANNAYA UNIVERSITY, Rajamahendravaram.)

ACADEMIC CELL

(Certificate to be issued by the University Nominee/Subject Expert/Member of BOS)

Department Name: *Zoology and Aquaculture*

Name of the BOS Member : *Sri. C. Adinarayana Chowdary*

(University Nominee /Subject Expert/Industrialist / Member)

I certify that the syllabus submitted by the*Aquaculture*..... Department is verified by me and I recommend the following suggestions:

- 1.
- 2.
- 3.
- 4.
- 5.

The syllabus is approved with the above suggested modification

K. Adinarayana
Signature with Date

Note: BOS Members are requested to fill the above details with necessary suggestions and send back to the Head of the department along with the syllabus

AGENDA FOR BOARD OF STUDIES MEETING-2026-2027

30/06/2026

1. Approval of the syllabus for UG B.Sc. (Honours) Aquaculture Single Major System in accordance with NEP 2020 and Outcome-Based Education (OBE).
2. Approval of Syllabus for all the Semesters and implementation of Choice Based Credit System and to introduce new syllabus for III & IV semesters as per APSCHE for 2025-26 admitted batch (Present II YR B.Sc., Zoology major)
3. Model question papers, Blue Print, Panel of paper setters and examiners.
4. Approval of Teaching–Learning and Evaluation Methodologies, including ICT integration and feedback mechanism
5. Implementation of Skill Enhancement Courses (SEC's) in Aquaculture by APSCHE through affiliating University for V semester and select one pair of courses based on the choice of majority of the stakeholders.
6. 75% Of Attendance is compulsory to appear for any examination
7. Conduct of guest lectures, field visits, assigning of project works etc.
8. Additional inputs and changes in the curriculum.
9. Continuation of Certificate courses choosing from the entitled Certificate Course on Diseases of Human Importance/Applied and Economic Zoology/Ornamental Fishery/Water quality Assessment/Biodiversity/Diseases of Human importance/AI in teaching and learning Biology
10. Continuous Internal Assessment pattern (CIA) introduced by APCCE
11. Designing and conduct of workshops and seminars
12. Arrangement of skill development, training programs and MOUs.
13. Conduct of Bridge Course and Remedial Coaching.
14. Approval of new courses introduced in the academic year 2026-27
15. Actionplan2026-2027
16. Any other proposal with the permission of the Chair.

Discussion:

The members of BOS have discussed all the points of Agenda extensively and approved with following suggestions which are incorporated in the resolutions.

PITHAPUR RAJAH'S GOVT COLLEGE(A), KAKINADA

DEPARTMENT OF ZOOLOGY & AQUACULTURE

BOARD OF STUDIES MEETING (2026-27) CONVENED ON 30 JUNE 2026

Resolutions

The members, Board of Studies, Aquaculture met through online and offline on **11 August 2025** 12.00 Noon to discuss the agenda points and to approve the course structure, Theory and Practical syllabus, Blue Print, Model question papers, Additional inputs in the Curriculum, Study Projects, Co- curricular and extracurricular activities of Department, Skill Development Courses and Certificate Courses offered , Internship programmes, Continuous Internal Assessment pattern (CIA) and Semester End examination Pattern.

The following resolutions are made.

Resolution-1

It is resolved to adopt the syllabus for UG B.Sc. (Honours) Aquaculture Single Major System in accordance with NEP 2020 and Outcome-Based Education (OBE), as prescribed by APSCHE.

Resolution-2

Resolved that the syllabus prescribed under the Single Major System and the Choice Based Credit System (CBCS) introduced by UGC/APSCH through Adikavi Nannaya University in 2025-26 be adopted for Semesters I to VI.

Further resolved that the syllabus prescribed by APSCH be implemented in toto for Semesters III and IV during the academic year 2026–27 for students admitted in the academic year 2025–26.

Resolution-3

Resolved to approve the panel of Examiners and Question paper setters, Model papers- and blueprint for all Semesters

Resolution-4

Resolved to implement 50 %external and 50% internal marks for theory exams from the academic year 2021- 22,2023-2024admitted batches, and 60% -40% for 2020-2021 admitted batch back log students as mentioned below and also resolved to split up 50marks of the or internal as 25 marks

for mid exams and 10 marks for project 3 marks for viva,5marks for assignment,2 marks for clean and green activity.

	Internal Assessment 50M						Ext' l Assessment
I Mid	II Mid	Project	Viva	Seminar	Assignment	Clean & Green	50 M (2023 admitted Batch onwards)
25M	25M	10	03	05	05	02	
I Mid	II Mid	Project		Seminar	Assignment etc,	Total	50 M (2021 Admitted batch)
25M	25M	10M		5M	10M	50M	
25M	25M			5M	10M	40M	60 M (2020 Admitted batch)

Resolution-5

It is resolved to choose Skill Enhancement Courses (SEC’s) 12 ,13, 14 & 15 from the list of Skill Enhancement Courses (SEC’s) for V Semester in Zoology for the academic year 2026-2027 as detailed below (Old pattern) for 2024-25 admitted batch

SEMESTER	Code	Title of the paper	Hr /week	Credits
V	12	Extension, Economics & Marketing- (T)	3	3
	12	Extension, Economics & Marketing- (P)	2	1
	13	Ornamental Fishery- (T)	3	3
	13	Ornamental Fishery - (P)	2	1
	14	Fishery Engineering- (T)	3	3
	14	Fishery Engineering - (P)	2	1
	15	Fish Processing Technology- (T)	3	3
	15	Fish Processing Technology- (P)	2	1
VI		Internship		

Resolution-5

Resolved to offer multi-disciplinary course Health and Hygiene in III Semester and ES in V Semester by Department of Zoology according to the curricular frame work prescribed by APSCHE / AKNU

Resolution-6

Resolved to allow students who have put up 75% of attendance to any examination conducted by the institution. It is also resolved to offer Certificate courses choosing from the entitled list Diseases of Human Importance/Applied and Economic Zoology/Ornamental Fishery/Water quality Assessment in the academic year 2025-26.

Resolution-7

Resolved to implement the SOPs given by APSCHE for CSP at the end of II semester, and Semester Internship in VI semester.

Resolution-8

Resolved to approve assessment process for CSP, Short-term and semester Internships in the following manner.

First internship (Community Service Project) will be taken up after the I year II semester end examinations or the summer vacation in the intervening 1st and 2nd years of study. The assessment is to be conducted for 100 marks. The number of credits assigned is 4. Later the marks are converted into grades and grade points to include finally in the SGPA and CGPA.

The weightage shall be:

Project Log	20%
Project Implementation	30%
Project report	25%,
Presentation	25%

Second Internship shall be undertaken by the students in the intervening summer vacation between 2nd and 3rd years or after the II-year IV semester end examinations. There will be only internal evaluation for this internship. The assessment is to be conducted for 100 marks and the credits assigned are 4. The marks are converted into grades and grade points to include finally in the SGPA and CGPA.

The weightage shall be:

Project Log	20%
Project report	25%
Presentation	25%

Third internship shall be for the entire 6th Semester; the student shall undergo Apprenticeship/ Internship /

On the Job Training. The assessment for the Semester long apprenticeship is for 200 marks and credits assigned are 12. The assessment for this internship / on the job training will be both internal and external assessment. The internal assessment will be for 25% of marks which will be continuous and the assessment by the industry/enterprise/organization where the student does his/her internship will be indicated in grades. The Project Presentation is to be made by the student after he/she reports back to the College. Grading given by the Company / Business unit / Enterprise where the student has undergone the training and these grades shall be converted into marks on the scale followed by the University. **The weight age shall be:**

Internal Assessment Component	Max. Marks	Marks Awarded
Project Log	10	
Project Implementation	20	
Project Report	10	
Presentation	10	
TOTAL	50	
External Assessment Component	Max. Marks	Marks Awarded

Performance Assessment by the Evaluation Committee, converting the grades awarded by the industry, enterprise, etc	100	
External Viva Voce	50	
Total	150	
Grand Total	200	

Resolution-9

It is resolved to implement 100% external assessment for Skill Development Courses and 100% internal assessment for Certificate Course and resolved to follow the standard operating procedures given by APSCHE through Adikavi Nannaya University for the evaluation of CSP and IV semester Apprenticeship (AnnexureII)

Resolution-10

Resolved to arrange Bridge Course for the newly admitted students and remedial classes for slow learners

Resolution-11

It is resolved to conduct Co- curricular activities like Student Seminars, quiz programmes, elocution, debate, Group discussion, Extension Activities, Study Projects and field trips and to encourage experiential learning and student participation in extracurricular activities of the college.

Resolution-13

Resolved to conduct Student and Staff Exchange Programmes with ASD Government College for Women(A), Kakinada, GDC Rajamahendravaram and SIFT Kakinada as a part of fulfilling the norms of MoU. Resolved to enter MOUs with Industries or training institutes

Resolution-14

It is resolved to take Feedback on Curriculum design and development from Students, Alumni, Teachers, Parents, and industry at the end of the semester.

Resolution-15

It is resolved to introduce the following new courses in—B.Sc. (Honours) Zoology, from the AY2026-27 for III & IV semesters

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	III	5	Fish Health Management	3	3
			Fish Health Management - Practical	2	1
		6	Shrimp Health Management	3	3
			Shrimp Health Management - Practical	2	1
		7	Fish Nutrition & Feed Technology	3	3
			Fish Nutrition & Feed Technology - Practical	2	1
	IV	8	Fish Immunology	3	3
			Fish Immunology - Practical	2	1
		9	Fish Processing Technology	3	3
			Fish Processing Technology -Practical	2	1
		10	Extension, Economics and Marketing	3	3
			Extension, Economics and Marketing-Practical	2	1

Resolution 16: Resolved to implement the following Action plan for the Academic year 2026-27

ACTION PLAN 2026-27					
S.No	Activity planned	Date/ Period	Outcomes/ Objectives	Approximate Budget	Remarks
1	Preparation of Annual Curricular Plans and Pre	Ist week of June 2026	*To deliver content in a systematic way		
	BOS Meetings	30 June 2026	* To design, develop and enrich curriculum		
2	*Free Medical Camp for all staff	July IV week	Faculty welfare,	5000	
3	Student seminars	August 2026	Student Assessment method	50000	
	*Launch of Certificate Course	August 2026	Curriculum enrichment		
	Invited Lecture	3 rd week of August	Curriculum Enrichment		
	Field Trips to II- & III-Year students	4 th week of August	Experiential Learning		
4					
	World Mosquito Day	20 August 2026	Awareness programme	5000	
5	*Student Seminars	Ist week of September	Experiential Learning	25000	
	*Field trip to I Year students	II week of September			
	*Remedial coaching	4 th week of September	Community service		
6	*Awareness program on Seasonal diseases	1 st week of October 2026	Extension Activity at nearby schools	5000	
	*Remedial coaching	October 2026			
7	*World Fisheries Day	21-11-2026	To highlight the importance of fisheries sector	3000	

	*Student Exchange Programme	4 th week of November	Innovative Teaching Methodology	10000	
8	*Student Training Program at SIFT *Student Seminars	December 2026	Skill Development Assessment & Presentation skills	20000	
9	*Faculty Exchange Program under MOU	January 2027	To Exchange academic resources and Knowledge sharing		
10	*PG CET Coaching	February 2027	Hand holding students for Higher Progression		
11	*Publications By Faculty in UGC Care /Scopus Journals *Remedial Coaching	March 2027	Research/Academic Excellence Outcome achievement		

Resolution-17

Resolved that the chairman, BOS is authorized to take up necessary amendments, changes, additions, and others as and when required as per the instructions of the University, APSCHE and other exigencies if necessary .

CURRICULAR FRAMEWORK

Single major System

2025-2026 Admitted Batch onwards

Curriculum Framework for B.Sc (Honours) from A.Y. 2025-26																										
Major+Minor with CSP & 6th sem Internship																										
Semester	Major (4 Cr)			Minor (4 Cr)			AECC (3 Cr)			Multi Disney' (2 Cr)			Skill Enhancement Courses (4Cr/2Cr)			OOTC			(VAC) IKS# Env. Edn* (2 Cr)			Total				
	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr	C	H (T+P)	Cr		
Sem 1	2	6+4	8				2	8	6				1	4+2	4							5	24	18		
Sem 2	2	6+4	8				2	8	6	1	2	2	1	4+2	4				1#	2	0	7	28	20		
Community Service Project of a minimum of 80 hours with 1 Credits. Student is eligible for Exit Option-1 with the award of Certificate in respective discipline																							1			
Sem 3	3	9+6	12	1	3+2	4	2	8	6	1	2	2	1	2	2							8	32	26		
Sem 4	3	9+6	12	1	3+2	4				1	2	2	1	2	2							6	24	20		
Sem 5	1+2	3+2 6+4	12	2	6+4	8													1*	2	2	6	27	22		
Sem 6	2	6+4	8	2	6+4	8																4	20	16		
Internship/Apprenticeship/OJT a minimum of 180 hours (8 weeks) with 3 Credits. Student is eligible for Exit Option-2 with the award of Degree in respective discipline																							3			
	15		60	6		24	6			18	3		6	4		12				1+1		2	36		126	
Sem 7	3	9+6	12										2	6+4	8	1	2	2	1#	2	0	7	29	22		
Sem 8	3	9+6	12										2	6+4	8	1	2	2	1#	2	0	7	29	22		
4-YR	21		84	6		24	6			18	3		6	8		28	2		4	4		2	50		170	
C	Courses				H	Hours				Cr	Credits				OOTC	Open Online Transdisciplinary										
#	Indian Knowledge Systems - Audit Course										*	Environ Edn														

For Mathematics and Statistics, the number of instructional hours shall be five (5) for courses involving problem-solving, and four (4) for courses comprising only theory.

CURRICULAR FRAMEWORK B.Sc HONOURS FROM THE A.Y. 2025-26 (Major + Minor with CSP & VI Semester Internship)								
1st Year - Semester I								
Sl.No	Category	Course No	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major - Core	I	3	2	5	3	1	4
2	Major - Core	II	3	2	5	3	1	4
4	Minor	0	0	0	0	0	0	0
5	AECC - English	I	4	0	4	3	0	3
6	AECC - MIL (Telugu/Hindi/Sanskrit)	I	4	0	4	3	0	3
7	Multidisciplinary Course	0	0	0	0	0	0	0
8	Skill Enhancement Course (SEC) Intro' to Artificial Intelligence	I	4	2 (Practice)	6	4	0	4
End of Semester I of 1st Year		5	18	6	24	16	2	18
1st Year - Semester II								
Sl.No	Category	Course No	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major - Core	III	3	2	5	3	1	4
2	Major - Core	IV	3	2	5	3	1	4
4	Minor	0	0	0	0	0	0	0
5	English	II	4	0	4	3	0	3
6	MIL (Telugu/Hindi/Sanskrit)	II	4	0	4	3	0	3
	Multidisciplinary Course	I	2	0	2	2	0	2
7	Skill Enhancement Course (SEC) Application of Artificial Intelligence (Discipline Specific)	II	4	2 (Practice)	6	4	0	4
8	Indian Knowledge System	I	2	0	2	0	0	0
9	Community Service Project (minimum of 80 hours with 1 Credit)							1
End of Semester II of 1st Year		7	22	6	28	18	3	21

CURRICULAR FRAMEWORK B.Sc HONOURS FROM THE A.Y. 2025-26 (Major + Minor with CSP & VI Semester Internship)								
2nd Year - Semester III								
Sl. No	Category	Course No	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major - Core	VI	3	2	5	3	1	4
2	Major - Core	VII	3	2	5	3	1	4
3	Major - Core	VIII	3	2	5	3	1	4
4	Minor	I	3	2	5	3	1	4
5	AECC (Creative Writing/Business Writing in English)	III	4	0	4	3	0	3
6	AECC (Creative Writing/Journalistic Writing in MIL - Telugu/Hindi/Sanskrit)	III	4	0	4	3	0	3
	Multidisciplinary Course	II	2	0	2	2	0	2
7	Skill Enhancement Course (SEC) Design Thinking/Problem Solving / Others	III	2	0	2	2	0	2
End of Semester III of 2nd Year		8	24	8	32	22	4	26
2nd Year - Semester IV								
Sl. No	Category	Course No	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major - Core	IX	3	2	5	3	1	4
2	Major - Core	X	3	2	5	3	1	4
3	Major - Core	XI	3	2	5	3	1	4
4	Minor	II	3	2	5	3	1	4
	Multidisciplinary Course	IV	2	0	2	2	0	2
7	Skill Enhancement Course (SEC) Design Thinking/Problem Solving / Others	IV	2	0	2	2	0	2
End of Semester IV of 2nd Year		6	16	8	24	16	4	20

CURRICULAR FRAMEWORK B.Sc HONOURS FROM THE A.Y. 2025-26 (Major + Minor with CSP & VI Semester Internship)								
3rd Year - Semester V								
Sl.No	Category	Course No	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major - Core	V	3	2	5	3	1	4
2	Major - Elective	XII	3	2	5	3	1	4
3	Major - Elective	XIII	3	2	5	3	1	4
4	Minor	III	3	2	5	3	1	4
5	Minor	IV	3	2	5	3	1	4
6	Environmental Education	I	2	0	2	2	0	2
End of Semester V of 3rd Year		6	17	10	27	17	5	22
3rd Year - Semester VI								
Sl.No	Category	Course No	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major - Elective	XIV	3	2	5	3	1	4
2	Major - Elective	XV	3	2	5	3	1	4
3	Minor	VII	3	2	5	3	1	4
4	Minor	VIII	3	2	5	3	1	4
5	Semester Internship (minimum of 180 hours with 3 Credits)							3
End of Semester VI of 3rd Year		4	12	8	20	12	7	19

Credit Framework for 3-year UG Program

Credits for Major - $11 \times 4 = 44 + 4 \times 4 = 16$. Total 60 Credits

Credits for Minor - $6 \times 4 = 24$ Credits

Credits for AECC (Languages) - $3 \times 3 = 9$ for Eng + $3 \times 3 = 9$ for MIL. Total = 18

Credits for Multidisciplinary Courses - $3 \times 2 = 6$ Credits

Credits for Skill Enhancement Courses - $2 \times 4 = 8$ for AI + 2×2 for others. Total 12 Credits

Credits for Value Added Courses - Env.Edn 2 Credits

Credits for Internships - 4 Credits

TOTAL CREDITS FOR 3-YEAR UG PROGRAMME - 126 Credits.

For Mathematics and Statistics, the number of instructional hours shall be five (5) for courses involving problem-solving, and four (4) for courses comprising only theory.

CURRICULAR FRAMEWORK B.Sc HONOURS FROM THE A.Y. 2025-26 (Major + Minor with CSP & VI Semester Internship)								
3rd Year - Semester V								
Sl.No	Category	Course No	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major - Core	V	3	2	5	3	1	4
2	Major - Elective	XII	3	2	5	3	1	4
3	Major - Elective	XIII	3	2	5	3	1	4
4	Minor	III	3	2	5	3	1	4
5	Minor	IV	3	2	5	3	1	4
6	Environmental Education	I	2	0	2	2	0	2
End of Semester V of 3rd Year		6	17	10	27	17	5	22
3rd Year - Semester VI								
Sl.No	Category	Course No	No. of Hours		Total No. of Hours	No. of Credits		Total No. of Credits
			Theory	Practical		Theory	Practical	
1	Major - Elective	XIV	3	2	5	3	1	4
2	Major - Elective	XV	3	2	5	3	1	4
3	Minor	VII	3	2	5	3	1	4
4	Minor	VIII	3	2	5	3	1	4
5	Semester Internship (minimum of 180 hours with 3 Credits)							3
End of Semester VI of 3rd Year		4	12	8	20	12	7	19

Credit Framework for 3-year UG Program

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Credits for Value Added Courses – Env.Edn 2 Credits

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For Mathematics and Statistics, the number of instructional hours shall be five (5) for courses involving problem-solving, and four (4) for courses comprising only theory.



ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

**Syllabus for 4-Year UG Honours in B.Sc. (Aquaculture) as Major in consonance with
Curriculum framework w.e.f. AY 2025-26**

Prepared by Acharya Nagarjuna University, Guntur

COURSE STRUCTURE (for Semester I to II)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1	Basic Principles and Practices of Aquaculture	3	3
			Basic Principles and Practices of Aquaculture-Practical	2	1
		2	Biology of Finfish & Shellfish	3	3
			Biology of Finfish & Shellfish - Practical	2	1
	II	3	Freshwater Aquaculture	3	3
			Freshwater Aquaculture - Practical	2	1
		4	Brackish water Aquaculture and Mariculture	3	3
			Brackish water Aquaculture and Mariculture - Practical	2	1
II	III	5	Fish Health Management	3	3
			Fish Health Management - Practical	2	1
		6	Shrimp Health Management	3	3
			Shrimp Health Management - Practical	2	1
		7	Fish Nutrition & Feed Technology	3	3
			Fish Nutrition & Feed Technology - Practical	2	1
	IV	8	Fish Immunology	3	3
			Fish Immunology - Practical	2	1
		9	Fish Processing Technology	3	3
			Fish Processing Technology -Practical	2	1
		10	Extension, Economics and Marketing	3	3
			Extension, Economics and Marketing-Practical	2	1
		11	Ornamental Fish Culture	3	3
			Ornamental Fish Culture -Practical	2	1
			Soil and Water Quality Management	3	3

III	V	12 A	Soil and Water Quality Management-Practical	2	1
		OR			
		12 B	Coastal Aquaculture	3	3
			Coastal Aquaculture - Practical	2	1
Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
		OR			
		12 C	Crustacean Culture	3	3
			Crustacean Culture - Practical	2	1
		13 A	Aquaculture Microbiology	3	3
			Aquaculture Microbiology - Practical	2	1
		OR			
		13 B	Aquaculture Engineering	3	3
			Aquaculture Engineering - Practical	2	1
		OR			
		13 C	Molluscan and Seaweed culture	3	3
			Molluscan and Seaweed culture - Practical	2	1
	VI	14 A	Post-Harvest Technology & Transportation	3	3
			Post-Harvest Technology & Transportation - Practical	2	1
		OR			
		14 B	Hatchery Technology in Aquatic organisms	3	3
			Hatchery Technology in Aquatic organisms - Practical	2	1
		OR			
		14 C	Genetics in Aquaculture	3	3
			Genetics in Aquaculture - Practical	2	1
		15 A	Techniques for Aqua Lab	3	3
			Techniques for Aqua Lab - Practical	2	1
		OR			
		15 B	Aquaculture Biotechnology	3	3
			Aquaculture Biotechnology - Practical	2	1
		OR			
		15 C	Quality Control in Processing Plants	3	3
			Quality Control in Processing Plants-Practical	2	1

Note: In the III Year (during the V and VI Semesters), students are required to select a pair of electives from one of the Three specified domains. For example: if set 'A' is chosen, courses 12 to 15 to be chosen as 12 A, 13 A, 14 A and 15 A. To ensure in-depth understanding and skill development in the chosen domain, students must continue with the same domain electives in both the V and VI Semesters.

B.Sc. Honours Zoology with Minor
III Semester Structure
2025-2026 admitted Batch

S. No	Subject/ paper	Title	Total hrs /week	No. of Credits	Remarks
1.	Course V	Fish Health Management	3+2= 5 Hrs	3+2	
2.	Course VI	Shrimp Health Management	3+2= 5 Hrs	3+2	
3	Course VII	Fish Nutrition & Feed Technology	3+2= 5 Hrs	3+2	
4	Minor I	Animal Diversity-I Biology of Non-Chordates	3+2= 5 Hrs	3+2	
5	First Language	English	3 Hrs	4	
6	Second Language	Tel/San/Hindi	3 Hrs	4	
7	Skill Courses (1Paper)	ICT 	2+2= 4 Hrs	2+2	A student must choose any one course

8	MDC		
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**B.Sc. Honours Zoology with
Minor**

**IV Semester Structure
2025-2026 admitted Batch**

S. No	Subject/ paper	Title	Total hrs /week	No. of Credits	Remarks
1.	Course VIII	Fish Immunology	3+2= 5 Hrs	3+2	
2.	Course IX	Fish Processing Technology	3+2= 5 Hrs	3+2	
3	Course X	Extension, Economics and Marketing	3+2= 5 Hrs	3+2	
4	Minor II	Animal Diversity-II Biology of Chordates	3+2= 5 Hrs	3+2	
5	Skill Course		2+2= 4 Hrs	2+2	A student must choose any one course
6	MDC				

2024-2025 ADMITTED BATCH

B.Sc (Honours) with Single Major																										
Semester	Major* (4 Cr)			Minor (4 Cr)			AECC (3 Cr) <i>Lang</i>			Multi Disney' (2 Cr)			Skill Enhanceme nt Courses (2Cr)			OOTC			Env. Edn (2 Cr)			Total				
	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr	C	H	Cr		
Sem 1	2*	10	8				2	8	6	1	2	2	2	6	4							7	26	20		
Sem 2	2	10	8	1	3+2	4	2	8	6				2	6	4							7	29	22		
Community Service Project of 180 hours with 4 Credits.																										
Student is eligible for Exit Option-1 with the award of Certificate in respective discipline																										
Sem 3	4	12+8	16	1	3+2	4				1	2	2	1	2	2							7	29	24		
Sem 4	3	9+6	12	2	6+4	8				1	2	2	1	2	2							7	29	24		
Short-Term Internship/Apprenticeship/OJT of 180 hours with 4 Credits.																										
Student is eligible for Exit Option-2 with the award of Diploma in respective major with minor																										
Sem 5	4	12+8	16	2	6+4	8													1	2	2	7	32	26		
Sem 6	Semester Internship/Apprenticeship/OJT with 12 Credits.																									
Student is eligible for Exit Option-3 with the award of Degree in respetive major																										
																			IKS#							
Sem 7	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22		
Sem 8	3	9+6	12										2*	6+4	8	1	2	2	1	2	0	6	29	22		
	21		84	6		24	4		12	3	6	6	10	32	28	2	4	4	2	4	0	47		160		
20 Additional Credits for 10 month mandatory Internship/OJT/Apprenticeship																										
C Courses				H Hours				Cr Credits				OOTC Open Online Transdisciplinary														
IKS# Indian Knowledge Systems - Audit Course																										

Andhra Pradesh State Council of Higher Education

B.Sc., Honours in AQUACULTURE MAJOR

w.e.f AY 2023-24 onwards

COURSE STRUCTURE

SEMESTER	Co le	Title of the paper	Hr /week	Credits
III	5	Basic Principles of Aquaculture- (T)	3	3
		Basic Principles of Aquaculture - (P)	2	1
	6	Capture Fisheries- (T)	3	3
		Capture Fisheries- (P)	2	1
	7	Fresh water Aquaculture- (T)	3	3
		Fresh water Aquaculture- (P)	2	1
	8	Brackish water Aquaculture- (T)	3	3
		Brackish water Aquaculture- (P)	2	1
IV	9	Fish Health management- (T)	3	3
	9	Fish Health management- (P)	2	1
	10	Shrimp Health Management- (T)	3	3
	10	Shrimp Health Management- (P)	2	1
	11	Fish nutrition & Feed technology - (T)	3	3
	11	Fish nutrition & Feed technology - (P)	2	1
V	12	Extension, Economics & Marketing- (T)	3	3
	12	Extension, Economics & Marketing- (P)	2	1
	13	Ornamental Fishery- (T)	3	3
	13	Ornamental Fishery - (P)	2	1
	14	Fishery Engineering- (T)	3	3
	14	Fishery Engineering - (P)	2	1
	15	Fish Processing Technology- (T)	3	3
	15	Fish Processing Technology- (P)	2	1
VI		Internship		

B.Sc. Aquaculture Program Outcomes

PO1. Scientific Knowledge: Apply fundamental and advanced knowledge of aquaculture, fisheries biology, aquatic ecology, genetics, nutrition, pathology, and biotechnology to solve problems related to sustainable aquatic food production.

PO2. Technical Competence: Demonstrate proficiency in planning, establishing, and managing freshwater, brackishwater, and marine aquaculture systems using modern farming technologies and best management practices.

PO3. Problem Analysis and Decision Making: Identify, analyze, and provide scientifically sound solutions to challenges in aquaculture production, disease management, water quality, environmental sustainability, and resource utilization.

PO4. Research and Innovation: Design and conduct experiments, analyze biological and environmental data using appropriate statistical tools, and apply research findings to improve aquaculture productivity and sustainability.

PO5. Digital and Technological Skills: Utilize modern digital tools, precision aquaculture technologies, GIS, remote sensing, automation, AI, and data analytics for efficient aquaculture management and monitoring.

PO6. Environmental Sustainability: Apply principles of ecosystem conservation, biosecurity, climate resilience, responsible resource management, and sustainable aquaculture practices to minimize environmental impacts and ensure long-term productivity.

PO7. Professional Ethics and Social Responsibility: Demonstrate ethical practices, regulatory compliance, food safety standards, animal welfare considerations, and social responsibility while contributing to sustainable aquatic food systems.

PO8. Communication and Teamwork: Communicate scientific and technical information effectively through oral, written, and digital media, and collaborate efficiently with multidisciplinary teams, farmers, researchers, industries, and extension agencies.

PO9. Entrepreneurship and Employability: Develop entrepreneurial competencies, business planning, financial management, value addition, marketing strategies, and leadership skills to establish and manage successful aquaculture enterprises and related industries.

PO10. Lifelong Learning and Professional Development: Engage in continuous learning, skill enhancement, professional development, and adaptation to emerging technologies, national policies, and global advancements in aquaculture and allied sectors.

B.Sc. Aquaculture - Program Specific Outcomes

PSO1. Aquaculture Production Systems: Demonstrate competence in the planning, establishment, operation, and management of freshwater, brackish water, and marine aquaculture production systems using scientific principles and best management practices.

PSO2. Hatchery and Seed Production: Apply advanced techniques for broodstock management, induced breeding, larval rearing, seed production, and nursery management of commercially important aquatic species.

PSO3. Aquatic Animal Health Management: Diagnose, prevent, and manage diseases of aquatic organisms through biosecurity measures, health monitoring, disease surveillance, and responsible therapeutic interventions.

PSO4. Nutrition and Feed Management: Formulate, evaluate, and manage nutritionally balanced feeds and feeding strategies to improve growth performance, feed efficiency, and sustainable aquaculture production.

PSO5. Water Quality and Environmental Management: Monitor, evaluate, and manage water quality and aquatic ecosystems using scientific methods to maintain optimum culture conditions and promote environmental sustainability.

PSO6. Fisheries Biotechnology and Genetics: Apply principles of genetics, genomics, biotechnology, and molecular techniques for species improvement, disease diagnosis, conservation, and sustainable aquaculture development.

PSO7. Aquaculture Engineering and Technology: Utilize modern aquaculture infrastructure, farm mechanization, aeration systems, RAS, Biofloc Technology, and precision farming tools to enhance production efficiency.

PSO8. Seafood Quality and Value Addition: Implement quality assurance, food safety standards, post-harvest handling, processing, preservation, value addition, and traceability practices for aquatic products.

PSO9. Data Analysis and Digital Applications: Apply statistical methods, information technology, GIS, remote sensing, artificial intelligence, and digital tools for aquaculture planning, monitoring, and decision-making.

PSO10. Entrepreneurship and Business Management: Develop entrepreneurial skills to establish, manage, and expand aquaculture enterprises through effective business planning, financial management, marketing, and value chain development.

PSO11. Extension and Community Development: Provide technical guidance and extension services to farmers, producer organizations, and rural communities for the adoption of sustainable and climate-resilient aquaculture practices.

PSO12. Professional Ethics and Lifelong Learning: Demonstrate professional ethics, leadership, effective communication, regulatory compliance, and a commitment to lifelong learning for continuous professional growth in aquaculture and allied sectors.

Pithapur Rajah's Govt. Degree College (A)
Kakinada

SEMESTER-I

COURSE 1: BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

Theory

Credits: 3

3 hrs/week

COURSE OBJECTIVES:

- To study the significance, history, present status of aquaculture in world, India and AP ■ To gain knowledge on various types of aquaculture systems and practices
- To learn the design and construction principles of aqua farms and hatcheries.
- To understand the significance of water and soil quality parameters in aquaculture ponds.
- To study the methods of eradication of aquatic weeds, insects, unwanted fishes and algal blooms in culture ponds.
- To improve technical skills in water analysis, identification of pond biota and gain hands-on and field experience by visiting aqua farms.

LEARNING OUTCOMES:

By the completion of the course, student will be able to –

- Understand the scope and status of aquaculture with related schemes and its significance.
- Differentiate various aquaculture systems and culture practices, and their significance.
- Explain design and construction principles of aqua farms and hatcheries.
- Analyse the physico-chemical and biological parameters of water and soil in aquaculture ponds and maintain their optimum levels for better production.
- Implement proper liming and fertilization techniques for maintaining pond health.
- Apply proper pond culture management practices for high yielding profitable culture.

SYLLABUS:

UNIT-I: Introduction

- 1.1. Definition, Significance and History of Aquaculture.
- 1.2. Concept of Blue Revolution and Pradhan Mantri Matsya Sampada Yojana (PMMSY)
- 1.3. Present status of Aquaculture at global, India and Andhra Pradesh level
- 1.4. Aquaculture versus Agriculture; Present day needs with special reference to A.P.

UNIT-II: Aquaculture Systems and Practices

- 2.1. Types of aquaculture: Freshwater aquaculture, Brackish water aquaculture and Mariculture

- 2.2. Culture Systems: Ponds, Raceways, Cages, Pens, Rafts, Water Recirculating Systems, Bio- flocc technology and 3C system
- 2.3. Culture practices: Traditional, Extensive, Modified Extensive, Semi-Intensive, Intensive and Super Intensive systems of fish and shrimp.
- 2.4. Culture methods: Monoculture, Poly culture, Mono-sex culture and Integrated fish farming.

UNIT-III: Design and Construction of Aqua Farms

- 3.1. Functional classification of ponds – head pond, hatchery, nursery, rearing, production, stocking and quarantine ponds
- 3.2. Criteria for the selection of site for freshwater and brackish water pond farms
- 3.3. Design and construction of an ideal fish and shrimp farms.
- 3.4. Design and construction of fish and shrimp hatcheries.

UNIT-IV: Pond Culture Management-I

- 4.1. Water quality in freshwater fish ponds: Significance of physico-chemical (temperature, transparency, turbidity, light, pH, DO, CO₂, orthophosphates, NH₃, NO₂) and biological (plankton and benthos) characteristics and their management at optimal levels in ponds.
- 4.2. Water quality in shrimp culture ponds: Significance of physico-chemical and biological characteristics and their management at optimal levels in ponds.
- 4.3. Significance of soil characteristics and their optimal levels for culture
- 4.4. Liming and fertilization: Lime and Fertilizers (organic manures and chemical Fertilizers) - Types and need of their application in ponds

UNIT-V: Pond Culture Management-II

- 5.1. Common aquatic weeds- advantages and disadvantages and their control in culture ponds
- 5.2. Aquatic insects: Disadvantages of insects and their control
- 5.3. Unwanted fishes: Common weed and predatory fishes - Disadvantages and their control.
- 5.4. Algal blooms: Bloom forming algae and their control

REFERENCE BOOKS:

1. Jhingran VG 1998. *Fish and Fisheries of India*. Hindustan Publishing Corporation, New Delhi
2. Pillay TVR & Kutty MN. 2005. *Aquaculture- Principles and Practices*. 2nd Ed. Blackwell
3. Pillay TVR & Dill MA. 1979. *Advances in Aquaculture*. Fishing News Books Ltd., London
4. Stickney RR 1979. *Principles of Warm Water Aquaculture*. John Wiley & Sons Inc. 1981
5. Boyd CE 1982. *Water Quality Management for Pond Fish Culture*. Elsevier Scientific Publ.
6. Bose AN et.al, 1991. *Costal Aquaculture Engineering*. Oxford & IBH Publishing Company.

CO-PO Mapping:**(1: Slight [Low] 2: Moderate [Medium];3: Substantial [High], : 0 : No Correlation)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	1	3	2	3	2	1	2	2
CO2	2	1	3	2	1	1	2	3	1	1	2	2	2
CO3	1	1	2	3	3	1	1	1	2	3	1	2	1
CO4	3	2	3	2	2	2	1	2	1	2	2	1	2
CO5	1	2	1	1	1	2	2	1	1	1	1	1	2

Pithapur Rajah's Govt. College (A) Kakinada.

DEPARTMENT OF ZOOLOGY & AQUACULTURE

SEMESTER I

COURSE 1: BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE**BLUE PRINT**

Time: 2 hrs

Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	2
IV	2	2
V	1 Out of 6, 3 questions should be answered 3X10=30M	1 Out of 7, 4 questions should be answered 4X5=20M

B
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AND PRACTICES OF AQUACULTURE

QUESTION BANK**Essay Questions**

UNIT – I

1. Describe the Status of aquaculture in India.
2. Explain the concept of the Blue Revolution and its impact on aquaculture development.
3. Write an essay on objectives and components of (**Pradhan Mantri Matsya Sampada Yojana**)
4. Discuss the present status of aquaculture in Andhra Pradesh.

UNIT – II

6. Explain Freshwater aquaculture, including its types and advantages.
7. Describe Brackish water aquaculture and its scope in India.
8. Explain Mariculture and its economic and ecological importance.
9. Explain Polyculture in aquaculture with examples and benefits.

UNIT – III

10. Describe the functional classification of ponds in aquaculture.
12. Explain the criteria for selecting a site for freshwater and brackish water farms.
13. Write an essay on the design and construction of an ideal fish farm.
14. Explain the design and construction of a shrimp hatchery with essential features.

UNIT – IV

15. Discuss the significance of water quality parameters and their management in aquaculture ponds.
16. Explain the importance of soil characteristics in aquaculture ponds.
17. Write an essay on types, methods of liming in aquaculture ponds.
18. Explain fertilization in aquaculture ponds, including types of fertilizers and application methods.

UNIT – V

19. Describe common aquatic weeds in culture ponds and their control measures.
20. Discuss aquatic insects in ponds, their impact on culture, and control methods.
21. Explain the problems caused by predatory and unwanted fishes in ponds.
22. Discuss algal blooms in aquaculture ponds.

Short Questions

UNIT – I

1. Blue Revolution.
2. PMMSY
3. Present status of aquaculture in India.

UNIT – II

5. Extensive culture system.
6. Semi-intensive culture system.
7. Intensive culture system.
8. Mono-sex culture.

UNIT – III

- 9. Head pond.
- 10. Hatchery pond.
- 11. Nursery pond.
- 12. Rearing pond.

UNIT – IV

- 13. Turbidity in ponds.
- 14. Dissolved Oxygen (DO) in ponds.
- 15. Ammonia (NH₃) in ponds.

UNIT – V

- 16. Examples of aquatic weeds.
- 17. Examples of predatory fishes.
- 18. Examples of bloom-forming algae.
- 19. Control of aquatic weeds.
- 20. Control of aquatic insects.

SEMESTER I- COURSE I

BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

MODEL QUESTION PAPER

Time: 3 Hours

Max. Marks: 50

SECTION- A

I. Answer any THREE questions choosing at least one question from each part.

Draw the diagrams wherever necessary

3 X10 = 30

PART – I

1. Describe the Status of aquaculture in India.
2. Explain freshwater aquaculture, including its types and advantages
3. Describe the functional classification of ponds in aquaculture

Part II

4. Write an essay on Liming types and methods of in aquaculture ponds.
5. Describe common aquatic weeds in culture ponds and their control measures.
6. Discuss the significance of water quality parameters and their management in aquaculture ponds

SECTION B

II. Answer any Four of the following.

4x5=20

7. Site selection
8. Mono sex culture
9. Nursery pond
10. Soil Characteristics
11. Pond fertilization
12. Predatory fish
13. Shrimp Hatchery

SEMESTER-I

COURSE 1: BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

1. Estimation of Dissolved Oxygen in pond water.
2. Estimation of total alkalinity, Bicarbonates and Carbonates in water samples.
3. Estimation of total hardness of water sample.
4. Estimation of Ammonia in water.
5. Study of beneficial and harmful algal species.
6. Collection, identification and isolation of zooplankton and phytoplankton.
7. Collection and study of aquatic weeds, aquatic insects, weed, predatory and larvivorous fishes.
8. Field visit to hatchery, nursery, rearing and stocking ponds of aqua farms.

Pithapur Rajah's Govt. Degree College (A) Kakinada.

DEPARTMENT OF ZOOLOGY & AQUACULTURE

SEMESTER-I

COURSE I: BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

PRACTICAL MODEL PAPER

I. Estimation of DO	- Major experiment	10 M
II. Identify	the following. Draw diagram and write notes	4X5=20
a) Algae		
b) Zooplankton		
c) Aquatic weed		
d) Aquatic predator		
III	Field Visit + Note	book
10M		
V. Record		-5M
VI. Viva		-5M
Total		-50M

DEPARTMENT OF ZOOLOGY & AQUACULTURE
SEMESTER-I
COURSE 2: BIOLOGY OF FINFISH & SHELLFISH

Theory Credits: 3

3 hrs/week

COURSE OBJECTIVES:

- To understand the classification, morphology and digestive system of fish and shrimp.
- To study the structure and functioning of respiratory, circulatory and endocrine systems of fish and shrimp.
- To explore the excretory, sensory, and reproductive systems in fish and shrimp.
- To understand feeding, methods of determination of age and growth in fish and shrimp. To study breeding biology, parental care and developmental stages in fish and shrimp.

LEARNING OUTCOMES:

By the completion of the course student will be able to –

- Identify and describe general features and digestive system of fish and shrimp.
- Explain gill structure, mechanism of respiration and gaseous exchange and endocrine glands Compare circulatory physiology in fish (closed) and shrimp (open).
- Gain knowledge on endocrine glands and their significance in fish and shrimp.
- Describe excretory, sensory and reproductive systems in fish and shrimp.
- Provide suitable type of feeding for fish and shrimp in culture ponds.
- Apply different methods (scales, otoliths, skeletal parts) for age and growth determination. Outline breeding activity and larval development in fish and shrimp

SYLLABUS:

UNIT-I: General characters, Classification, External Morphology and Digestive System

- 1.1. General characters of fishes and crustaceans
- 1.2. Classification of fish and crustaceans up to classes
- 1.3. External morphology of teleost fish and shrimp
- 1.4. Digestive system of fish and shrimp.

UNIT-II: Respiratory, Circulatory and Endocrine systems

- 2.1. Structure of gills, Mechanism of Respiration and gaseous exchange in fish and shrimp
- 2.2. Structure of heart in fishes
- 2.3. Physiology of Circulation in fish and Shrimp
- 2.4. Endocrine glands and their role in fish and shrimp.

UNIT-III: Excretory, Sensory and

Reproductive Systems 3.1. Structure and function of kidneys in fishes.

- 3.2. Excretory organs in shrimp.
- 3.3. Sensory organs in fish and shrimp.
- 3.4. Reproductive structure in Fishes and Shrimp

UNIT-IV: Feeding and Growth

- ## UNIT-V: Reproductive and Developmental Biology

- ### REFERENCE BOOKS:

- ## CO-POMapping:

[illegible]

CO5	2	2	1	1	1	2	2	1	1	1	1	1	2
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DEPARTMENT OF ZOOLOGY & AQUACULTURE

Semester-I

COURSE 2: BIOLOGY OF FIN FISH & SHELL FISH

MODEL QUESTION PAPER

Time: 2 hrs

Max.

Marks :50

SECTION- A

I. Answer any THREE questions choosing at least one question from each section. Draw the diagrams wherever necessary

3 X10 = 30

PART – I

1. Explain the digestive system of a fish
2. Explain the structure of gills in fishes and add a note on mechanism of respiration and gaseous exchange in fishes
3. Write an essay on sense organs in fishes

Part – II

4. What are the different methods of determination of age and growth in fishes? Explain
5. Write an essay on Parental care in fishes
6. Explain the Life cycle of shrimp with a neat labelled diagram

SECTION-B

Answer any Four of the following.

4x5=20

7. Chondrichthyes
8. Heart in fishes
9. Excretory organs in shrimp
10. Natural food of fishes
11. Moulting in shrimp
12. Breeding in fishes
13. Nauplius

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Kakinada.

DEPARTMENT OF ZOOLOGY &

AQUACULTURE

BLUE PRINT FOR QUESTION PAPER

I SEMESTER

Course No.: 2 – BIOLOGY OF FIN FISH & SHELL FISH

Time: 21/2 hrs

Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	1
IV	1	2
V	2	2
	Out of 6, 3 questions should be answered 3X10=30M	Out of 7, 4 questions should be answered 4X5=20M

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Kakinada.**

**DEPARTMENT OF ZOOLOGY &
AQUACULTURE
I SEMESTER**

Course No. 2: BIOLOGY OF FIN FISH & SHELL FISH

QUESTION BANK

I. ESSAY TYPE QUESTIONS

1. Explain the digestive system of a fish
2. Explain the external morphology of a teleost fish
3. Explain the general characters of fishes
4. Explain the external morphology of shrimp
5. Explain the structure of gills in fishes and add a note on mechanism of respiration and gaseous exchange in fishes
6. Write an essay on heart in fishes
7. Write an essay on Endocrine glands and their role in fishes.
8. Explain the Structure and function of kidneys in fishes.
9. Explain the Reproductive system in Fishes
10. Explain the Reproductive system in shrimp
11. Write an essay on sense organs in fishes
12. What are the different methods of determination of age and growth in fishes? Explain
13. Write an essay on the Natural food and the feeding habits of commercially important fishes
14. Write an essay on Parental care in fishes
15. Explain the Life cycle of shrimp with a neat labelled diagram
16. Explain the life cycle of a carp fish

II. SHORT ANSWER TYPE

1. Chondrichthyes
2. Osteichthyes
3. Crustaceans general characters
4. Shrimp external morphology
5. Structure of gills

6. Heart in fishes
7. Physiology of circulation in fishes
8. Pituitary gland
9. Adrenal gland
10. Corpuscles of stannius
11. Ultimobranchial gland
12. Sense organs in shrimp
13. Lateral line system
14. Swim bladder
15. Excretory organs in shrimp
16. Natural food of fishes
17. Factors affecting growth in fish
18. Scale method
19. Otolith Method
20. Moulting in shrimp
21. Breeding in fishes
22. Life cycle of shrimp
23. Nauplius
24. Zoea
25. Mysis

Pithapur Rajah's Govt. College (A) Kakinada.
DEPARTMENT OF ZOOLOGY & AQUACULTURE SEMESTER-
I

COURSE 2: BIOLOGY OF FIN FISH & SHELLFISH

Practical Credits: 1

2

hrs/week

1. External morphology of fish and shrimp.
2. Digestive system of herbivorous, carnivorous and predatory fishes, and in shrimp.
3. Gut content analysis in fish and shrimp
4. Mouth parts and appendages of cultivable prawn and shrimp.
5. Endocrine glands and its significance in fish and shrimp.
6. Study of eggs of fish, shrimp and prawn.
7. Study of maturity stages and fecundity in fish and shellfish
8. Life cycles of carp and shrimp.
9. Observation of crustacean larvae
10. Study of nest building and brooding of fishes

Pithapur Rajah's Govt. Degree College (A) Kakinada.

DEPARTMENT OF ZOOLOGY & AQUACULTURE

SEMESTER-I

COURSE 2: BIOLOGY OF FIN FISH & SHELLFISH

PRACTICAL MODEL PAPER

- I. Digestive system of herbivorous, carnivorous and predatory fishes 10M
II. Draw neat labelled diagrams of mouth parts and appendages of cultivable prawn 10M
III. Identification of Crustacean larvae

4X5=20M

- a) Nauplius
b) Zoea
c) Mysis
d) Phyllosoma/ Alima

V.Record

-5M

VI.Viva

-5M

Total

-50M

PR GOVERNMENT COLLEGE (A) KAKINADA

SEMESTER-II

COURSE 3: FRESHWATER AQUACULTURE

Theory _____ **Credits: 3** _____ **3 hrs/week**

COURSE OBJECTIVES:

- To understand the status and prospects of freshwater aquaculture in world, India and AP.
- To know the criteria for the selection of species for culture and major cultivable species.
- To study the bundh and induced breeding techniques, and types of hatcheries.

- To learn the nursery, rearing and production pond management of Indian major carps. ■ To know the culture of exotic and air-breathing fishes and their role in aquaculture
- To understand the biology, seed production, and culture practices of freshwater prawns. ■ To acquire knowledge on freshwater ornamental fishes and sewage-fed fish culture.

LEARNING OUTCOMES:

By the completion of the course student will be able to

- Explain the scope of freshwater aquaculture and water bodies suitable for culture.
- Select the species for culture and know the commercially important species of culture.
- Practice bundh and induced breeding of carps and hatchery management. ■ Manage nursery, rearing and production ponds of Indian major carps
- Analyse the impact of exotic fishes, and culture of air-breathing fishes.
- Describe commercial prawn species, and their biology, seed production and culture.
- Fabricate and maintain aquaria and practice breeding and rearing of ornamental fishes.

SYLLABUS:

UNIT-I: Introduction to Freshwater Aquaculture

- 1.1. Status, scope and prospects of freshwater aquaculture in the world, India and AP
- 1.2. Freshwater bodies suitable for culture in India – ponds, swamps, reservoirs and flood plain wetlands or beels.
- 1.3. Criteria for the selection of species for culture.
- 1.4. Major cultivable freshwater fish for aquaculture and their commercial importance.

UNIT-II: Carp Culture

- 2.1. Bundh breeding of Indian major carp
- 2.2. Induced breeding of Indian major car.
- 2.3. Types of hatcheries – traditional, chinese and jar hatcheries.
- 2.4. Preparation and Management of Indian major carp culture ponds.

UNIT-III: Culture of Exotic and Air-breathing fishes

- 3.1. Exotic fishes introduced into India and their impact on indigenous fishes
- 3.2. Culture of *Tilapia* and *Pangasius*.
- 3.3. Recent developments in the culture of murrels, magur and koi.
- 3.4. Advantages and constraints in the culture of air-breathing fishes.

UNIT-IV: Culture of freshwater prawns

- 4.1. Fresh water prawns of India - commercial value

- 4.2. *Macrobrachium rosenbergii* and *M. malcolmsonii* – biology and seed production.
- 4.3. Preparation and management of freshwater prawn culture ponds.
- 4.4. Morphotypes and harvesting techniques of prawns.

UNIT-V: Ornamental and sewage-fed fish culture

- 5.1. Common freshwater ornamental fishes.
- 5.2. Fabrication, setting up and maintenance of an aquarium.
- 5.3. Breeding and rearing of freshwater ornamental fishes.
- 5.4. Sewage-fed fish culture

REFERENCE BOOKS:

1. Jhingran VG 1998. *Fish and Fisheries of India*. Hindustan Publishing Corporation, New Delhi
2. MPEDA: *Handbooks on culture of carp, shrimp, etc.*
3. Pillay TVR. 1990. *Aquaculture- Principles and Practices*. Fishing News Books Ltd., London.
4. Pillay TVR & Kutty MN. 2005. *Aquaculture- Principles and Practices*. 2nd Ed. Blackwell
5. ICAR. 2006. *Hand Book of Fisheries and Aquaculture*. ICAR.
6. FAO. 2007. *Manual on Freshwater Prawn Farming*.
7. Stickney RR. 1979. *Principles of Warmwater Fish Culture*. John Wiley & Sons.
- Santharam R, N Sukumaran & P Natarajan 1987. *A manual of aquaculture*, Oxford-IBH, New Delhi
8. Srivatsava 1993. *Fresh water aquaculture in India*, Oxford-IBH, New Delhi
9. Rath RK. 2000. *Freshwater Aquaculture*. Scientific Publ.
10. Chakraborty C & Sadhu AK. 2000. *Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn*. Daya Publ. House.
11. Huet J. 1986. *A text Book of Fish Culture*. Fishing News Books Ltd.
12. Marcel H 1972. *Text book of fish culture*. Oxford fishing news books.

CO-POMapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High], o No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	2	3	2	3	2	2	2	2

CO2	2	1	2	2	1	1	2	3	1	2	2	2	2
CO3	1	1	2	3	2	1	1	2	2	2	1	2	1
CO4	2	2	3	2	2	2	2	2	2	2	2	2	2
CO5	2	2	1	1	1	2	2	1	1	1	1	1	2

Pithapur Rajah's Govt. Degree College (A) Kakinada.
DEPARTMENT OF ZOOLOGY & AQUACULTURE
BLUE PRINT FOR QUESTION PAPER
I SEMESTER
Course No.: 3– FRESHWATER AQUACULTURE

Time: 21/2 hrs

Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	1
IV	1	2
V	2	2
	Out of 6, 3 questions should be answered 3X10=30M	Out of 7, 4 questions should be answered 4X5=20M

P.R. GOVERNMENT COLLEGE(A), KAKINADA
Course 3 : FRESH WATER AQUACULTURE
MODEL PAPER

Time: 2 hrs

Max

Marks:50

SECTION-A

I. Answer any THREE questions choosing at least one question from each section.

Draw the diagrams wherever necessary

3X10 =30

PART-I

1. Describe the status, scope and prospects of freshwater aquaculture in India.
2. Explain the process and importance of Bundh breeding in Indian major carps
3. Describe the exotic fishes introduced into India and discuss their impact on indigenous fish species

Part-II

4. Write an essay on the culture of *Macrobrachium rosenbergii*
5. Discuss common fresh water ornamental fish
6. Explain sewage fed fish culture.

SECTION-B

II. Answer any FOUR questions. Draw the diagrams wherever necessary

4x5=20

7. Scope of freshwater aquaculture.
8. Bundh breeding
9. induced breeding of carps.
10. exotic fishes of India
11. commercially important freshwater prawn.
12. Maintenance of Aquarium
13. Rearing of ornamental f

QUESTION BANK

Course No.: 3– FRESHWATER AQUACULTURE

Essay Questions

1. Describe the status, scope and prospects of freshwater aquaculture in India.
2. Write an essay on the freshwater bodies suitable for fish culture in India.
3. Explain the criteria for selection of species for aquaculture.
4. Discuss the major cultivable freshwater fishes and their commercial importance.
5. Explain the process and importance of Bundh breeding in Indian major carps.
6. Describe the induced breeding techniques in Indian major carps.
7. Write an account of the types of hatcheries used in carp seed production.
8. Explain the preparation and management of Indian major carp culture ponds.
9. Describe the exotic fishes introduced into India and their impact on indigenous fishes.
10. Discuss the culture practices of *Tilapia* and *Pangasius* in India.
11. Write an essay on the recent developments in the culture of air-breathing fishes like murrels, magur and koi.
12. Explain the biology and seed production of *Macrobrachium rosenbergii* and *M. malcolmsonii*.
13. Describe the preparation and management of freshwater prawn culture ponds.
14. Write an essay on the fabrication, setting up and maintenance of an aquarium.
15. Explain the principles and advantages of sewage-fed fish culture.

Short Answer Questions

1. Write briefly on the scope of freshwater aquaculture.
2. List the types of freshwater bodies suitable for fish culture.
3. What are the criteria for selection of fish species for culture?
4. Name the major cultivable freshwater fishes of India.
5. Write short notes on Bundh breeding.
6. What is induced breeding? Mention its advantages.
7. Distinguish between traditional, Chinese and jar hatcheries.
8. Write short notes on pond preparation and management.
9. Mention some exotic fish species introduced into India.
10. Write a short note on the culture of Tilapia.
11. What are the advantages and constraints in the culture of air-breathing fishes?
12. Name any commercially important freshwater prawns of India.
13. What are prawn morphotypes?
14. Write short notes on ornamental fishes commonly reared in aquaria.
15. What is sewage-fed fish culture? Mention its import

SEMESTER-II

COURSE 3: FRESHWATER AQUACULTURE

Practical

Credits: 1

2 hrs/week

-
1. Identification of important cultivable carps.
 2. Identification of exotic fishes.
 3. Identification of important cultivable air-breathing fishes
 4. Identification of important cultivable freshwater prawns.
 5. Identification of different life history stages of fish.
 6. Identification of different life history stages of freshwater prawn.
 7. Identification of Phytoplankton and Zooplankton (any 5 each).
 8. Pituitary gland – structure, collection, preparation of pituitary extract, dosage and injection for induced breeding of carp.
 9. Morphotypes of prawn
 10. Identification of important freshwater ornamental fishes
 11. Fabrication, setting up and maintenance of an aquarium.
 12. Field visit to fish hatchery.
 13. Field visit to fish farm /culture ponds.

Pithapur Rajah's Govt. Degree College (A) Kakinada.

DEPARTMENT OF ZOOLOGY & AQUACULTURE

SEMESTER-II

COURSE 3: FRESHWATER AQUACULTURE

PRACTICAL MODEL PAPER

I. Collection and preparation of Pituitary extract	10M
II. Identify the following 4X5=20M	
a) Labeo	
b) Ctenopharyngodon	
c) M. malcolmsonii	
d) Diatom	
IV. Field visit and field note book	5+5=10
V.Record	-5M
VI.Viva	-5M
Total	-50M

**PR GOVERNMENT COLLEGE (A) KAKINADA
SEMESTER-II**

**COURSE 4: BRACKISH WATER AQUACULTURE AND
MARICULTURE**

Theory

Credits: 3

3 hrs/week

COURSE OBJECTIVES:

- To understand the status and prospects of brackish water aquaculture and mariculture in India and AP.
- To know the brackish water resources (water bodies and species) for culture in India ■ To study the breeding, hatchery techniques, seed management, and culture of shrimps ■ To learn breeding and culture techniques of brackish water fishes.
- To acquire knowledge on the culture of mud crabs and marine ornamental fishes ■ To study the culture methods of edible and pearl oysters and seaweeds.

LEARNING OUTCOMES:

By the completion of the course student will be able to

- Understand the scope and prospects of brackish water aquaculture and mariculture.
- Know various resources supporting brackish water aquaculture.
- Acquire knowledge on shrimp breeding, seed management and culture practices to improve productivity and sustainability in shrimp farming.
- Gain practical understanding of rearing and culture potentials of brackish water fishes.
- Culture the mud crabs and maintain marine aquaria.
- Understand the culture of edible oysters and techniques of pearl production and artificial pearl production prospects in India.
- Explain the commercially important seaweed species and their culture methods.

SYLLABUS:

UNIT-I: Introduction

- 1.1. Status, scope and prospects of brackish water aquaculture and mariculture in India and AP
- 1.2. Brackish water as a medium for aquaculture, ecological factors – Abiotic and biotic factors.
- 1.3. Brackish water resources for culture in India –Bheries, lagoons (Chilka lake, Pulicat Lake, Vembanad Lake), paddy/pokkali fields and coastal ponds.
- 1.4 Major cultivable species for brackish water aquaculture and their commercial importance.

UNIT-II: Culture of shrimps

- 2.1. Breeding and hatchery management of a typical penaeid shrimp (*Penaeus monodon* / *Litopenaeus vannamei*).
- 2.2. Transportation of shrimp seed and nursery management
- 2.3. Pond preparation and management of *P. monodon* or *L. vannamei* culture ponds.
- 2.4. Biofloc technology (BFT) in shrimp culture – Benefits and management practices.

UNIT-III: Culture of brackish water fishes

- 3.1. Breeding and culture of Milk fish, *Chanos chanos*
- 3.2. Breeding and culture of Asian sea bass, *Lates calcarifer*
- 3.3. Breeding and culture of Grey mullet, *Mugil cephalus*

UNIT-IV: Culture of crabs and ornamental fishes

- 4.1. Culture of mud crab, *Scylla serrata* – Biology and culture techniques.
- 4.2. Common marine ornamental fishes.
- 4.3. Setting up and maintenance of marine aquarium.
- 4.4. Breeding and rearing of marine ornamental fishes.

UNIT-V: Culture of oysters and seaweeds

- 5.1. Cultivable species of edible oysters and pearl oysters
- 5.2. Culture techniques for farming edible oysters.
- 5.3. Method of artificial pearl production.
- 5.4. Major commercial seaweed species; Methods of seaweed culture.

REFERENCE BOOKS:

1. Jhingran VG. 1991. *Fish and Fisheries of India*. Hindustan Publ. Corporation, India.
2. ICAR. 2006. *Hand Book of Fisheries and Aquaculture*. ICAR.
3. MPEDA: *Handbooks on culture of carp, shrimp, etc.*
4. Pillay TVR. 1990. *Aquaculture-Principles and Practices*. Fishing News Books Ltd., London.
5. Pillay TVR & Kutty MN. 2005. *Aquaculture- Principles and Practices*. 2nd Ed. Blackwell
6. Nandeesh MC & AG Jhingran. *Brackishwater Aquaculture in India*. ICAR-CIBA Publ.
7. Felix, S. *Coastal Aquaculture in India*. Dr. J. Jayalalithaa Fisheries University (TNJFU)
8. Kurian CV & Sabastian VO. 1976. *Prawns and Prawn Fisheries of India*. Hindustan Publ.Co.
9. Shankar KM & Mohan CV 2002. *Fish and Shell Fish Health Management* UNESCO. Publ. Sundermann CJ.
10. Guland JA (ed) 1984. *Penaeid Shrimps – Their Biology and Management*.
11. Raymond T et al.,1990. *Crustacean Sexual Biology*,Columbia UniversityPress,New York.

CO-PO Mapping:
(1:Slight[Low];2:Moderate[Medium];3:Substantial[High], o No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	2	3	2	3	2	2	2	2
CO2	2	1	2	2	1	1	2	3	1	2	2	2	2
CO3	1	1	2	3	2	1	1	2	2	2	1	2	1
CO4	2	2	3	2	2	2	2	2	2	2	2	2	2
CO5	2	2	1	1	1	2	2	1	1	1	1	1	2

Pithapur Rajah's Govt. Degree College (A) Kakinada.
DEPARTMENT OF ZOOLOGY & AQUACULTURE
BLUE PRINT FOR QUESTION PAPER
II SEMESTER

**COURSE 4: BRACKISH WATER AQUACULTURE AND
MARICULTURE**

Time: 2 1/2 hrs

Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	1
IV	1	2
V	2	2
	Out of 6, 3 questions should be answered 3X10=30M	Out of 7, 4 questions should be answered 4X5=20M

PR Government College (A) Kakinada
SEMESTER II
COURSE 4: BRACKISH WATER AQUACULTURE AND MARICULTURE
MODEL QUESTION PAPER

Time: 3 Hours

Max. Marks: 50

SECTION A

Answer any THREE questions choosing at least one question from each section.

Draw the diagrams wherever necessary

3X10 =30

PART-1

1. Describe the status, scope, and prospects of brackish water aquaculture in India.
2. Explain the abiotic and biotic factors influencing brackish water aquaculture
3. Describe the breeding and hatchery management *Penaeus monodon*

PART-1

4. Explain the pond preparation and management practices for shrimp culture
5. Write an essay on the breeding and culture techniques of *Chanos chanos*.
6. Discuss the culture practices of pearl oysters

SECTION B

Answer any Four of the following.

4x5=20

7. Brackish water resources
8. Major cultivable species for brackish water aquaculture
9. Bio floc Technology
10. culture of Asian sea bass
11. biology of mud crab (*Scylla serrata*).
12. marine ornamental fish aquarium.
13. commercial seaweed

COURSE 4: BRACKISH WATER AQUACULTURE AND MARICULTURE

QUESTION BANK

UNIT – I

ESSAY QUESTIONS.

1. Discuss the status, scope, and prospects of brackish water aquaculture and mariculture in India, with special reference to Andhra Pradesh.
2. Explain the ecological factors influencing brackish water aquaculture.
- 3.. List the major cultivable species used in brackish water aquaculture in India and explain their commercial importance.

SHORT QUESTIONS

1. What are the major abiotic and biotic factors influencing brackish water aquaculture productivity?
2. Name any three important brackish water resources in India suitable for aquaculture and mention one characteristic feature of each.
3. List any four major cultivable species in brackish water aquaculture and state their commercial importance.

UNIT – II

ESSAY QUESTIONS

1. Describe the breeding and hatchery management practices of a typical penaeid shrimp (*Penaeus monodon* or *Litopenaeus vannamei*).
2. Explain the principles and benefits of Biofloc Technology (BFT) in shrimp culture. Discuss its management practices and role in sustainable aquaculture.

SHORT QUESTIONS

1. What are the main steps involved in the transportation and nursery management of shrimp seed in *Litopenaeus vannamei* culture?

2. What is Biofloc Technology (BFT) in shrimp culture, and mention two major benefits of using it? UNIT – III

ESSAY QUESTIONS

1. Describe the breeding and culture practices of milkfish (*Chanos chanos*). Discuss its seed production, pond management, feeding, and harvesting methods.
2. Explain the breeding and culture techniques of Asian sea bass (*Lateolabrax niloticus*). Highlight its hatchery operations, larval rearing, grow-out systems, and market potential.
3. Discuss the breeding and culture methods of grey mullet (*Mugil cephalus*). Describe seed collection, rearing practices, feeding, and significance in brackish water aquaculture.

SHORT QUESTIONS

1. Write a short essay on the breeding and culture practices of milkfish (*Chanos chanos*).
2. Explain briefly the breeding and culture techniques of Asian sea bass (*Lateolabrax niloticus*).
3. Give a short account of the breeding and culture of grey mullet (*Mugil cephalus*) in brackish water environments.

UNIT-IV

Essay questions

1. Explain in detail the culture techniques used for farming edible oysters. 1. Describe the biology and culture techniques of the mud crab (*Scylla serrata*).
2. Explain the characteristics and importance of common marine ornamental fishes cultured in India.
3. Discuss the procedure for setting up and maintaining a marine aquarium for ornamental fish culture.

SHORT QUESTIONS

1. What are the main steps involved in the culture of mud crab (*Scylla serrata*)?
2. Name any four common marine ornamental fishes and mention one characteristic of each.

3. What are the basic requirements for setting up and maintaining a marine aquarium?

UNIT-V

1. Describe the cultivable species of edible and pearl oysters found in India and discuss their biological and economic importance.

3. Discuss the methods of artificial pearl production and give an account of major commercial seaweed species and their culture methods.

SHORT QUESTIONS

1. Name two cultivable species each of edible oysters and pearl oysters commonly found in India.

2. What are the main steps involved in the culture of edible oysters?

3. Mention any two major commercial seaweed species and state one common method used for their culture.

P.R. GOVERNMENT COLLEGE(A), KAKINADA

**Course4 : BRACKISH WATER AQUA CULTURE
PRACTICAL SYLLABUS**

Practical Credits: 1

2 hrs/week

1. Identification of cultivable brackish water fish and shrimp (any 3 each)
2. Identification of crabs, and edible & pearl oysters of commercial importance (any 2 each)
3. Identification of different live feed organisms for shrimp larvae (any 4)
4. Identification of larval stages of shrimp.
5. Demonstration of eye stalk ablation in *Penaeus monodon*.
6. Identification and mounting of appendages of shrimp.
7. Field visit to shrimp hatchery. 8. Field visit to shrimp culture ponds / farm

COURSE4: BRACKISH WATER AQUACULTURE
PRACTICAL MODEL PAPER

- | | |
|---|--------|
| 1. Identify any two cultivable brackish water fishes . | 2X5=10 |
| 2. Identify any two crabs of commercial importance. | 2X5=10 |
| 3. Identify larval stages of shrimp | 2X5=10 |
| 4. Identification of any two Plankton | 2X5=10 |
| 5. field visit to shrimp hatchery and pond + field Note Book | 5+5=10 |
| 6.record + viva | |
| 5+5=10 | |
|
TOTAL MARKS ----- |
50 |

MULTI DISCIPLINARY COURSE

	Pithapur Rajah's Govt. Degree College (A) Kakinada.	Program & Semester B.Sc. Honours in Zoology (Major) Semester-II			
Course Code	TITLE OF THE COURSE Multidisciplinary Courses PRINCIPLES OF BIOLOGICAL SCIENCES				
Teaching	Hours Allocated: 30 (THEORY)	L	T	P	C
Pre-requisites:	Basics of Zoology	3	1	-	3

Syllabus

Learning Outcomes: On completion of this course students will be able to:

1. Understand the relationship between structure and function at all levels.
2. Recognize the mechanisms underlying biological evolution, its patterns, and its significance as biology's overarching unifying principle.
3. Understand the contributions of biology to the resolution of medical, ethical, social, and environmental concerns in human affairs.

UNIT-I Diversity of Life

- 1.1 Introduction to Biology, Branches of Biology, Basic Principles of Biology
- 1.2 Biological Classification-Two kingdom and Five kingdom classification, Viruses, Viroid's and Lichens
- 1.3 Diversity in the living world, Taxonomic categories, Taxonomic aids
- 1.4 Plant organization-The form, structure and function of plant vegetative and reproductive organs, Classification of Plant Kingdom,
- 1.5 Basis of Animal Classification, Classification of Animal Kingdom

UNIT-II Biomolecules and metabolism

- 2.1 Ultra structure of cell and Cell organelles (Structure and Functions), Plant cell vs Animal cell
- 2.2 Plant Physiology: Photosynthesis, Respiration, Transportation, Mechanisms of Nitrogen fixation.
- 2.3 Plant growth and development, physiology of flowering.
- 2.4 Human Physiology: Digestion, Respiration, Circulation
- 2.5 Male and female reproductive organs, gametogenesis, fertilization.

UNIT-III Principles of Biology

- 3.1** Genetics: Mendel's laws of inheritance, Genetic disorders- Colour blindness, Sickle cell anaemia.
- 3.2** Evolution: Geological time scale for evolution of plants and vertebrates, Origin and evolution of plants and man
- 3.3** Common Human Diseases: causing organism, prevention and treatment- malaria, dengue, AIDS, cancer, corona.
- 3.4** Common Plant Diseases: causing organism, prevention and treatment- Black spot, Leafspots, Powdery mildew, Blight, Canker.
- 3.5** Biotechnology: Tools and process of recombinant DNA technology, Applications of biotechnology in agriculture, food industry, medicine and transgenic animals.

Text Books

- 1. Pandey, B.P. (2013) College Botany, Volume-I, S. Chand Publishing, New Delhi.
- 2. Kotpal, R.L. 2022. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut).
- 3. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolution and Ecology. S. Chand publishers, New Delhi, India.

Reference Books

- 1. Sreekrishna V. 2005. Biotechnology –I, Cell Biology and Genetics. New Age International Publ. New Delhi, India.
- 2. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.

BLUE PRINT

MODULE	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	01	02	20
MODULE – II	02	02	30
MODULE – III	02	03	35
Total no.of Questions	05 Of which 3 to be answered	07 Of which 4 to be answered	85 marks including choice Of which 50 marks to be answered

PITAPUR RAJAH'S GOVERNMENT COLLEGE (A), KAKINADA

MULTI DISCIPLINARY COURSE SEM II

PRINCIPLES OF BIOLOGICAL SCIENCES

MODEL PAPER

SECTION- A

Time:2hrs.

Max.Marks:50

Answer any THREE of the following questions

3X10=30

1. Write an overview on five kingdom classification?
2. Discuss the ultrastructure of a cell and the functions of cell organelles. Compare the structure of plant cells and animal cells?
3. Explain the physiology of photosynthesis, respiration, and transportation in plants.
4. Discuss Mendel's laws of inheritance and their significance in understanding genetic traits.
5. Examine common plant diseases. Describe the causal preventive measures, and treatment methods.

SECTION- B

Answer any FOUR of the following questions

4X5=20

6. Viroid
7. Plant Reproductive organs
8. Plant cell structure
9. Fertilization
10. Geological time scale
11. Applications of Biotechnology
12. Photosynthesis
13. Transgenic animals

SEMESTER-III

P.R GOVT COLLEGE (A),KAKINADA
DEPARTMENT OF ZOOLOGY & AQUACULTURE
MAJOR AQUACULTURE SEMESTER - III
COURSE 5: FISH HEALTH MANAGENENT

Course outcomes:

1. Provide students with knowledge about fish diseases and pathological aspects of diseases.
2. Learn about Fungal, Viral and Bacterial diseases of finfish.
3. Gain knowledge of Nutritional deficiency related diseases and antibiotic and chemotherapeutics.
4. Understand and learn the importance of diagnostic tools in identification of diseases and application and development of vaccines.

SYLLABUS

UNIT I: Pathology and parasitology

- 1-1 Introduction to fish diseases –Definition and categories of diseases – Disease and environment
- 1-2 Disturbance in cell structure – changes in cell metabolism, progressive and retrogressive tissue changes, types of degeneration, infiltration, necrosis, cell death and causes
- 1-3 Atrophy, hypertrophy, neoplasms, inflammation, healing and repair

UNIT II: Fungal and viral Diseases of fin fish.

- 2-1 Fungal diseases (both of shell and finfish) – Saprolegniosis, brachiomycosis, ichthyophthirius diseases – Lagenidium diseases – Fusarium disease, prevention and therapy
- 2-2 Viral diseases – Emerging viral diseases in fish, haemorrhagic septicemia, spring viremia of carps, infectious hematopoietic necrosis in trout, infectious pancreatic necrosis in salmonids, swim-bladder inflammation in cyprinids, channel cat fish viral disease, prevention and therapy

UNIT III: bacterial Diseases of fin fish.

- 3.1 Bacterial diseases – Emerging bacterial diseases, aeromonas, pseudomonas and vibrio infections, columnaris, furunculosis, epizootic ulcerative syndrome, infectious abdominal dropsy, bacterial gill disease, enteric red mouth, bacterial kidney disease, proliferative kidney disease, prevention and therapy

UNIT IV: Protozoan Diseases of fin fish.

- 4.1 Protozoan diseases: Ichthyophthiriasis(White spot Disease), Costiasis, Whirling disease

UNIT V: Nutritional diseases

5.1 Nutritional pathology – lipid liver degeneration, Vitamin and mineral deficiency diseases. Aflatoxin and dinoflagellates.

5.2 Antibiotic and chemotherapeutics. Nutritional cataract. Genetically and environmentally induced diseases.

CO-PO Mapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High], -:No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	2	3	2	3	2	2	2	2
CO2	2	1	2	2	1	1	2	3	1	2	2	2	2
CO3	1	1	2	3	2	1	1	2	2	2	1	2	1
CO4	2	2	3	2	2	2	2	2	2	2	2	2	2
CO5	2	2	1	1	1	2	2	1	1	1	1	1	2

P.R. Govt. College (Autonomous), Kakinada

Major Aquaculture Semester-III

TITLE: FISH HEALTH MANAGEMENT

COURSE 5

BLUE PRINT

MODULE NO.	ESSAY QUESTIONS10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
Module -I	01	03	20
Module -II	02	01	25
Module - III	01	02	20
Module - IV	02	01	15

TOTAL	06 Of which 3 to be answered	07 Of which 5 to be answered	95 marks including choice Of which 50 marks to be answered
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P.R. Govt. College (Autonomous), Kakinada

Aquaculture major

Semester-III COURSE- 5

FISH HEALTH MANAGEMENT

MODEL QUESTION PAPER

Time: 2 hrs

Max. Marks :50

SECTION- A

I. Answer any THREE questions choosing at least one question from each section.

Draw the diagrams wherever necessary

3 X10 = 30M

PART I

1. Explain about the progressive and retrogressive tissue changes BT3
2. Write an essay on different fungal diseases in fin fish BT2
3. Explain different viral diseases and its prevention methods in fin fish BT1

PART II

4. Explain columnaris, diseases and its prevention BT2
5. Write an essay on Protozoan diseases BT1
6. Illustrate Antibiotic and chemotherapeutic practices BT3

SECTION- B

II. Answer any Four questions	4x5=20M
7, Differentiate infiltration and necrosis	BT2
8. Types of degeneration	BT1
9. Neoplasms	BT1
10 Define IHN	BT1
11. Epizootic ulcerative syndrome and their symptoms	BT2
12. Dinoflagellates	BT2
13. Nutritional cataract	BT2

QUESTION BANK

COURSE 5 - FISH HEALTH MANAGEMENT

MAJOR AQUACULTURE MODULE -I

Essay Questions

S.NO	QUESTION	BT LEVEL	CO	PO
1	Explain different categories of diseases	BT 1	co 1	Pso 1
2	Explain about the progressive and retrogressive tissue changes	BT 3	co 2	Pso1
3	Write an essay on Atrophy, hypertrophy	BT 1	co 1	Pso 1

Short Answer Question

S.NO	QUESTION	BT LEVEL	CO	PO
1	Types of degeneration	BT 1	CO 2	PSO 3
2	Difference between infiltration, necrosis	BT 1	CO 1	PSO 2
3	Neoplasms	BT 2	CO 3	PSO 3
4	Environmental diseases in fishes	BT 2	CO 3	PSO 3

5	healing Mechanism of cell	BT 1	CO 1	PSO 2
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MODULE II Essay Questions

S.NO	QUESTION	BT LEVEL	CO	PO	Short Answer P O
1	Explain about Fusarium disease, prevention and therapy	BT 1	CO 3	PSO	
2	Write an essay on different fungal diseases in fin fish	BT 2	CO3	PSO 5	P S O 2
1	Furunculosis disease, symptoms and prevention	BT 2	C O3		
3	Explain the different viral diseases and its prevention methods in fin fish	BT 1	CO3	PSO 5	
2	epizootic ulcerative syndrome and their symptoms	BT 1	C O4		P S O 5
S.NO	QUESTION	BT LEVEL	CO	PO	Questions
1	infectious pancreatic necrosis in salmonids,	BT 1	CO3	PSO 5	
2	Define IHN	BT 2	CO3	PSO 5	

SHORT QUESTIONS

S. NO	QUESTION	BT LEVEL	C O
1	Describe the aeromonas, pseudomonas and vibrio infections	BT 2	C O3
2	Summarize the infectious abdominal dropsy, bacterial gill disease, enteric red mouth, bacterial kidney disease their symptoms	BT 1	C O4

MODULE -IV Essay Question

1. Illustrate the Antibiotic and chemotherapeutics BT 1 CO1 PSO2
2. Explain about environmentally induced diseases in fishes. BT 1 CO1 PSO2
3. Describe the Vitamin and mineral deficiency diseases in fin fish BT 1 CO1 PSO2

Short Answer Questions

S.NO	QUESTION	BT LEVEL	CO	PO
1	Aflatoxin	BT 2	CO1	PSO3
2	Dinoflagellates	BT 1	CO2	PSO2
3	Nutritional cataract	BT 1	CO2	PSO2
4	Lipid liver regeneration	BT 1	CO3	PSO1

Practical syllabus

credits :1

- a. Enumeration of Bacteria by TPC Method
- b. Enumeration of total Coli forms
- c. Observation of gross pathology and external lesions of fish with reference to the common diseases in aquaculture
- d. Examination of pathological changes in gills and gut lumen, lymphoid organ, muscles and nerves of fish
- e. Collection, processing and analysis of data for epidemiological investigations of viral diseases
- f. Bacterial pathogens – isolation, culture and characterization
- g. Identification of parasites in fishes: Protozoan, Helminths, Crustaceans
- h. Estimation of dose, calculation of concentration, methods of administration of various chemo therapeutics to fish and shell fish
- i. Estimation of antibiotics used in aquaculture practices

PRESCRIBED BOOK(S):

Shaperclaus W. 1991 Fish Diseases- Vol.I & II. Oxonian Press Pvt.ltd

Roberts RJ 1989. Fish pathology. Bailliere Tindall, New York

Lydia Brown 1993. Aquaculture for veterinarians- fish husbandry and medicine. Pergamon Press. Oxford

REFERENCES:

Shankar KM & Mohan CV. 2002. Fish and Shellfish Health Management. UNESCO Publ. Sindermann CJ. 1990 Walker P & Subasinghe RP. (Eds.). 2005 Principal Diseases of Marine Fish and Shellfish. Vols. I, II. 2nd Ed.

Academic Press

DNA Based Molecular Diagnostic Techniques: Research Needs for Standardization and Validation of the Detection of Aquatic Animal Pathogens and Diseases. FAO Publ. Wedmeyer G, Meyer FP & Smith L. 1999.

Bullock G et.al., 1972 Bacterial diseases of fishes. TFH publications, New Jersey

Post G 1987. Text book of Fish Health. TFH publications, New Jersey

Johnson SK 1995. Handbook of shrimp diseases. Texas A & M University, Texas

FISH HEALTH MANAGEMENT

PRACTICAL MODEL PAPER

1. Enumeration of Bacteria by TPC Method	12M
2. Estimation of antibiotics used in aquaculture practices	8 M
3. Identification of Parasites in fishes	5X4=20M
A. Protozoan,	
B. Protozoan,	
C. Helminths	
D. Helminths	
E. Crustaceans	
4. Record	05 M
5. Viva	05 M
Total	50M

	P .R.GOVERNMENT COLLEGE (A) KAKINADA	SEMESTER – III PAPER- 6			
TITLE	Shrimp Health Management Core: 6				
Course C ode					
Teaching	Hours Allocated: 60 (Theory)				
Pre-requisites:	Credits 3				

SYLLABUS

Course outcomes:

- Provide students with knowledge about shrimp diseases and pathological aspects of diseases.
- Learn about Fungal, Viral and Bacterial diseases of shellfish.
- Gain knowledge of Nutritional deficiency related diseases and antibiotic and chemotherapeutics
- Understand and learn the importance of diagnostic tools in identification of diseases and application and development of vaccines.
- To know about production of disease-free seeds and good feed management.

UNIT I: Viral Diseases of shell fish (Symptoms, Treatment and Prophylaxis)

- 1.1 Major shrimp viral diseases –Baculovirus penaei, Monodon Baculovirus,
- 1.2 Baculoviral midgut necrosis, Infectious hypodermal and haematopoietic necrosis virus, Hepatopancreatic parvo like virus,
- 1.3 Yellow head baculovirus, white spot baculovirus.

UNIT II: Bacterial Diseases of shell fish(Symptoms, Treatment and Prophylaxis)

- 2.1 Bacterial diseases of shell fish –aeromonas, pseudomonas and vibrio infections,
- 2.2 Luminous bacterial disease, filamentous bacterial disease. Prevention and therapy

UNIT III:Protozoan Diseases of shell fish (Symptoms, Treatment and Prophylaxis)

- 3-1 Protozoan diseases-Ichthyophthiriasis, Costiasis,
- 3-2 Whirling diseases, trypanosomiasis

UNIT IV: Health management

- 4.1 Diagnostic tools –immune detection-DNA/RNA techniques,
- 4.2 General preventive methods and prophylaxis.
- 4.3 Application and development of vaccines.
- 4.5 Quarantine –Significance, methods and regulations for transplants.

UNIT V: Production of disease-free seeds.

- 5.1 Production of disease-free seeds.
- 5.2 Evaluation criteria of healthy seeds.
- 5.3 Good Feed management for healthy organisms, Zero water exchange, Probiotics
- 5.4 General preventive methods and prophylaxis.
- 5.5 Methods of pathological examination of Shrimp and infectious diseases.

CO-PO Mapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High], -0:NoCorrelation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	2	3	2	3	2	2	2	2
CO2	2	1	2	2	1	1	2	3	1	2	2	2	2
CO3	1	1	2	3	2	1	1	2	2	2	1	2	1
CO4	2	2	3	2	2	2	2	2	2	2	2	2	2
CO5	2	2	1	1	1	2	2	1	1	1	1	1	2

SEMESTER-III

BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
Module - I	02	01	25
Module -II	01	02	20
Module - III	01	01	15

Module - IV	01	01	15
Module - V	01	02	20
	06 Of which 3 to be answered	07 Of which 5 to be answered	95 marks including choice
			Of which 50 marks to be answered

P.R. GOVT. COLLEGE (AUTONOMOUS), KAKINADA
SEMESTER-III– CORSE: 6
SHRIMP HEALTH MANAGEMENT
MODEL QUESTION PAPER
Time: 2 hrs Max. Marks :50

SECTION- A

I. Answer any THREE questions choosing at least one question from each section.

Draw diagrams wherever necessary 3X10 = 30

PART – 1

1. Write an essay on Major shrimp viral diseases-----BT1
- 2 Explain Yellow head and white spot bacculoviral diseases. -----BT2
3. Describe the common bacterial diseases and their treatment in shell fish. ---- BT2

PART – II

4. Describe the Discussion about the Ichthyophthiriasis, Costakis. -----BT2
5. Write an essay on vaccines development and their applications. ----BT2
6. Discuss about the Production of disease-free seeds. -----BT2

SECTION-B

II. Answer any Four questions

4x5=20

7. Bacculoviral midgut necrosis ----BT2
- 8 Prevention and therapy of Bacterial diseases. ---BT1
9. filamentous bacterial disease----B3
10. trypanosomiasis. ----BT1
11. Good Feed management ----BT2
12. Quarantine. BT2
13. Disease Diagnostic tools (PCR) ---BT2

P.R. Govt. College (Autonomous), Kakinada
Aquaculture major Semester-III
Shrimp health management - Course: 6

QUESTION BANK

UNIT:I ESSAY QUESTIONS

- 1 . Write an essay on Major shrimp viral diseases
- 2 Discuss the Yellow head and white spot baculoviral diseases
- 3 Describe the Baculoviral midgut necrosis, Infectious hypodermal and haematopoietic necrosis virus

Shorts

1. Baculoviral midgut necrosis
2. Hepatopancreatic parvo like virus
3. Treatment and prophylaxies of viral diseases

UNIT:II ESSAY QUESTIONS

1. Describe the common bacterial diseases and treatment in shell fish
2. Describe the aeromonas, pseudomonas and vibrio infections and their prevention
3. Prevention and therapy of bacterial diseases

Shorts

- 1 Luminous bacterial disease.
2. filamentous bacterial disease
3. Aeromonas infections
4. pseudomonas infections
3. Vibrio infections.

UNIT:III ESSAY QUESTIONS

1. Describe the Discussion about the Ichthyophthiriasis, Costiasis
2. Write an essay on Whirling diseases and trypanosomiasis
3. Describe the protozoan diseases and their treatment in shell fish

Shorts

1. Ichthyophthiriasis.
2. Costiasis.
3. Whirling diseases
4. Trypanosomiasis.
5. Preventions of protozoan diseases.

UNIT:IV ESSAY QUESTIONS

1. Write an essay on vaccines development and their Applications
2. Discuss about the Immunological techniques used in disease diagnosis

Shorts

1. Quarantine.

2. Disease Diagnostic tools.
3. Vaccines

UNIT:IV ESSAY QUESTIONS

1. Discuss about the Production of disease-free seeds
2. Explain Good Feed management for healthy organisms
3. Define probiotics. Elaborate probiotics used for shell fish growth

Shorts:

1. . Probiotics.
- 2 .Good feed management for shell fish growth.
- 3.Diseases -free seeds.
4. Evaluation criteria of healthy seeds.

III SEMESTER

Course 6 - Shrimp Health Management

PRACTICAL SYLLABUS

credits :1

1. Enumeration of Bacteria by TPC Method
2. Observation of gross pathology and external lesions of fish and prawn with reference to the common diseases in aquaculture
3. Examination of pathological changes in gut lumen, hepatopancreas, lymphoid organ, muscles and nerves of prawn and shrimp
4. Collection, processing and analysis of data for epidemiological investigations of viral diseases
5. Bacterial pathogens – isolation, culture and characterization
6. Antibigrams – preparation and evaluation
7. Molecular and immunological techniques; Biochemical tests; PCR; ELISA;
8. Agglutination test; Challenge tests; Purification of virus for development of vaccines (Demonstration at institutes/labs)
9. Estimation of dose, calculation of concentration, methods of administration of various chemotherapeutics to fish and shell fish
10. Estimation of antibiotics used in aquaculture practices
11. Estimation of probiotics used in aquaculture

PRACTICAL MODEL PAPER
SHRIMP HEALTH MANAGEMENT

1. Enumeration of Bacteria by TPC Method	12 M
2. Estimation of antibiotics used in aquaculture practices	8 M
Identification of Parasites in fishes	
3. Protozoan, Protozoan, Helminths, Helminths ,Crustaceans	5 X4=20M
4. Record	05 M
5. Viva	05 M
Total	-
	50M

P.R. Govt. College (Autonomous), Kakinada

Aquaculture major

Semester-III

COURSE.: 7

Fish nutrition & Feed technology

Course outcomes:

1. Understand Nutritional requirements of cultivable fishes and factors affecting energy partitioning and feeding.
2. Know different types of feed and FCR and different types of feeders
3. Gain Knowledge of Feed manufacture and storage methods of feeds
4. Understand the value of Feed additives and non-nutrient ingredients.
5. To create awareness of different nutritional deficiency and importance of natural and supplementary feeds and balanced diet.

SYLLABUS

UNIT-I: Nutritional requirements of cultivable fish

- 1.1 Requirements for energy, proteins, carbohydrates, lipids, fiber, micronutrients for different stages of cultivable fish and prawns
- 1-2 Essential amino acids and fatty acids, protein to energy ratio, nutrient interactions and protein sparing effect
- 1.3 Dietary sources of energy, effect of ration on growth, determination of feeding rate, check tray

UNIT-II: Forms of feeds & Feeding methods

- 2-1 Feed conversion efficiency, feed conversion ratio and protein efficiency ratio
- 2-2 Wet feeds, moist feeds, dry feeds, mashes, pelleted feeds, floating and sinking pellets, advantages of pelletization
- 2-3 Manual feeding, demand feeders, automatic feeders, surface spraying, bag feeding and tray feeding

UNIT-III: Feed manufacture & Storage

- 3-1 Feed ingredients and their selection, nutrient composition and nutrient availability of feed ingredients
- 3-2 Feed formulation – extrusion processing and steam pelleting, grinding, mixing and drying, pelletization, and packing

- 3-3 Water stability of feeds, farm made aqua feeds, micro-coated feeds, micro-encapsulated feeds and micro-bound diets
- 3-4 Microbial, insect and rodent damage of feed, chemical spoilage during storage period and proper storage methods.

UNIT-IV: Feed additives & non-nutrient ingredients

- | | |
|-----|--|
| 4-1 | Binders, anti-oxidants, probiotics |
| 4-2 | Feed attractants and feed stimulants |
| 4-3 | Enzymes, hormones, growth promoters and pigments |
| 4-4 | Anti- metabolites, aflatoxins and fiber. |

UNIT-V: Nutritional Deficiency in Cultivable fish

- 5-1 Protein deficiency, vitamin and mineral deficiency symptoms
- 5-2 Nutritional pathology and ant-nutrients
- 5-3 Importance of natural and supplementary feeds, balanced diet.

REFERENCE BOOK(S):

1. HALVER JE 1989. Fish nutrition. Academic press, San diego
2. Lovell rt 1998. Nutrition and feeding of fishes, Chapmann& Hall, NewYork
3. Sena de silva, trevor a anderson 1995. Fish nutrition in aquaculture. Chapmann&Hall,
4. Guiland J.A (ed) 1984. Penaeid shrimps- Their Biology andManagement.
5. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, NewDelhi

CO-PO Mapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High], -:No Correlation

[illegible]

P.R. GOVERNMENT COLLEGE (A), KAKINADA

FISH NUTRITION & FEED TECHNOLOGY

SEMESTER - III, COURSE -7

QUESTION BANK

MODULE - I

ESSAY QUESTIONS

S.No	Question	BT Level	CO	PO
1	Nutritional requirements for different stages of cultivable fish	BT 1	CO1	PO2
2	Nutritional requirements for different stages of cultivable Prawns	BT2	CO1	PO1
3	Explain the dietary factors effecting the ratio on growth	BT1	CO2	PO2

SHORT QUESTIONS

S.No	Question	BT Level	CO	PO
1	Essential Amino acids	BT 1	CO1	PO2
2	Fatty acids	BT2	CO1	PO1
3	Protein to energy ratio	BT1	CO2	PO2

MODULE - II

ESSAY QUESTIONS

S.No	Question	BT	CO	PO
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		Level		
1	Write a essay on types of dry feeds	BT 1	CO1	PO2
2	Explain Feed conversion ratio (FCR) in Aquaculture	BT2	CO1	PO1
3	Decribe non dry feeds in Aquaculture	BT1	CO2	PO2

SHORT QUESTIONS

S.No	Question	BT Level	CO	PO
1	Dry Feeds	BT 1	CO1	PO2
2	Automatic feeders	BT2	CO1	PO1
3	Mechanised feeding	BT1	CO2	PO2

MODULE - III

ESSAY QUESTIONS

S.No	Question	BT Level	CO	PO
1	Write a essay on feed ingredients and their selection.	BT 1	CO1	PO2
2	Explain nutrient composition & nutrient availability of feed ingredients.	BT2	CO1	PO1
3	Decribe the process of feed formulation	BT1	CO2	PO2

SHORT QUESTIONS

S.No	Question	BT Level	CO	PO
1	Water stability of feeds	BT 1	CO1	PO2
2	Farm made feeds	BT2	CO1	PO1

3	Causes of spoilage	BT1	CO2	PO2
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MODULE - IV

ESSAY QUESTIONS

S.No	Question	BT Level	CO	PO
1	Write a essay on Binders & anti oxidents	BT 1	CO1	PO2
2	Explain feed attractants and feed stimulants.	BT2	CO1	PO1
3	Decribe the Groth promortes & pigments	BT1	CO2	PO2

SHORT QUESTIONS

S.No	Question	BT Level	CO	PO
1	Probiotics	BT 1	CO1	PO2
2	Anti-metabolites	BT2	CO1	PO1
3	Fiber	BT1	CO2	PO2

MODULE - V

ESSAY QUESTIONS

S.No	Question	BT Level	CO	PO
1	Write a essay on protein deficiency symptoms in cultivable fishes	BT 1	CO1	PO2
2	Write a essay on vitamin deficiency symptoms in cultivable fishes	BT2	CO1	PO1
3	Explain the importance of natural & supplementary feeds	BT1	CO2	PO2

SHORT QUESTIONS

S.No	Question	BT Level	CO	PO
1	Mineral deficiency symptoms	BT 1	CO1	PO2
2	Alkaloids	BT2	CO1	PO1
3	Benefits of using supplementary feed	BT1	CO2	PO2

P.R. GOVERNMENT COLLEGE (A), KAKINADA

FISH NUTRITION & FEED TECHNOLOGY

SEMESTER - III COURSE - 7

MODEL QUESTION PAPER

TIME: 2Hrs

Max. Marks: 50

Section - A

I. Answer any three questions choosing at least one question from each section.

Draw diagrams where ever necessary.

Max Marks: 3X10=30

Part - I

1. Nutritional requirements for different stages of cultivable Prawns
2. Explain Feed conversion ratio (FCR) in Aquaculture
3. Write an essay on feed ingredients and their selection.

Part - II

4. Describe the process of feed formulation.
5. Write an essay on Binders & anti-oxidants
6. Explain the importance of natural & supplementary feeds & balanced diet.

Section - B

II. Answer any four of the following questions. Draw diagrams where ever necessary.

Marks: 4X5=20

7. Essential Amino acids
8. Protein to energy ratio
9. Automatic feeders
10. Dry Feeds
11. Causes of spoilage
12. Fibers
13. Alkaloids

SEMESTER - III COURSE-7

FISH NUTRITION & FEED TECHNOLOGY

BLUE PRINT

Time: 2 hrs.

Max Marks: 50

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	01	02	20
MODULE – II	01	02	20
MODULE – III	02	01	25
MODULE – IV	02	02	30
Total number of Questions	06 Of which 3 to be answered	07 Of which 4 to be answered	95 marks including choice Of which 50 marks to be Answered

FI

SH NUTRITION & FEED TECHNOLOGY

Practical syllabus

credits :1

1. Estimation of protein content in aquaculture feeds
2. Estimation of carbohydrate content in aquaculture feeds
- 3 Estimation of lipid content in aquaculture feeds
4. Estimation of ash in aquaculture feed
5. Study of water stability of pellet feeds
6. Feed formulation and preparation in the lab
7. Study of binders used in aquaculture feeds
8. Study of feed packing materials
9. Study of physical and chemical change during storage
10. Study on physical characteristics of floating and sinking feeds
- 11.Visit to a aqua-feed production unit

REFERENCES:

HALVER JE 1989. Fish nutrition. Academic press, San diego

1.1 Lovell rt 1998. Nutrition and feeding of fishes, Chapmann & Hall, New York

1.2 Sena de silva, trevor a anderson 1995.

1.3 Fish nutrition in aquaculture. Chapmann & Hall, New York.

Fish nutrition & Feed technology

Practical Model question paper

I. Estimate protein content in the given feed sample	1X 15= 15 M
II. Feed formulation in the lab	1X10=10 M
III. Preparation of floating feed	1X10=10M
IV. Field note book	5M
V. Viva voce	5M
Record	5M

Total	50 M

MULTIDISCIPLINARY COURSE

SEMESTER-III

HEALTH AND HYGIENE

Credits:2

2 hrs/week

Unit I: Basics of Nutrition 10

Hrs.

1. Nutrition – definition, importance, good nutrition and mal nutrition; Balanced Diet: Basics of Meal Planning
2. Carbohydrates –functions, dietary sources, effects of deficiency.
3. Lipids –functions, dietary sources, effects of deficiency.
4. Proteins –functions, dietary sources, effects of deficiency.
5. Brief account of Vitamins- functions, food sources, effects of deficiency,
6. Macro and micro minerals –functions, effects of deficiency; food sources of Calcium, Potassium and Sodium; food sources of Iron, Iodine and Zinc
7. Importance of water– functions, sources, requirement and effects of deficiency.

Unit II: Health 10 Hrs.

8. Health - Determinants of health, Key Health Indicators, Environment health & Public health; Health-Education: Principles and Strategies
9. Health Policy & Health Organizations: Health Indicators and National Health Policy of Govt. of India-2017; Functioning of various nutrition and health organizations in India viz., NIN (National Institution of Nutrition), FNB (Food and Nutrition Board), ICMR (Indian Council of Medical Research), IDA (Indian Dietetics Association), WHO-India, UNICEF-India
10. National Health Mission: National Rural Health Mission (NRHM) Framework, National Urban Health Mission (NUHM) Framework

11. Women & Child Health Care Schemes: Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+); Janani Shishu Suraksha Karyakaram (JSSK);

Rashtriya Bal Swasthya Karyakram(RBSK); India Newborn Action Plan (INAP);

Adolescent Health- Rashtriya Kishor Swasthya Karyakram (RKSK)

12. Disaster Management – Containment, Control and Prevention of

Epidemics and Pandemics – Acts, Guidelines and Role of Government and Public

Unit III: Hygiene 10 Hrs.

13. Hygiene – Definition; Personal, Community, Medical and Culinary hygiene; WASH (Water, Sanitation and Hygiene) programme

14. Rural Community Health: Village health sanitation & Nutritional committee (Roles & Responsibilities); About Accredited Social Health Activist (ASHA); Village

Health Nutrition Day, Rogi Kalyan Samitis

15. Community & Personal Hygiene: Environmental Sanitation and Sanitation in Public places

16. Public Awareness through Digital Media - An Introduction to Mobile

Apps of Government of India: NHP, Swasth Bharat, No More Tension,

Pradhan Mantri Surakshit Mantritva Abhiyan (PM Suman Yojana), My

Hospital (Mera aspaatal), India fights Dengue, JSK Helpline, Ayushman

Bhava, Arogya Setu, Covid 19AP REFERENCES

□ Bamji, M.S., K. Krishnaswamy & G.N.V. Brahmam (2009) Textbook of Human Nutrition(3rd edition) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi^L

□ Swaminathan (1995)Food & Nutrition(Vol I, Second Edition) The Bangalore Printing &Publishing Co Ltd., , Bangalore^L

□ Vijaya Khader (2000)Food, nutrition & health, Kalyan Publishers, New Delhi^L Srilakshmi,

□ B., (2010)Food Science, (5th Edition) New Age International Ltd., New Del

SEMESTER III
HEALTH & HYGIENE
Model Question Paper

Time: 2 Hours

Maximum Marks: 50

Section–A

I. Answer any THREE questions. Choosing at least 1 question from each part

$3 \times 10 = 30$ Marks

PART I

1. Explain the functions, dietary sources and deficiency effects of **carbohydrates, lipids and proteins**.
2. Discuss the **National Health Mission** frameworks – NRHM and NUHM – and their key objectives.
3. Describe the types of **Hygiene** and elaborate on the **WASH programme**.

PART II

4. Give a detailed account of **vitamins** – their functions, sources and deficiency disorders.
5. Write an essay on the **Women and Child Health Care Schemes** in India.
6. Explain the **role of digital media** and important mobile apps of Government of India in creating public awareness of health and hygiene.

Section–B

II. Answer any Four questions.

4× 5 = 20 Marks

7. Define **balanced diet**. What are the basics of meal planning?
8. Write the functions and deficiency effects of **iron, iodine and zinc**.
9. List the **key health indicators** and determinants of health.
10. Briefly describe the functioning of **NIN and ICMR**.
11. What are the **roles and responsibilities** of Village Health Sanitation & Nutritional Committee?
12. Write short notes on **environmental sanitation** and sanitation in public places.
13. Explain the role of an **Accredited Social Health Activist (ASHA)** in rural health.

Pithapur Rajah's Govt. College (A) Kakinada.
DEPARTMENT OF ZOOLOGY & AQUACULTURE
IV SEMESTER

Course No.: 08 – FISH IMMUNOLOGY

3Hrs/week

Credits :3

Course Outcomes

CO1: Knowledge on **types** of immunity

CO2; Understand the concept of lymphatic system

CO3: Gain knowledge on structure, types and functions of antibodies

CO4: Discuss about types of autoimmune diseases.

CO5: Acquire knowledge on importance of vaccines

SYLLABUS

UNIT I:

1.1 Immunity and types of immunity.

1.2 Fundamental concepts and anatomy of the immune system, components of innate and acquired immunity, Phagocytosis, Complement and inflammatory responses,

1.3 Organs and Cells of the immune system-primary and secondary lymphoid organs

UNIT II

2.1 Lymphatic system, Lymphocyte circulation, Lymphocyte homing, Mucosal and Cutaneous associated Lymphoid tissue (MALT & CALT); Mucosal immunity.

2.2 Antigens: Types and properties. Major Histocompatibility Complex (MHC) - MHC genes,

2.3 Immune responsiveness and disease susceptibility and HLA typing.

UNIT III

3.1 Immunoglobulins: Structure, types and functions.

3.2 Immunogenetics: Genetic basis of antibody diversity. Molecular biology of B and T cells.

3.3 Complement proteins and cytokines.

UNIT IV:

4.1 Disorders of immune system: autoimmunity- types of autoimmune diseases.

4.2 Immunodeficiency- Primary immuno deficiencies, Acquired or secondary immuno deficiencies.

4.3 Hypersensitivity.

4.4 Hybridoma technology- mono and polyclonal antibodies.

UNIT V

5.1 Vaccines- Live, killed, attenuated, sub unit vaccines.

5.2 Non-specific immunity of shellfish.

5.3 Active and passive immunization; ELISA, RIA and Immuno electrophoresis applications.

5.4 Transplantation- Immunological basis of graft rejection. Tumor immunology- Tumor antigens; immune response to tumors and tumors evasion of the immune system, Cancer immunotherapy.

REFERENCES BOOKS:

References:

Eli Benjamini Immunology – a short course

I. Riott Essentials of immunology Blackwell

I Riott et al Immunology Molsby

Aruna B Manual of practical immunology Palaniparamount

CO-PO Mapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High], -:No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	1	2	1	2	2	3	2	3	2	2	2	2
CO2	2	1	2	2	2	1	2	3	1	2	2	3	2
CO3	1	1	2	3	2	1	1	1	2	2	1	1	1
CO4	1	2	3	2	2	2	2	2	3	2	2	2	2
CO5	2	2	1	1	1	2	2	1	1	1	1	1	2

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DEPARTMENT OF ZOOLOGY & AQUACULTURE

IV SEMESTER

Course No.: o8 – FISH IMMUNOLOGY

MODEL QUESTION PAPER

Time: 2 hrs

Max. Marks :50

SECTION- A

**I. Answer any THREE questions choosing at least one question from each section.
Draw the diagrams wherever necessary**

3 X10 = 30

PART – I

1. What is Immunity? Explain the different types of immunity with suitable examples. -BT 1
2. What are Antigens? What are the types of Antigens? Explain their properties-BT-1
3. What are Immunoglobulins? What are the types of Immunoglobulins? Explain their structure and functions. -BT 2

PART – II

4. What is Autoimmunity? Discuss the types of Autoimmune diseases-BT 2
5. Write an essay on Hybridoma Technology-BT 2
6. What are Vaccines? Explain the different types of vaccines BT-2

SECTION-B

II. Answer any Four of the following.

4x5=20

7. Primary lymphoid organs-BT 1
8. Lymphocyte Homing-BT 1
9. T-Cells BT 2
10. Cytokines BT 2
11. Hypersensitivity BT 2
12. Active Immunization BT 1
13. ELISA BT 3

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DEPARTMENT OF ZOOLOGY & AQUACULTURE

BLUE PRINT FOR QUESTION PAPER

IV SEMESTER

Course No.: o8 – FISH IMMUNOLOGY

Time: 21/2 hrs

Max. Marks: 50

Unit	Essay	Short
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I	1	1
II	1	1
III	1	2
IV	2	1
V	1	2
	Out of 6, 3 questions should be answered 3X10=30M	Out of 7, 4 questions should be answered 4X5=20M

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DEPARTMENT OF ZOOLOGY & AQUACULTURE

IV SEMESTER

Course No.: 08 – FISH IMMUNOLOGY

QUESTION BANK

I. ESSAY TYPE QUESTIONS

1. What is Immunity? Explain the different types of immunity with suitable examples. BT 1

2. What are the different components of innate and acquired immunity B T1
3. Write an essay on the various cells of immune system BT1
4. What are lymphoid organs? Write in detail about Primary and secondary lymphoid organs BT1
5. What are Antigens? What are the types of Antigens? Explain their properties BT2
6. Write an essay on Major Histocompatibility Complex (MHC) BT2
7. What are Immunoglobulins? What are the types of Immunoglobulins? Explain their structure and functions BT2.
8. Discuss in detail about the molecular biology of B-cells and T-cells BT2
9. What is Autoimmunity? Discuss the types of Autoimmune diseases BT2
10. What is a secondary immune deficiency disorder? Explain it with an example BT2
11. Write an essay on Hybridoma Technology BT3
12. What are Vaccines? Explain the different types of vaccines BT3
13. Write an essay on Immunoelectrophoresis and its applications BT3
14. What is ELISA? Explain the different types of ELISA techniques BT3
15. Discuss in detail about Tumor immunology BT2

II. SHORT ANSWER TYPE

1. Primary lymphoid organs BT1
2. Innate Immunity BT1
3. Acquired Immunity BT1
4. Phagocytosis BT1
5. Bone marrow BT1
6. Thymus BT1
7. Spleen BT1
8. MALT BT2
9. CALT BT2
10. Lymphocyte Homing BT2
11. T-Cells BT1
12. B-Cells BT1
13. Antigens BT1
14. MHC BT2
15. HLA typing BT2
16. Immunoglobulins BT1
17. IgG Antibody BT1
18. IgM Antibody BT1
19. Complements BT2
20. Cytokines BT2
21. Autoimmunity BT1
22. Hypersensitivity BT1
23. Monoclonal Antibodies BT2
24. Hybridoma Technology BT3
25. Non specific immunity of shell fish BT2
26. Active Immunization BT2
27. ELISA BT3
28. RIA BT3
29. Graft Rejection BT2
30. Tumor Immunology BT3
31. Cancer Immunotherapy BT3

Pithapur Rajah's Govt. Degree College (A) Kakinada.
DEPARTMENT OF ZOOLOGY & AQUACULTURE

IV SEMESTER

Course No.: 08 – FISH IMMUNOLOGY credits :1
PRACTICALS:

1. Preparation of antigens, Immunization and methods of bleeding, serum separation and storage.
2. Antibody titre by ELISA method.
3. Isolation and purification of Ig G from serum or Ig Y from chicken egg.
4. Blood smear identification of leucocytes by Giemsa stain.
5. Separation of leucocytes by dextran method.
6. Demonstration of phagocytosis.

7. Immuno electrophoresis, Isolation of antibody from serum, Nonspecific immune response

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DEPARTMENT OF ZOOLOGY & AQUACULTURE

IV SEMESTER

Course No.: 08 – FISH IMMUNOLOGY Credits :1

PRACTICALS:

MODEL PAPER

Time: 2hrs

Max Marks: 50

1. Blood smear identification of leucocytes by Giemsa stain-10M
2. Antibody titre by ELISA method. -10M
3. Separation of leucocytes by dextran method. -10M
4. Immuno electrophoresis or Isolation and purification of IgG from serum or Demonstration of Phagocytosis-10M

4.Record
5. Viva
Total

05M
05M
50M

	PR GOVERNMENT COLLEGE (A): KAKINADA DEPARTMENT OF ZOOLOGY	PROGRAM & SEMESTER B.SC. HONOURS IN AQUACULTURE (MAJOR) SEMESTER-IV			
COURSECODE 9	FISH PROCESSING TECHNOLOGY				
THEORY	CREDITS:3	3 HRS/WEEK			
TEACHING	HOURS ALLOCATED:60(THEORY)	L	T	P	C
PRE-REQUISITES:	FISH PROCESSING TECHNOLOGY	4	0	2	4

HOURS:60

Max.Marks: 50

COURSE OUTCOMES

Course outcomes

CO1: Understand the Principles of fish preservation

CO2: Learn about fundamental principles involved in chilling and freezing of fish and fishery products

CO3: Understand the methods of drying, smoking and freeze drying

CO4: Knowledge about packaging materials and the process of packing

CO5: gain Knowledge about the export of Fishery products from India.

Learning objectives

1. Gain proficiency in unit operations such as filleting, freezing, canning, drying, and smoking.
2. Understand the design and maintenance of fish processing plants, including equipment like IQF (Individual Quick Freezing) systems and canning machinery
3. Learn methods for microbiological, biochemical, and sensory evaluation of fish products.
4. Understand food safety standards, including Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Points (HACCP).
5. Study the importance of hygiene and sanitation in processing environments
6. Engage in hands-on training in laboratories equipped with modern processing equipment.
7. Participate in the preparation and assessment of various fishery products

SYLLABUS

UNIT 1: Introduction

1.1 Principles of fish preservation.

1.2 Quality of water and ice in fish handling and processing.

1.3 Preparation of ice. Different types of ice used in the seafood industry and their merits.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 2: Freezing and Canning:

2.1 Fundamental principles involved in chilling and freezing of fish and fishery products.

2.2 Various freezing methods. Freezing of shrimps and fishes.

2.3 Changes during the cold storage of fish and fishery products.

2.4 Principles involved in canning of fish. Different types of containers.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 3: Drying, Smoking and Freeze-drying:

3.1 Different types of drying, Factors affecting drying.

3.2 Packing and storage of dried products. Spoilage of dried products. Preventive measures

3.3 Smoking of fish, Salting of fish

3.4 Principles of freeze drying. Accelerated freeze drying and packing of freeze dried products. Modern methods of preservation by irradiation and modified atmospheric storage.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 4: Packing, Cold Storage and Export of Fishery Products:

4.1 Functions of packing. Different types of packing materials and its quality evaluation.

4.2 Packing requirements for frozen and cured products.

4.3 Statutory requirements for packing.

4.4 Labelling requirements. Different types of cold storages, Insulated and refrigerated vehicles.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 5: Export of fishery products

5.1 Export of Fishery products from India - major countries, important products, export documents and procedures.

5.2 Prospects and constraints in export including tariff and non- tariff barriers, marine insurance, export incentives, registered exporters

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

REFERENCES:

1 📖 "Fish Processing: Sustainability and New Opportunities" Edited by George M. Hall

- Covers sustainable practices, new product development, and advanced processing methods.
- **"Seafood Processing: Technology, Quality and Safety"** Edited by Ioannis S. Bozaris
- Focuses on preservation techniques, quality control, and safety standards

Web Resources

Website: <https://www.fao.org/fishery/en>

Website: <https://www.journals.elsevier.com/food-control>

Website: <https://www.seafoodsource.com>

Co-Curricular Activities

Mandatory:

Workshops & Hands-on Training: Fish filleting and deboning techniques

Fish preservation methods (salting, drying, smoking, freezing)

o Packaging and labeling techniques

Field Visits & Industrial Tours:

o Visits to fish processing plants or seafood industries

o Exposure to commercial fish markets and cold storage facilities

Competitions & Exhibitions:

o Fish product innovation contests (e.g., developing new fish-based products)

o Participating in food technology fairs or exhibitions

Research Projects & Surveys:

o Conducting studies on fish spoilage or preservation methods

o Market surveys on consumer preferences for processed fish products

Seminars & Guest Lectures:

- o Inviting industry experts to talk about trends and challenges in fish processing
- o Organizing awareness programs on food safety and hygiene

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	2	2	1	2	2	3	2	3	2
CO3	,2	1	2	2	1	1	2	3	1	2
CO3	1	1	2	3	2	1	1	2	2	2
CO4	2	2	1	2	1	2	2	2	2	2
CO5	2	2	1	1	1	2	2	1	1	1

P.R. GOVT. COLLEGE (AUTONOMOUS), KAKINADA

SEMESTER IV – COURSE IX AQUACULTURE

FISH PROCESSING TECHNOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

MODULE NO.	ESSAY QUESTIONS	SHORT ANSWER QUESTIONS	MARKS ALLOTTED TO THE UNIT
MODULE-1	1	2	20
MODULE-2	1	1	15

MODULE-3	1	2	20
MODULE-4	2	1	25
MODULE-5	1	1	15
TOTAL	06 OF WHICH 3 TO BE ANSWERED	07 OF WHICH 4 TO BE ANSWERED	95 MARKS INCLUDING CHOICE OF WHICH 50 MARKS TO BE

PITHAPUR RAJA'S GOVT. COLLEGE (AUTONOMOUS), KAKINADA

MAJOR AQUACULTURE SEMESTER-V-

Course 9- FISH PROCESSING TECHNOLOGY

MODEL QUESTION PAPER

Time: 3 hrs.

Max Marks: 50

SECTION –A

I. Answer Any THREE of the following by choosing at least one question in each section (Draw labelled diagrams wherever necessary)

3X10=30

PART- I

S.NO	Question	BT Level	CO	PO

1	Explain Principles of Fish Preservation, Quality of Water and Ice in Fish Handling and Processing	BT1	CO1	PO2
2	Describe Various Freezing Methods: Freezing of Shrimps and Fishes .	BT2	CO2	PO2
3	Write about Modern Methods of Preservation:	BT2	CO3	PO2

PART- II

S.NO	Question	BT Level	CO	PO
4	Explain different types of packing materials used for frozen and cured products	BT1	CO1	PO2
5	Describe the different types of cold storage facilities and the role of insulated and refrigerated vehicles in maintaining product quality.	BT2	CO3	PO2
6	Describe Important Fishery Products	BT2	CO1	PO2

SECTION - B

II. Answer any FOUR of the following: Draw labeled diagrams wherever necessary

4x5=20 M

7	Question	BT Level	CO	PO
8	Write Types of Ice in the Seafood Industry	BT1	CO2	PO1
9	Explain about principles of preservation	BT1	CO2	PO1
10	Write Types of Containers used in canning	BT2	CO1	PO2
11	What are two factors that affect the drying process of fish products?	BT3	CO2	PO2

12	Smoking ,salting	BT1	CO2	PO1
13	Write Statutory requirements for packing	BT1	CO2	PO1

P.R. Govt. College (A), Kakinada

Semester-IV

COURSE: 9

FISH PROCESSING TECHNOLOGY

Question Bank

UNIT: I

ESSAY QUESTIONS

S.No	Question	BT Level	CO	PO
1	Explain Principles of Fish Preservation, Quality of Water and Ice in Fish Handling and Processing	BT1	CO1	PO2
2	Write Different types of ice used in the seafood industry and their merits	BT1	CO1	PO2

Short Answer Questions

S.No	Question	BT Level	CO	PO
1	Explain about Quality of water in fish handling and processing.	BT1	CO2	PO2
2	ice quality in fish handling and processing.	BT 2	CO2	PO2
3	Write the types of ice used in seafood industry	BT1	CO2	PO2

UNIT-II

Essay questions

S.No	Question	BT Level	CO	PO
1	Fundamental Principles Involved in Chilling and Freezing of	BT1	CO4	PO2

	Fish and Fishery Products			
2	Different Types of Containers Used in Fish Canning.	BT2	CO1	PO2
3	Various Freezing Methods: Freezing of Shrimps and Fishes	BT3	CO1	PO2
4	Principles Involved in Canning of Fish	BT1	CO 2	PO2

SHORT ANSWER QUESTION

S.No	Question	BT Level	CO	PO
1	What is the primary difference between chilling and freezing ?	BT1	CO5	PO2
2	Discuss about two freezing methods commonly used for shrimps.	BT1	CO4	PO2
3	Physicochemicals changes in fish during the cold storage of fish	BT2	CO1	PO2
4	Why is heat treatment necessary during the canning of fish products?	BT2	CO2	PO2

UNIT – III

Essay questions

S.No	Question	BT Level	CO	PO
1	Explain Types of Drying and Factors Affecting Drying in Food Preservation	BT1	CO2	PO2
2	Write Modern Methods of Food Preservation	BT2	CO2	PO2
3	Write about Packing, Storage, and Spoilage of Dried Products	BT2	CO1	PO2

SHORT ANSWER QUESTIONS:

S.No	Question	BT Level	CO	PO
1	Freeze drying	BT1	CO1	PO2
2	Smoking of fish	BT2	Co2	PO2
3	Salting of fish	BT1	CO2	PO2
4	Packaging of freeze dried fishery products	BT2	CO3	PO3
5	Accelerated freeze drying	BT2	CO2	PO2

UNIT – IV**Essay questions**

S.No	Question	BT Level	CO	PO
1	Explain about Functions of Packing & Types of Packing Materials,	BT1	CO3	PO2
2	What are the Packing Requirements for Frozen and Cured Products	BT2	CO2	PO2
3	Explain Types of Cold Storages, and Insulated Vehicles	BT1	CO1	PO3

SHORT ANSWER QUESTIONS:

S.No	Question	BT Level	CO	PO
1	Functions of packaging in the food industry?	BT2	CO1	PO2
2	Different types of packaging materials used in fisheries	BT2	CO2	PO2
4	Different types of cold storages in fisheries	BT1	CO1	PO2
5	Labelling requirements for fishery by products	BT2	CO1	PO3

UNIT – V

Essay questions

S.No	Question	BT Level	CO	PO
1	Explain about Export of Fishery Products from India – Major Countries.	BT2	CO1	PO2
3	Write about Prospects and Constraints in Export of Fishery Products .	BT2	CO1	PO2

SHORT ANSWER QUESTIONS:

S.No	Question	BT Level	CO	PO
1	Major countries importing fishery products from India.	BT1	CO3	PO2
2	Important fishery products exported from India.	BT1	CO5	PO2
3	Define tariff and non-tariff barriers.	BT2	CO5	PO2

SEMESTER-IV

PAPER – 15 – FISH PROCESSING TECHNOLOGY

PRACTICALS 2 HRS/WEEK

Experiments:

1. Determination of moisture content in fish and fishery products
2. General description –freezing
3. Processing shrimp
4. Filleting of fish
5. Drying of fish

6. Organoleptic analysis of fish
7. Preparation of fishery by products
8. Preparation of shark fin rays fish maws, chitin, fish wafer
9. Fish pickling
10. Value added fishery products, fish curry, cutlets fish finger.
11. Preparation of surimi

Filed visit: 1. Visit to sea food pre-processing plants

Text books:

- K.Gopakumar, Fish Processing Technology, ICAR, New Delhi
- T.K. Govindan, Fish Processing Technology Oxfor & IBH Publication Co.
- K.K. Balachandran Fish Canning – Principles & Practices.
- Borgstrom,G. Fish as Food.
- K.K. Balachandran, Postharvest Technology in Fish and Fishery Products.
- Moorjani,M.V. Fish Processing in India.
- Connell,J.J. Advances in Fishery science and Technology.
- CIFT. Manual of Quality Control in Fish and Fishery Products.
- Gopakumar,K. Fish Packaging Technology

Reference Books: 1. A.M.Martin, Fisheries – Processing Chapman & Hall, Madras 2. Ed.G.M.Hall – Fish Processing Technology Chopra & Hall. Madras.

MAJOR AQUACULTURE

PAPER -9 FISH PROCESSING TECHNOLOGY

PRACTICAL MODEL QUESTION PAPER - MAX MARKS-50

Answer any two (Each carries 13 marks) (2 × 13 = 26 marks)

Moisture Content Determination:

Demonstrate the procedure for determining the moisture content in fish or a fishery product using the oven drying method. Record your observations and calculate the moisture percentage.

Shrimp Processing:

Perform shrimp processing, including washing, de heading, peeling, deveining, and grading.

Explain each step with proper hygiene protocols.

Preparation of Surimi:

Prepare surimi from fresh fish. List all the steps involved in the process and mention quality control measures.

Answer any TWO of the following:

2 × 7 = 14 marks

Fish Pickling:

Prepare a simple fish pickle. Mention the ingredients used and outline the process.

Organoleptic Analysis:

Conduct organoleptic analysis of a fish sample. Record observations based on color, texture, odor, and taste.

Preparation of Fishery By-products:

Demonstrate the preparation of Isin glass. Briefly describe its applications.

III,Viva Voce

5 Marks

IV.Record and Observation Book

5 Marks

TOTAL-

50 MARKS

	PITHAPUR RAJAH'S GOVT. COLLEGE (A) KAKINADA.	PROGRAM & SEMESTER B.SC. HONOURS IN AQUACULTURE (MAJOR) SEMESTER-IV			
COURSECODE: 10	EXTENSION, ECONOMICS & MARKETING				
THEORY	CREDITS:3	3 HRS/WEEK			
TEACHING	HOURS ALLOCATED:60 (THEORY)	L	T	P	C
PRE- REQUISITES:	MARKETING	4	0	2	4

HOURS:60

Max.Marks: 50

COURSE OUTCOMES

- CO1:**Gain Knowledge of basic concepts of economics with reference to fisheries and various factors influencing the fishery products price.
- CO2:**Know about fisheries marketing, methods of economic analysis of business organizations and preparation of project and project appraisal.

3. **CO3:** To know about application of economic principles to aquaculture operations
 4. **CO4:** 4. Get the broad knowledge of scope and objectives, principles of fisheries extension.
 5. **CO5:** Understand the importance of transfer technology of ICAR programmes and training at DAATT Centers and their role in education of aqua farmers through print and electronic media.
-

Bottom of Form

Learning outcomes

Some of the learning outcomes for a course in **EXTENSION, ECONOMICS & MARKETING**

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

- 🔍 Evaluate the status of Fish marketing
- 🔍 Explain the economics & elasticity demand
- 🔍 Learn the theories of production, functions, price and demand of fish and fisheries
- 🔍 Get knowledge on various training and education systems
- 🔍 Inspect the different methods fishery extension

• Top of Form

SYLLABUS

UNIT – 1 Introduction

- 1-1 Meaning and scope of economics with reference to fisheries
- 1-2 Basic concepts of economics – goods, services, wants and utility, demand and supply, value price, market demand and individual demand, elasticity of demand.
- 1-3 Theory of production, production function in fisheries
- 1-4 Various factors influencing the fishery product's price

UNIT – I1 Fisheries marketing

- 2-1 Basic marketing functions, consumer behavior and demand, fishery market survey and test marketing a product
- 2-2 Fish marketing – prices and price determination of fishes
- 2-3 Marketing institutions- primary (producer fishermen, fishermen cooperatives, and fisheries corporations) and secondary (merchant/agent/speculative middlemen)
- 2-4 Preparation of project and project appraisal

UNIT-III Fisheries economics

- 3-1 Aquaculture economics- application of economics principles to aquaculture operations
- 3-2 Cost and earnings of aquaculture systems – carp culture, shrimp farming systems, hatcheries, Cost and earnings of fishing units and freezing plants
- 3-3 Socio-economic conditions of fishermen in Andhra Pradesh, Role of Matsyafed and NABARD in uplifting fishermen's conditions, fishermen cooperatives
- 3-4 Contribution of fisheries to the national economy

UNIT-IV Fisheries extension

- 4-1 Fisheries extension – scope and objectives, principles and features of fisheries extension education
- 4.2 Fisheries extension methods and rural development
- 4-3 Adoption and diffusion of innovations

UNIT-V Transfer of technology

5-1 ICAR programs – salient features of ORP, NDS, LLP, IRDP, ITDA, KVK, FFDA, FCS, FTI, TRYSEM

5-2 Training – meaning, training vs. education and teaching

5-3 DAATT centres and their role in tot programs, video conferencing, education of farmers through print and electronic media

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

REFERENCES:

1. Dewwett KK and Varma JD 1993. Elementary economic theory. S.chand, New Delhi
2. Korakandy R 1996. Economics of Fisheries Mangement. Daya Publishing House, Delhi
3. Tripathi SD 1992. Aquaculture Economics. Asian Fisheries Society, Mangalore.
4. Adivi Reddy sv 1997. An introduction to extension education. Oxford & IBH Co.Pvt. Ltd. New Delhi 2. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal Science University. Tuticorn
5. Subba Rao N 1986. Economics of Fisheries. Daya publishing house, Delhi

Co-Curricular Activities

Mandatory:

1. **For Teacher:** Training of students by the teacher to get data steps of extension, economics, marketing procedures of Aquaculture – Training of students on other employability skills in the fishery sector.
2. **For Student:** Students shall (individually) visit – various types of fishery extension systems. Observe the different education modules and make observations on procedures practiced there and submit a brief handwritten Fieldwork/Project work Report with pictures and data /survey in 10 pages.
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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	2	3	2	3	2	2	2	2
CO2	2	1	2	2	1	1	2	3	1	2	2	2	2
CO3	1	1	2	3	2	1	1	2	2	2	1	2	1
CO4	2	2	1	2	1	2	2	2	2	2	2	2	2
CO5	2	2	1	1	1	2	2	1	1	1	1	1	2

P.R. GOVT. COLLEGE (AUTONOMOUS), KAKINADA

TITLE: COURSE 12: EXTENSION, ECONOMICS & MARKETING

BLUE PRINT FOR QUESTION PAPER SETTER

MODULE NO.	ESSAY QUESTIONS 10	SHORT ANSWER QUESTIONS 5	MARKS ALLOTTED TO THE UNIT
MODULE-1	1	1	15

MODULE-2	1	1	20
MODULE-3	2	2	15
MODULE-4	1	2	25
MODULE-5	1	1	15
TOTAL	Out of 06 questions 3 should be answered 3X10=30	Out of 07 questions 4 should be answered 4X5=20	90

PITHAPUR RAJA'S GOVT. COLLEGE (AUTONOMOUS),
KAKINADA
DEPARTMENT OF ZOOLOGY AND AQUACULTURE
MAJOR ZOOLOGY SEMESTER-V- EXTENSION, ECONOMICS & MARKETING
MODEL QUESTION PAPER

Time: 2 hrs.

Max

Marks: 50

SECTION - A

I. Answer Any THREE of the following questions by choosing at least one question in each section (Draw labelled diagrams wherever necessary)

3X10=30

PART I

S. No	Questions	BT Level	CO	PO	Marks
1	Write a detailed note on Market demand, individual demand & elasticity demand	BT2	1	2	10
2	Write an essay on consumer behavior & demand in relation to fishery marketing.	BT1	2	0	10
3.	Write an essay application of economic principles to aquaculture operations.	BT1	2	0	10

PART – II

S.No	Questions	BT Level	CO	PO	Marks
3	Describe the socio economic conditions of fisher men in AP.	BT3	1	2	05
4	Give a detailed note on various Fisheries extension methods and their role in rural development.	BT2	2	2	05
5	Write a detailed note on DAATT centers and role in TOT programs	BT1	1	2	05

SECTION - II

II. Answer any FOUR of the following: Draw labeled diagrams wherever necessary

4x5=20 M

S.N o	QUESTION	BT LEVEL	CO	PO	MARKS
7	Demand & supply	BT2	2	1	01
8	Middle men	BT3	0	1	01
9	NABARD	BT3	1	2	01
10	Freezing plant	BT2	2	2	01
11	Fisheries extension	BT1	2	1	01
12	Rural development	BT3	0	1	01
13	ITDA & KVK.	BT1	1	2	01

P.R. Govt. College (Autonomous),
Kakinada
Semester-IV
EXTENSION, ECONOMICS & MARKETING Course X –
Question Bank

UNIT: I

ESSAY QUESTIONS

- 1. Discuss the basic concepts of fish economics in detail. BT1**

- 2 Write a detailed note on Market demand, individual demand & elasticity demand- BT2
- 3 Describe the various factors influencing the fishery products price. –BT3

SHORT ANSWER QUESTIONS:

- 1 Goods - BT2
- 2 Elasticity demand - BT1
- 3 Price BT3
- 4 Demand & supply BT2

UNIT-II

Essay questions

1. Write an essay on consumer behavior & demand in relation to fishery marketing. -BT1
2. Discuss the importance of price & price determination of fish marketing. - BT2
3. Describe various types of marketing institutions in fishery sector with special reference to primary & secondary institutions. BT3

SHORT ANSWER QUESTIONS

1. Fishermen cooperatives – BT2
2. Merchant – BT2
3. Agent - BT1
4. Middle men BT3

UNIT – III

Essay questions

1. Write an essay application of economic principles to aquaculture operations. -BT1
2. Describe the cost & earning system in aquaculture with spl ref to shrimp farming systems. BT2
3. Describe the socio-economic conditions of fisher men in AP.-BT3
4. Write an essay on emu farming and its economic importance – BT2

SHORT ANSWER QUESTIONS:

1. Freezing plants.- BT1
2. Matshya fed –BT2
3. NABARD-BT3
4. Hatchery - BT2

UNIT – IV

Essay questions

1. Write an essay on the scope, objectives, principles and features of fisheries extension. BT1
2. Give a detailed note on various Fisheries extension methods and their role in rural development .BT2
3. List out the various innovations in adoption & diffusion? BT1

SHORT ANSWER QUESTIONS:

1. Fisheries extension - BT1

2. Fishery education. BT2
3. Adoption. BT2
4. Rural development. BT3

UNIT – V

Essay questions

1. Define ICAR and list out the various types of activities carried out by ICAR. BT1.
2. Differentiate Training & education with spl reference to teaching. –BT1
3. Write a detailed note on DAATT centers and role in TOT programs-BT1

SHORT ANSWER QUESTIONS:

1. ORP & NDS. BT 2
2. ITDA & KVK. BT1
3. FFDA & FCS. BT3
4. Print & electronic media. BT 1

SEMESTER-V
MAJOR AQUACULTURE
COURSE X – EXTENSION, ECONOMICS & MARKETING
PRACTICALS 2 HRS/WEEK
CREDITS-1

SYLLABUS

1. Basic marketing functions
2. Prices and price determination of fishes
3. Fisheries extension
4. Education of Fish farmers
5. Field notes and necessary inputs –should be focused in the practicals

Prescribed Books:

1. Adivi Reddy sv 1997. An introduction to extension education. Oxford & IBH Co.Pvt. Ltd. New Delhi
2. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal

Science University, Tuticorn

3. Subba Rao N 1986. Economics of Fisheries. Daya publishing house, Delhi

References:

1. Dewwett KK and Varma JD 1993. Elementary economic theory. S.chand, New Delhi
 2. Korakandy R 1996. Economics of Fisheries Mangement. Daya Publishing House, Delhi
 3. Tripathi SD 1992. Aquaculture Economics. Asian Fisheries Society, Mangalore.
-

**PR GOVT COLLEGE AUTONOMOUS
KAKINADA
MAJOR AQUACULTURE
PAPER -12
EXTENSION, ECONOMIS & MANAGEMENT
PRACTICAL MODEL QUESTION PAPER - MAX MARKS-50**

Part A — Major Exercise **20 Marks**

1. Different types of basic marketing functions.

Part B —Minor Exercise **15 Marks**

1. Role of fishery education in rural development - case study

Part C — Field visit report **(5 Marks)**

Part D — Viva Voce **(5 Marks)**

**Part E — Record and Observation Book
Marks)**

(5

TOTAL- 50 MARKS

SEMESTER V

	PITHAPUR RAJAH'S GOVT. DEGREE COLLEGE (A) KAKINADA.	PROGRAM & SEMESTER B.SC. HONOURS IN AQUACULTURE (MAJOR) SEMESTER-V			
COURSECODE: 12	EXTENSION, ECONOMICS & MARKETING				
THEORY	CREDITS:3	3 HRS/WEEK			
TEACHING	HOURS ALLOCATED:60 (THEORY)	L	T	P	C
PRE-REQUISITES:	MARKETING	4	0	2	4

HOURS:60

Max.Marks: 50

COURSE OUTCOMES

1. **CO1:** Gain Knowledge of basic concepts of economics with reference to fisheries and various factors influencing the fishery products price.
2. **CO2:** Know about fisheries marketing, methods of economic analysis of business organizations and preparation of project and project appraisal.
3. **CO3:** To know about application of economic principles to aquaculture operations
4. **CO4:** 4.Get the broad knowledge of scope and objectives, principles of fisheries extension.
5. **CO5:** Understand the importance of transfer technology of ICAR programmes and training at DAATT Centers and their role in education of aqua farmers through print and electronic media.

Learning outcomes

Some of the learning outcomes for a course in **EXTENSION, ECONOMICS & MARKETING**

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

-  Evaluate the status of Fish marketing
-  Explain the economics & elasticity demand
-  Learn the theories of production, functions, price and demand of fish and fisheries
-  Get knowledge on various training and education systems
-  Inspect the different methods fishery extension

SYLLABUS

UNIT – 1 Introduction

1-1 Meaning and scope of economics with reference to fisheries

1-2 Basic concepts of economics – goods, services, wants and utility, demand and supply, value price, market demand and individual demand, elasticity of demand.

- 1-3 Theory of production, production function in fisheries
- 1-4 Various factors influencing the fishery product's price

UNIT – I1 Fisheries marketing

- 2-1 Basic marketing functions, consumer behavior and demand, fishery market survey and test marketing a product
- 2-2 Fish marketing – prices and price determination of fishes
- 2-3 Marketing institutions- primary(producer fishermen, fishermen cooperatives, and fisheries corporations) and secondary (merchant/agent/speculative middlemen) 2-4 Preparation of project and project appraisal

UNIT-III Fisheries economics

- 3-1 Aquaculture economics- application of economics principles to aquaculture operations
- 3-2 Cost and earnings of aquaculture systems – carp culture, shrimp farming systems, hatcheries, Cost and earnings of fishing units and freezing plants
- 3-3 Socio-economic conditions of fishermen in Andhra Pradesh, Role of Matsyafed and NABARD in uplifting fishermen's conditions, fishermen cooperatives
- 3-4 Contribution of fisheries to the national economy

UNIT-IV Fisheries extension

- 4-1 Fisheries extension – scope and objectives, principles and features of fisheries extension education
- 4.2 Fisheries extension methods and rural development
- 4-3 Adoption and diffusion of innovations

UNIT-V Transfer of technology

- 5-1 ICAR programs – salient features of ORP, NDS, LLP, IRDP, ITDA, KVK, FFDA, FCS, FTI, TRYSEM
- 5-2 Training – meaning, training vs. education and teaching
- 5-3 DAATT centres and their role in tot programs, video conferencing, education of farmers through print and electronic media

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

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Co-Curricular Activities

Mandatory:

1. **For Teacher:** Training of students by the teacher to get data steps of extension, economics, marketing procedures of Aquaculture – Training of students on other employability skills in the fishery sector.
2. **For Student:** Students shall (individually) visit – various types of fishery extension systems. Observe the different education modules and make observations on procedures practiced there and submit a brief handwritten Fieldwork/Project work Report with pictures and data /survey in 10 pages.
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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	2	3	2	3	2	2	2	2
CO2	2	1	2	2	1	1	2	3	1	2	2	2	2
CO3	1	1	2	3	2	1	1	2	2	2	1	2	1
CO4	2	2	1	2	1	2	2	2	2	2	2	2	2
CO5	2	2	1	1	1	2	2	1	1	1	1	1	2

P.R. GOVT. COLLEGE (AUTONOMOUS), KAKINADA

TITLE: COURSE 12: EXTENSION, ECONOMICS & MARKETING

BLUE PRINT FOR QUESTION PAPER SETTER

MODULE NO.	ESSAY QUESTIONS	SHORT ANSWER QUESTIONS	MARKS ALLOTTED TO THE UNIT
	10	5	
MODULE-1	1	1	15
MODULE-2	1	1	15
MODULE-3	2	2	30
MODULE-4	1	2	20
MODULE-5	1	1	15
TOTAL	Out of 06 questions 3 should be answered 3X10=30	Out of 07 questions 4 should be answered 4X5=20	95

**PITHAPUR RAJA'S GOVT. COLLEGE (AUTONOMOUS),
KAKINADA
DEPARTMENT OF ZOOLOGY AND AQUACULTURE
MAJOR ZOOLOGY SEMESTER-
V-**

EXTENSION, ECONOMICS & MARKETING

MODEL QUESTION PAPER Time: 2 hrs. Max

Marks: 50

SECTION - A

3X10= 30M

I. Answer Any THREE of the following questions by choosing at least one question in each section (Draw labelled diagrams wherever necessary)

PART- I

S.No	Questions	BT Level	CO	PO	Marks
1	Write a detailed note on Market demand, individual demand & elasticity demand	BT2	1	2	10
2	Give a clear picture on preparation of project & project appraisal.	BT3	2	0	10
3.	Describe the cost & earning system in aquaculture with spl ref to shrimp farmin systems.	BT2	2	0	10

PART – II

S.No	Questions	BT Level	CO	P O	Mark s
4	Give a detailed note on contribution of fisheries to national economy.	BT2	1	2	05
5	IGive a detailed note on various Fishries extension methods and their role in rural development.	BT2	2	2	05
6	Write a detailed note on DAATT centres and role in TOT programmes	BT1	1	2	05

SECTION - B

II. Answer any FOUR of the following:

4x5=20 M

Draw labeled diagrams wherever necessary

S.No	QUESTION	BT LEVEL	CO	PO	MARKS
7	Demand & supply	BT2	2	1	01
8	Middlemen	BT3	0	1	01
9	NABARD	BT3	1	2	01
10	Freezing plant	BT2	2	2	01
11	Fisheries extension	BT1	2	1	01
12	Rural development	BT3	0	1	01
13	ITDA & KVK.	BT1	1	2	01

P.R. Govt. College (Autonomous),
Kakinada
Semester-IV
TITLE: EXTENSION, ECONOMICS & MARKETING
PAPER: 12 - Question Bank

UNIT: I

ESSAY QUESTIONS

1. Discuss the basic concepts of fish economics in detail. BT1
- 2 Write a detailed note on Market demand, individual demand & elasticity demand- BT2
- 3 Explain the theories of production and its function in fisheries. BT1
- 4 Describe the various factors influencing the fishery products price. –BT1

SHORT ANSWER QUESTIONS:

- 1 Scope of economics - BT1
- 2 Goods - BT2
- 3 Elasticity demand - BT1
- 4 Price BT3
- 5 Demand & supply BT2

UNIT-II

Essay questions

1. Write an essay on consumer behaviour & demand in relation to fishery marketing. -BT1
2. Discuss the importance of price & price determination of fish marketing. - BT2

3. Give a clear picture on preparation of project & project appraisal. -BT3
4. Describe various types of marketing institutions in fishery sector with special reference to primary & secondary institutions.

SHORT ANSWER QUESTIONS

1. Producer fishermen – BT1
2. Fish market survey – BT2
3. Fishermen cooperatives – BT2
4. Merchant – BT2
5. Agent - BT1
6. Middlemen BT3

UNIT – III

Essay questions

1. Write an essay application of economic principles to aquaculture operations.-BT1
2. Describe the cost & earning system in aquaculture with spl ref to shrimp farming systems.BT2
3. Describe the socio-economic conditions of fisher men in AP.-BT1
4. Write an essay on emu farming and its economic importance – BT2
5. Give a detailed note on contribution of fisheries to national economy. – BT2

SHORT ANSWER QUESTIONS:

1. Aquaculture operations.-BT1
2. Carp culture – BT2
3. Freezing plants.- BT2
4. Matsya-fed –BT2
5. NABARD-BT3
6. Hatchery - BT2

UNIT – IV

Essay questions

1. Write an essay on the scope, objectives, principles and features of fisheries extension. BT1
2. Give a detailed note on various Fisheries extension methods and their role in rural development .BT2
3. List out the various innovations in adoption & diffusion ?BT1

SHORT ANSWER QUESTIONS:

1. Fisheries extension - BT1
2. Fishery education. BT2
3. Adoption.BT2
4. Diffusion. BT1
5. Rural development. BT3

UNIT – V

Essay questions

1. Define ICAR and list out the various types of activities carried out by ICAR. BT1.
2. Differentiate Training & education with spl reference to teaching. –BT1
3. Write a detailed note on DAATT centres and role in TOT programmes-BT1

SHORT ANSWER QUESTIONS:

1. ORP & NDS. BT 2
2. ITDA & KVK. BT1
3. FFDA & FCS. BT3
4. Video conferencing BT2
5. Print & electronic media. BT 1

SEMESTER-V
MAJOR AQUACULTURE PAPER – 12 –
EXTENSION, ECONOMICS & MARKETING
PRACTICALS 2 HRS/WEEK
CREDITS-1

SYLLABUS

1. Basic marketing functions
2. Prices and price determination of fishes
3. Fisheries extension
4. Education of Fish farmers
5. Field notes and necessary inputs –should be focused in the practicals

Prescribed Books:

1. Adivi Reddy sv 1997. An introduction to extension education. Oxford & IBH Co.Pvt. Ltd. New Delhi
2. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal Science University. Tuticorn
3. Subba Rao N 1986. Economics of Fisheries. Daya publishing house, Delhi

References:

1. Dewwett KK and Varma JD 1993. Elementary economic theory. S.chand, New Delhi
 2. Korakandy R 1996. Economics of Fisheries Mangement. Daya Publishing House, Delhi
 3. Tripathi SD 1992. Aquaculture Economics. Asian Fisheries Society, Mangalore.
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PR GOVT COLLEGE AUTONOMOUS
KAKINADA
MAJOR AQUACULTURE
PAPER -12
EXTENSION, ECONOMIS & MANAGEMENT
PRACTICAL MODEL QUESTION PAPER - MAX MARKS-50

Part A — Major Experiment **20 Marks**

1. Different types of basic marketing functions.

Part B —Minor Experiment **15 Marks**

1. Role of fishery education in rural development - case study

Part C — Field visit report **(5 Marks)**

Part D — Viva Voce **(5 Marks)**

Part E — Record and Observation Book **(5 Marks)**

TOTAL- **50 MARKS**

Pithapur Rajah's Govt. Degree College (A) Kakinada.
DEPARTMENT OF ZOOLOGY & AQUACULTURE

V SEMESTER

Course No.: 13 - Ornamental Fishery

credits :3

Course outcomes:

- CO1: Gain Knowledge on Aquarium Fishes
- CO2: Have Knowledge on fresh water and marine water Ornamental Fishes
- CO3: Have Practical knowledge on the setting up of aquarium
- CO4: gain knowledge on water quality management for different types of aquariums
- CO5: Apply the knowledge for self-employment

SYLLABUS

UNIT I: Introduction

- 1-1 Aquarium and ornamental fishes – introduction
- 1-2 Present status of Aquarium trade in the world and India
- 1-3 Aquarium accessories – aerators, filters, lighters and heaters
- 1-4 Water quality needs and different kinds of feeds

UNIT II: Fresh water ornamental fishes

- 2-1 Live bearers, gold fish, koi, gourami, barbs abd tetras, angel fish and cichlid fish
- 2-2 Brood stock development, breeding, larval rearing and grow out
- 2-3 Larval feeds and feeding

UNIT III: Marine ornamental fishes

- 3-1 Varieties and habitat of marine ornamental fishes
- 3-2 major marine ornamental fish resources of India
- 3-3 Collection and transportation of live fish, use of anaesthetics
- 3-4 Breeding of marine ornamental fish
- 3-5 Other aquarium animals – sea anemones, lobsters, worms, shrimps, octopus and starfish

UNIT IV: Aquarium management

4-1 Setting up fresh water, marine and reef aquariums

4-2 Water quality management for different types of aquariums

4-3 Common diseases of aquarium fish, diagnosis and treatment

4-4 Temperature acclimatization and oxygen packing for aquarium fish

UNIT V: Commercial production of aquarium fish and plants

5-1 Commercial production units of ornamental fish- requirements and design

5-2 Commercial production of goldfish, live bearers, gourami's, barbs, angels and tetras

5-3 Mass production of aquarium plants

5-4 Retail marketing and export of ornamental fish

CO-POMapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High], -:No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
C01	1	2	2	1	2	2	3	2	3	2	2	2	2
C02	2	1	2	2	1	1	2	3	1	2	2	2	2
C03	1	1	2	3	2	1	1	2	2	2	1	2	1
C04	2	2	3	2	2	2	2	2	2	2	2	2	2
C05	2	2	1	1	1	2	2	1	1	1	1	1	2

Pithapur Rajah's Govt. College (A) Kakinada
DEPARTMENT OF ZOOLOGY & AQUACULTURE

Semester-V
COURSE 13 - ORNAMENTAL FISHERY
MODEL QUESTION PAPER

Time: 2 hrs

Max. Marks :50

SECTION- A

Answer any THREE questions choosing at least one question from each section.
Draw diagrams wherever necessary **3 X10 = 30**

PART – I

1. Write an essay on the present status of Aquarium trade in the world and India
2. Write about brood stock development of aquarium fishes and their breeding
3. Explain breeding of marine Ornamental fish

Part – II

4. Explain the management of water quality for different types of Aquariums
5. What are the common diseases affecting aquarium fishes? Write their diagnosis and treatment.
6. What are the requirements and design for the commercial production units of ornamental fish?

SECTION-B

Answer any Four of the following.

4x5=20

7. Kinds of Aquarium feeds
8. Gold Fish & Gourami
9. Lobsters
10. Oxygen packing for Aquarium fish
11. Reef Aquariums
12. Aquarium plants
13. Export of Ornamental fish

Pithapur Rajah's Govt. Degree College (A) Kakinada.
DEPARTMENT OF ZOOLOGY & AQUACULTURE

BLUE PRINT FOR QUESTION PAPER
V SEMESTER Course No.: 13 -
Ornamental Fishery

Time: 2 1/2 hrs

Max. Marks: 50

Unit	Essay	Short
I	1	1
II	1	1
III	1	1

IV	2	2
V	1	2
	Out of 6, 3 questions should be answered 3X10=30M	Out of 7, 4questions should be answered 4X5=20M

Pithapur Rajah's Govt. Degree College (A) Kakinada.
DEPARTMENT OF ZOOLOGY & AQUACULTURE

V SEMESTER

Course No.: 13 - Ornamental Fishery

QUESTION BANK

I. ESSAY TYPE QUESTIONS

1. Write an essay on the present status of Aquarium trade in the world and India
2. Write an essay on various aquarium accessories
3. Write about brood stock development of aquarium fishes and their breeding
4. Explain the features of any 5 live bearers
5. Explain breeding of marine Ornamental fish
6. Write an essay on Collection and transportation of live ornamental fish
7. Explain the management of water quality for different types of Aquariums
8. What are the common diseases affecting aquarium fishes? Write their diagnosis and treatment.
9. Explain the setting up of a fresh water aquarium
10. What are the requirements and design for the commercial production units of ornamental fish?
11. Write an essay on Retail marketing and export of ornamental fish

II. SHORT ANSWER TYPE

1. Kinds of Aquarium feeds
2. Aquarium aerators & heaters
3. Angel fish
4. Koi & Abdominal Tetras
5. Larval feeds
6. Gold Fish & Gourami
7. Lobsters
8. Sea anemone
9. Anaesthetics in ornamental fish transport
10. Fin rot and tail rot
11. Abdominal dropsy
12. Oxygen packing for Aquarium fish
13. Temperature acclimatization
14. Reef Aquariums
15. Aquarium plants
16. Export of Ornamental fish

Pithapur Rajah's Govt. Degree College (A) Kakinada.
DEPARTMENT OF ZOOLOGY & AQUACULTURE

V SEMESTER

Course No.: 13 - Ornamental Fishery

credits :1

PRACTICALS:

1. Study of aerators – types and structures
2. Water circulation methods in aquarium and filtration
3. Collection and identification of aquarium plants
4. Identification of common marine aquarium fishes
5. Identification of common fresh water aquarium fishes
6. Breeding of egg layers
7. Breeding of live bearers
8. Evaluation of significance of aquaria for commercial and domestic use.

PRESCRIBED BOOK(S):

1. Dick Mills 1998. Aquarium fishes, Dorling Kindersly Ltd, London
2. Van Ramshort JD 1978. The complete aquarium encyclopedia, Elsevier

REFERENCES:

1. Jameson JD and Santhanan R 1996. Manual of ornamental fishes and farming technologies, Fisheries College and research institute, Tuticorn
2. Stephen Spotte 1993. Marine aquarium keeping. John wiley and sons, USA

Pithapur Rajah's Govt. Degree College (A) Kakinada.
DEPARTMENT OF ZOOLOGY & AQUACULTURE

V SEMESTER

Course No.: 13 - Ornamental

Fishery credits :1

PRACTICALS:

MODEL PAPER

Time: 2hrs

Max Marks: 50

1. Identification and write notes on the following with a neat labelled diagram

4X5=20M

A. Aquarium Plant

B. Marine Aquarium Fish

C. Freshwater Aquarium Fish

D. Marine/Fresh water Aquarium Fish

2. Breeding of egg layers/live bearers

10M

3. Types of aerators or water circulation methods in Aquarium

10M

4. Record

05M

5. Viva

05M

Total

50M

	P.R. Government Degree College (A) Kakinada	Program & Semester			
Course Code	TITLE OF THE COURSE Subject: AQUACULTURE MANAGEMENT Semester –V Course 14: FISHERY ENGINEERING	III B.Sc., (V SEM)			
Teaching	Hours Allocated: 50 (Theory)	L	T	P	C
Pre-requisites:		3	1	-	3

Course Outcomes:

CO1: Have knowledge on traditional, motorized and mechanized fishing crafts of India

CO2: Gain Knowledge on Design of fishing gear and fish catching methods

CO3: Learn about the type of anchors and Navigation equipment

Co4: Gain Knowledge on Remote sensing applications in fish finding and catching

CO5: Learn about the Fish Processing Equipment

SYLLABUS

UNIT I: Fishing crafts

1-1 Different types of fishing crafts in India- inland and marine– traditional, motorized and mechanized.

1-2 Classification of fishing craft.

1-3 Boat building materials - wood, steel, FRP, ferro-cement, aluminum etc.,

1-4 Mechanization of fishing craft and its impact

UNIT II: Fishing gear

2-1 Design of fishing gear and fish catching methods

2-1 Fishing accessories, Netting materials – natural and synthetic fishing gear materials and yarn numbering system

2.3 Active fishing gear - classification and description of modern fishing gears. -

2.4 Design and operation of –trawls, purse seines, ring seines, beach / shore seine, boat seine, pole and line, squid jigs, trolling.

UNIT III: Anchors, Fish Finding & Navigational Equipment (Introductory)

3-1 Types of Anchors – Chains, ropes, blocks, leads and drogues

3-2 Echo sounders, fish finders, sonar and net sonde

3-3 Chronometer, gyro compass, radar, Decca, omega etc.

UNIT IV: Exploration of fish and Conservation

4.2 Remote sensing applications in fish finding and catching.

4-2 Turtle exclusion devices

4.3 By-catch reduction devices

4.4 Destructive and prohibited fishing practices

UNIT V: Fish Processing Equipment

5-1 Ice making machinery, Brine tank

5-2 Arrangements for leak detection

5-3 Operation of various freezing machinery

5.4 Special equipment for freez rying, irradiation and cryogenics

Reference Books

1. Fridman AI 1992. Calculations for fishing gear designs. FAO, USA. Fishing news books Ltd, England
2. Gerhard Klust 1982. Netting material for fishing gears. FAO, USA. Fishing news books Ltd, England
3. Jan-Olf- Traung 1992. Fishing boats of the world- Volumes – 1, 2, & 3. FAO, USA. Fishing news books Ltd, England

CO-POMapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High], -:No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
C01	1	2	2	1	2	2	3	2	3	2	2	2	2
C02	2	1	2	2	1	1	2	3	1	2	2	2	2
C03	1	1	2	3	2	1	1	2	2	2	1	2	1
C04	2	2	3	2	2	2	2	2	2	2	2	2	2
C05	2	2	1	1	1	2	2	1	1	1	1	1	2

Course 14: FISHERY ENGINEERING
BLUE PRINT

ModuleName	PART I EssayTypeQuestions10 marks each	PartIIShortAnswer Questions 5markseach	MarksAllottedtothe Chapter
UNIT I	1	01	15
UNIT II	1	02	20
UNIT III	2	01	25
UNIT IV	1	02	20
UNIT V	1	01	15
5.Total	06 Ofwhich3tobe answered	07 Of which4 to be answered	95Marksincluding choice. Ofwhich60Marksto be answered

P.R. GOVERNMENT COLLEGE(A), KAKINADA

Course14: FISHERY ENGINEERING

MODEL QUESTION PAPER

SECTION-A

I. Answer any THREE questions choosing at least one question from each section. Draw the diagrams wherever necessary **3X10 =30**

PART-I

1. Describe the different types of fishing crafts used in India, both in inland and marine fisheries
2. Describe the design of fishing gear and discuss various fish catching
3. Explain the different types of anchoring equipment used in fishing operations.

Part-II

4. Describe the working principles and uses of modern fish detecting equipment
5. Explain the applications of remote sensing in fish finding and fishing operations
6. Explain the working of ice-making machinery and describe the function of a brine tank.

SECTION-B

II. Answer any 4 questions

4x5=20

7. List any four materials commonly used in boat building
8. Explain in detail about different fishing accessories and netting
9. Mention the difference between natural and synthetic materials
10. Anchoring Equipments
11. How does a TED work?
12. Mention any two advantages of TEDs.
13. Name any two methods of detecting gas leaks in cold storage units

P.R. GOVERNMENT COLLEGE(A), KAKINADA
AQUACULTURE
Course 14: FISHERY ENGINEERING

QUESTION BANK FOR FISHERY ENGINEERING

Module I

Essay Questions

1. Describe the different types of fishing crafts used in India, both in inland and marine fisheries.
2. Explain the classification of fishing crafts with suitable examples 3. Discuss various materials used in the construction of fishing boats.
4. Explain the concept of mechanization of fishing crafts.
5. Evaluate its impact on fishing efficiency, fish stock sustainability, and the socio-economic conditions of fishermen.

Short Answer Questions

1. Differences between traditional and mechanized fishing crafts?
2. List any four materials commonly used in boat building.
3. Define motorized fishing crafts and give two examples.
4. What is FRP, and why is it popular in modern boat construction?

Module II

Essay Questions

1. Describe the design of fishing gear and discuss various fish catching
2. Explain in detail about different fishing accessories and netting
3. Mention the difference between natural and synthetic materials.
4. Classify active fishing gears and describe the modern fishing gears used in the present fishing industry.
5. Explain the design and operation of the fishing gears and its types **Short Questions**

1. Write any two commonly used fish catching methods.
2. Brief note on natural and synthetic netting materials.
3. What is the purpose of yarn numbering in net making?
4. Mention two modern fishing gears used in marine fisheries.
5. What is a trawl net? How does it operate?
6. Differentiate between purse seine and ring seine.
7. Write a short note on squid jigs and their use in squid fishing.
8. What is trolling in fishing? How is it operated?

ModuleIII

Essay Questions:

1. Explain the different types of anchoring equipment used in fishing operations.
2. Describe the working principles and uses of modern fish detecting equipment.
3. Discuss the role and importance of navigational instruments in marine fishing.

Short Questions:

1. Anchoring Equipment's
2. What is the function of drogues in fishing?
3. Define the role of chain and rope in anchoring.
4. What are blocks and leads used for in gear operation?
5. What is the principle of an echo sounder?
6. How does a fish finder help in locating fish shoals?
7. Differentiate between sonar and net sonde.
8. Name two advantages of using sonar in deep sea fishing.
9. What is the function of a gyro compass in marine navigation?
10. Mention any two differences between radar and sonar.
11. What is the use of Decca navigation system in fishing vessels?

MODULE IV

Essay Questions:

1. Explain the applications of remote sensing in fish finding and fishing operations.
2. Describe the working, design, and importance of Turtle Exclusion Devices (TEDs).
3. What are By-Catch Reduction Devices (BRDs)? Explain their significance in fisheries.
4. Discuss various destructive and prohibited fishing practices.

Short Questions:

1. How is sea surface temperature useful in fish finding?
2. Name two satellites used for fishery remote sensing.
3. What does chlorophyll concentration indicate in fishing?
4. Why are TEDs used in trawl fisheries?
5. How does a TED work?
6. Mention any two advantages of TEDs.
7. Define by-catch in fisheries.
8. Why is poisoning water to catch fish banned?
9. Mention any two prohibited fishing methods in India.

MODULE V

1. Explain the working of ice-making machinery and describe the function of a brine tank.
2. Describe different arrangements for detecting leaks in refrigeration systems.
3. Explain the operation of various types of freezing machinery used in fish preservation.
4. Write a detailed note on special equipment used for freeze-drying, irradiation, and cryogenic preservation.

Short Questions:

1. What is the role of ice in fish preservation?
2. Name two types of ice-making machines.
3. What is a brine tank used for?
4. Mention one advantage of flake ice over block ice
5. What is the importance of leak detection in refrigeration?
6. Name any two methods of detecting gas leaks in cold storage units.
7. What is the soap bubble method?
8. Mention one electronic device used for refrigerant leak detection.
9. Differentiate between blast freezing and tunnel freezing.
10. What is the working principle of a spiral freezer?
11. What is freeze-drying?
12. Name any one advantage of cryogenic freezin

P.R. GOVERNMENT COLLEGE(A), KAKINADA

Course 14: FISHERY ENGINEERING

PRACTICAL SYLLABUS

Learning Outcomes:

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

- Identify the characters of Ornamental water cultivable species
- Estimate physico chemical characteristics of water used for aquaculture ■ Examine the diseases of fin and shellfish
- Suggest measures to prevent diseases in aquaculture

PRACTICALS:

1. Site survey: preparation of site map and contour map
2. Ice making and harvesting
3. Testing different netting materials- natural and synthetic
4. Estimation of buoyancy and de-buoyancy of different floating and sinking materials
5. Designing trawl net by conducting survey
6. Solving problems on finding position of gravity, flotation and buoyancy
7. Visit to fishing harbor to study deck machinery
8. Visit to fishing harbor to study hull equipment
9. Visit to boat building yard and dry-docking yard
10. Visit to a fish processing unit to study the equipment used in fish processing

PRESCRIBED BOOKS:

1. Fridman AI 1992. Calculations for fishing gear designs. FAO, USA. Fishing news books Ltd, England
2. Gerhard Klust 1982. Netting material for fishing gears. FAO, USA. Fishing news books Ltd, England
3. Jan-Olf- Traung 1992. Fishing boats of the world- Volumes – 1, 2, & 3. FAO, USA. Fishing news books Ltd, England

REFERENCES:

1. Dag Pike 1992. Fishing boats and their equipment. FAO, USA. Fishing news books Ltd, England

P.R. GOVERNMENT COLLEGE(A), KAKINADA

**Course14: FISHERY ENGINEERING
PRACTICAL MODEL PAPER**

Max. Marks 50 Time: 2Hours

Identify the following spotters/Charts/Photographs (6x5) 30M

1. Site survey: preparation of site map and contour map Ice making and harvesting
2. Estimation of buoyancy and de-buoyancy of different floating and sinking materials
3. Solving problems on finding position of gravity, flotation and buoyancy
4. Visit to fishing harbor to study hull equipment
5. Visit to a fish processing unit to study the equipment used in fish processing.
6. Designing trawl net by conducting survey

- | | | | |
|----|-------------------------------------|-------|-----|
| 1. | Record | ----- | 05M |
| 2. | Field note book/project work report | ----- | 10M |
| 3. | Viva voce | ----- | 05M |

Total 50M

	PITHAPUR RAJAH'S GOVT. DEGREE COLLEGE (A) KAKINADA.	PROGRAM & SEMESTER B.SC. HONOURS IN ZOOLOGY (MAJOR) SEMESTER-V			
COURSECODE 15	FISH PROCESSING TECHNOLOGY				
THEORY	CREDITS:3	3 HRS/WEEK			
TEACHING	HOURS ALLOCATED:60(THEORY)	L	T	P	C
PRE- REQUISITES:	FISH PROCESSING TECHNOLOGY	4	0	2	4

HOURS:60

Max.Marks: 50

COURSE OUTCOMES

Course outcomes

6. CO1: Understand the Principles of fish preservation
7. CO2:Learn about fundamental principles involved in chilling and freezing of fish and fishery products
8. CO3: Understand the methods of drying, smoking and freeze drying
9. CO4:Knowledge about packaging materials and the process of packing
10. CO5: gain Knowledge about the export of Fishery products from India.

Learning objectives

1. Gain proficiency in unit operations such as filleting, freezing, canning, drying, and smoking.
2. Understand the design and maintenance of fish processing plants, including equipment like IQF (Individual Quick Freezing) systems and canning machinery
3. Learn methods for microbiological, biochemical, and sensory evaluation of fish products.
4. Understand food safety standards, including Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Points (HACCP).
5. Study the importance of hygiene and sanitation in processing environments
6. Engage in hands-on training in laboratories equipped with modern processing equipment.
7. Participate in the preparation and assessment of various fishery products

Learning outcomes

Here are typical learning outcomes for a course or training in **Fish Processing Technology**:

1. **Understand Principles of Fish Processing** ○ Explain the biological and chemical properties of fish affecting processing and preservation.
 - Identify spoilage mechanisms and methods to control them.
2. **Knowledge of Processing Techniques** ○ Describe various fish processing methods: chilling, freezing, drying, salting, smoking, canning, and value-added products.
 - Apply appropriate techniques based on fish species and end product requirements.
3. **Quality Control and Safety Standards** ○ Implement quality assurance and control measures in fish processing.
 - Understand and apply food safety regulations such as HACCP, GMP, and international standards.
4. **Handling and Storage Skills** ○ Demonstrate safe and effective handling, storage, and transportation of fish products to maintain quality and safety.

SYLLABUS

UNIT 1:

Introduction

1.1 Principles of fish preservation.

1.2 Quality of water and ice in fish handling and processing. 1.3 Preparation of ice.

Different types of ice used in the seafood industry and their merits.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 2: Freezing and Canning:

2.1 Fundamental principles involved in chilling and freezing of fish and fishery products.

2.2 Various freezing methods. Freezing of shrimps and fishes.

2.3 Changes during the cold storage of fish and fishery products.

2.4 Principles involved in canning of fish. Different types of containers.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 3: Drying, Smoking and Freeze-drying:

3.1 Different types of drying, Factors affecting drying.

3.2 Packing and storage of dried products. Spoilage of dried products. Preventive measures 3.3 Smoking of fish, Salting of fish

3.4 Principles of freeze drying. Accelerated freeze drying and packing of freeze dried products.

Modern methods of preservation by irradiation and modified atmospheric storage.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 4: Packing, Cold Storage and Export of Fishery Products:

- 4.1 Functions of packing. Different types of packing materials and its quality evaluation.
- 4.2 Packing requirements for frozen and cured products.
- 4.3 Statutory requirements for packing.
- 4.4 Labeling requirements. Different types of cold storages, Insulated and refrigerated vehicles.

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

UNIT 5: Export of fishery products

5.1 Export of Fishery products from India - major countries, important products, export documents and procedures. 5.2 Prospects and constraints in export including tariff and non- tariff barriers, marine insurance, export incentives, registered exporters

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

REFERENCES:

1 "Fish Processing: Sustainability and New Opportunities"

Edited by George M. Hall

- Covers sustainable practices, new product development, and advanced processing methods.
- **"Seafood Processing: Technology, Quality and Safety"** Edited by Ioannis S. Bozaris
- Focuses on preservation techniques, quality control, and safety standards

Web Resources

Website: <https://www.fao.org/fishery/en>

Website: <https://www.journals.elsevier.com/food-control>

Website: <https://www.seafoodsource.com>

Co-Curricular Activities

Mandatory:

1. Workshops & Hands-on Training:

- Fish filleting and deboning techniques
- Fish preservation methods (salting, drying, smoking, freezing)
- Packaging and labeling techniques

2. Field Visits & Industrial Tours:

- Visits to fish processing plants or seafood industries
- Exposure to commercial fish markets and cold storage facilities

3. Competitions & Exhibitions:

- Fish product innovation contests (e.g., developing new fish-based products)
- Participating in food technology fairs or exhibitions

4. Research Projects & Surveys:

- Conducting studies on fish spoilage or preservation methods
- Market surveys on consumer preferences for processed fish products

5. Seminars & Guest Lectures:

- Inviting industry experts to talk about trends and challenges in fish processing
- Organizing awareness programs on food safety and hygiene

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	2	3	2	3	2	2	2	2
CO2	2	1	2	2	1	1	2	3	1	2	2	2	2
CO3	1	1	2	3	2	1	1	2	2	2	1	2	1
CO4	2	2	1	2	1	2	2	2	2	2	2	2	2
CO5	2	2	1	1	1	2	2	1	1	1	1	1	2

P.R. GOVT. COLLEGE (AUTONOMOUS), KAKINADA

TITLE: COURSE 15: FISH PROCESSING TECHNOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

MODULE NO.	ESSAY QUESTIONS 10	SHORT ANSWER QUESTIONS 5	MARKS ALLOTTED TO THE UNIT
MODULE-1	1	2	20
MODULE-2	1	1	15
MODULE-3	1	2	20
MODULE-4	2	1	25
MODULE-5	1	1	15
TOTAL	06 OF WHICH 3 TO BE ANSWERED	07 OF WHICH 4 TO BE ANSWERED	95 MARKS INCLUDING CHOICE OF WHICH 50 MARKS TO BE

**PITHAPUR RAJA'S GOVT. COLLEGE (AUTONOMOUS),
KAKINADA**

**MAJOR AQUACULTURE SEMESTER-V-
Course 15 - FISH PROCESSING TECHNOLOGY**

MODEL QUESTION PAPER

Time: 3 hrs.

Max Marks: 50

SECTION –I

3X10=30

Answer Any THREE of the following by choosing at least one question in each section (Draw labelled diagrams wherever necessary)

PART- I

S. No	Questions	BT Level	CO	P O	Marks
1	Explain Principles of Fish Preservation, Quality of Water and Ice in Fish Handling and Processing	BT1	1	2	10
2	Describe Various Freezing Methods: Freezing of Shrimps and Fishes .	BT2	2	0	10
3.	Write about Modern Methods of Preservation:	BT2	2	0	10

PART- II

S.No	Questions	BT Level	CO	PO	Marks
4	Explain different types of packing materials used for frozen and cured products	BT1	1	2	05
5	Describe the different types of cold storage facilities and the role of insulated and refrigerated vehicles in maintaining product quality.	BT2	2	2	05
6	Describe Important Fishery Products	BT2	1	2	05

SECTION - B

I. Answer any FOUR of the following: Draw labeled diagrams wherever necessary

4x5=20 M

S.No	QUESTION	BT LEVEL	CO	PO	MARKS
7	Write Types of Ice in the Seafood Industry	BT1	2	1	01
8	Explain about principles of preservation	BT1	0	1	01
9	Write Types of Containers used in canning	BT2	1	2	01
10	What are two factors that affect the drying process of fish products?	BT3	2	2	01
11	Smoking ,salting	BT1	2	1	01
12	Write Statutory requirements for packing	BT1	0	1	01
13	Name any two major fishery products exported from India and two major importing countries	BT2	1	2	01

P.R. Govt. College (A), Kakinada

Semester-V

TITLE : FISH PROCESSING TECHNOLOGY

PAPER: 15 - Question Bank

UNIT: I

ESSAY QUESTIONS

1. Explain Principles of Fish Preservation, Quality of Water and Ice in Fish Handling and Processing
2. Write Different types of ice used in the seafood industry and their merits

Short Answer Questions

1. List three common products derived from fish apart from fresh fish.
2. What is the main purpose of freezing fishery products?
3. Mention two by-products obtained from fish processing. Bottom of Form

UNIT-II

Essay questions

1. Fundamental Principles Involved in Chilling and Freezing of Fish and Fishery Products-BT1
2. Different Types of Containers Used in Fish Canning. - BT2
3. Various Freezing Methods: Freezing of Shrimps and Fishes-BT3
4. Principles Involved in Canning of Fish

SHORT ANSWER QUESTION

1. What is the primary difference between chilling and freezing of fish?
2. Name two freezing methods commonly used for shrimps.
3. What is lipid oxidation, and how does it affect frozen fish?
4. Why is heat treatment necessary during the canning of fish products?

UNIT - III

Essay questions

6. Explain Types of Drying and Factors Affecting Drying in Food Preservation
7. Write Modern Methods of Food Preservation
8. Write about Packing, Storage, and Spoilage of Dried Products

SHORT ANSWER QUESTIONS:

1. Fish Pickling
2. Smoking
3. Freezing

UNIT - IV

Essay questions

1. Explain about Functions of Packing & Types of Packing Materials,
2. What are the Packing Requirements for Frozen and Cured Products
3. Explain Types of Cold Storages, and Insulated Vehicles

SHORT ANSWER QUESTIONS:

1. What are two main functions of packaging in the food industry?
2. Name any two materials used for vacuum packaging.
3. Why is moisture barrier important in frozen food packaging?
4. Mention two types of cold storage based on temperature.
5. What is the role of labeling in consumer protection?

6. UNIT – V

Essay questions

1. Explain about Export of Fishery Products from India – Major Countries,
2. Describe about Export of Marine Products from India – Opportunities and Challenges

3. Write about Prospects and Constraints in Export of Fishery Products **SHORT ANSWER QUESTIONS:**

1. Name any three major countries importing fishery products from India.
2. List two important fishery products exported from India.
3. Define tariff and non-tariff barriers.

SEMESTER-V

PAPER – 15 – FISH PROCESSING TECHNOLOGY PRACTICALS 2 HRS/WEEK

Experiments:

1. Determination of moisture content in fish and fishery products
2. General description –freezing
3. Processing shrimp
4. Filleting of fish
5. Drying of fish
6. Organoleptic analysis of fish
7. Preparation of fishery by products
8. Preparation of shark fin rays fish maws, chitin, fish wafer
9. Fish pickling
10. Value added fishery products, fish curry, cutlets fish finger.
11. Preparation of surimi

Filed visit: 1. Visit to sea food pre-processing plants

Text books:

1. K.Gopakumar, Fish Processing Technology, ICAR, New Delhi
2. T.K. Govindan, Fish Processing Technology Oxfor & IBH Publication Co.
3. K.K. Balachandran Fish Canning – Principles & Practices.
4. Borgstrom,G. Fish as Food.
5. K.K. Balachandran, Postharvest Technology in Fish and Fishery Products.
6. Moorjani,M.V. Fish Processing in India.
7. Connell,J.J. Advances in Fishery science and Technology.
8. CIFT. Manual of Quality Control in Fish and Fishery Products.
9. Gopakumar,K. Fish Packaging Technology

Reference Books: 1. A.M.Martin, Fisheries – Processing Chapman & Hall, Madras
2. Ed.G.M.Hall – Fish Processing Technology Chopra & Hall. Madras.

**MAJOR AQUACULTURE
PAPER -15
FISH PROCESSING TECHNOLOGY**

PRACTICAL MODEL QUESTION PAPER - MAX MARKS-50

I. Answer any two (Each carries 13 marks) ($2 \times 13 = 26$ marks)

1. Moisture Content Determination:

Demonstrate the procedure for determining the moisture content in fish or a fishery product using the oven drying method. Record your observations and calculate the moisture percentage.

2. Shrimp Processing:

Perform shrimp processing, including washing, de heading, peeling, deveining, and grading. Explain each step with proper hygiene protocols.

3. Preparation of Surimi:

Prepare surimi from fresh fish. List all the steps involved in the process and mention quality control measures.

II. Answer any TWO of the following: $2 \times 7 = 14$ marks

5. Fish Pickling:

Prepare a simple fish pickle. Mention the ingredients used and outline the process.

6. Organoleptic Analysis:

Conduct organoleptic analysis of a fish sample. Record observations based on color, texture, odor, and taste.

7. Preparation of Fishery By-products:

Demonstrate the preparation of Isin glass. Briefly describe its applications.

III, Viva Voce

5 Marks

IV. Record and Observation Book

5 Marks

TOTAL-

50 MARKS

SEM V
COMMON VALUE-ADDED COURSE

w.e.f. AY 2023-24

ENVIRONMENTAL EDUCATION

Credits: 2

2 hrs/week

Course objective: A Generic Course intended to create awareness that the life of human beings is an integral part of environment and to inculcate the skills required to protect environment from all sides.

Learning outcomes: On completion of this course the students will be able to

1. Understand the nature, components of an ecosystem and that humans are an integral part of nature.
2. Realize the importance of environment, the goods and services of a healthy biodiversity, dependence of humans on environment.
3. Evaluate the ways and ill effects of destruction of environment, population explosion on ecosystems and global problems consequent to anthropogenic activities.

4. Discuss the laws/ acts made by government to prevent pollution, to protect biodiversity and environment as a whole.
5. Acquaint with international agreements and national movements, and realize citizen's role in protecting environment and nature.

Unit 1: Environment and Natural Resources

06 Hrs.

1. Multidisciplinary nature of environmental education; scope and importance.
2. Man as an integral product and part of the Nature.
3. A brief account of land, forest and water resources in India and their importance.
4. Biodiversity : Definition; importance of Biodiversity - ecological, consumptive, productive, social, ethical and moral, aesthetic, and option value.
5. Levels of Biodiversity: genetic, species and ecosystem diversity.

Unit-2: Environmental degradation and impacts 10Hrs 1.

Human population growth and its impacts on environment; land use change, land degradation, soil erosion and desertification.

2. Use and over-exploitation of surface and ground water, construction of dams, floods, conflicts over water (within India).
3. Deforestation: Causes and effects due to expansion of agriculture, firewood, mining, forest fires and building of new habitats.
4. Non-renewable energy resources, their utilization and influences.
5. A brief account of air, water, soil and noise pollutions; Biological, industrial and solid wastes in urban areas. Human health and economic risks.
6. Green house effect - global warming; ocean acidification, ozone layer depletion, acid rains and impacts on human communities and agriculture.
7. Threats to biodiversity: Natural calamities, habitat destruction and fragmentation, over exploitation, hunting and poaching, introduction of exotic species, pollution, predator and pest control.

Unit 3: Conservation of Environment 10 Hrs

1. Concept of sustainability and sustainable development with judicious use of land, water and forest resources; afforestation.
2. Control measures for various types of pollution; use of renewable and alternate sources of energy.
3. Solid waste management: Control measures of urban and industrial waste.
4. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

5. Environment Laws: Environment Protection Act; Act; Wildlife Protection Act; Forest Conservation Act.
6. International agreements: Montreal and Kyoto protocols; Environmental movements: Bishnois of Rajasthan, Chipko, Silent valley.

Suggested activities to learner: (4 hours)

1. Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc
2. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural site.
3. Study of common plants, insects, birds and basic principles of identification.
4. Study of simple ecosystems-forest, tank, pond, lake, mangroves etc.
5. Case study of a Forest ecosystem or a pond ecosystem.

Suggested text book :

- ErachBarucha (2004) *Text book of Environmental Studies for Undergraduate courses* (Prepared for University Grants Commission) Universities Press.
- PurnimaSmarath (2018) *Environmental studies* Kalyani Publishers, Ludhiana

Reference books :

- Odum, E.P., Odum, H.T. & Andrews, J. (1971) *Fundamentals of Ecology*. Philadelphia:Saunders.
- Pepper, I.L., Gerba, C.P. &Brusseau, M.L. (2011). *Environmental and Pollution Science*.Academic Press.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. (2012) *Environment. 8th edition*. JohnWiley & Sons.
- Singh, J.S., Singh, S.P. and Gupta, S.R. (2014) *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
- Sengupta, R. (2003) *Ecology and economics: An approach to sustainable development*.OUP.
- Wilson, E. O. (2006) *The Creation: An appeal to save life on earth*. New York: Norton.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll (2006) *Principles of Conservation Biology*. Sunderland: Sinauer Associates,

ENVIRONMENTAL EDUCATION

(Total hours of Teaching – 30 Hrs. @ 02 Hrs. per Week)

Time: 2 Hours

Maximum Marks: 50

Section–A

I. Answer any THREE questions. Choosing at least 1 question from each part

$3 \times 10 = 30$ Marks

PART I

1. Define Biodiversity. Explain its importance and conservation strategies
2. Explain the reasons and effects of Deforestation.
3. Write an essay on sustainable development.

PART II

4. Describe Land **and Water Resources** in India
5. Discuss **Global Warming** and its impacts.
6. Explain International agreements for environmental protection

Section–B

II. Answer any Four questions.

$4 \times 5 = 20$ Marks

1. Forest resources
2. Ecosystem Diversity
3. Nonrenewable energy
4. Ozone layer depletion
5. Air pollution
6. Habitat destruction
7. Environmental protection Act

SEMESTER-VI

INTERNSHIP

DEPARTMENT OF ZOOLOGY LIST OF EXAMINERS			
S. No	Name of the Exan 	Subject	Name of the College
1.	Dr. N. Sreenivas	Zoology	GDC Ramachandrapuram
2.	B. Ahmad Ali Baba	Zoology	GDC Pithapuram
3.	Dr. P John Kiran	Zoology	GDC Perumallapuram
4.	Dr.M. Vijaya Kumar	Zoology	SRR GDC Vijayawada
5.	Dr.P. Jaya Bharathi	Zoology	VSK College, Vizag
6.	N. Suneetha	Zoology	SRR GDC, Vijayawada
7.	V. Sandhya	Zoology	GDC, Kaikaluru
8.	Dr. R P Dattu	Zoology	GDC, Tiruvuru.
9.	Dr. K Rama Rao	Zoology	VSK College, Vizag
10.	Dr. T Samuel David Raj	Zoology	VSK College, Vizag
11.	Dr. P R Vani	Zoology	VSK College, Vizag
12.	Dr Y. Poli Naidu	Zoology	GDC, Srikakulam
13.	A. Arjuna Apparao	Zoology	GDC, Yellamanchili
14.	Dr G. Mani	Zoology	GDC (M), Srikakulam
15.	P.S.C.H.P Deepika Rani	Zoology	SKR College (W), Rajahmundry
16.	Dr G. Vijay Prathap	Zoology	VSK College, Vizag
17.	Dr. Y. Shantiprabha	Zoology	VSK College, Vizag
18.	M. Hima Sridevi	Zoology	SKR College(W), Rajahmundry

Lecturer in charge
Dept of Zoology & Aquaculture

DEPARTMENT OF ZOOLOGY
LIST OF QUESTION PAPER SETTERS

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