

**PITHAPUR RAJAH'S GOVERNMENT COLLEGE  
(AUTONOMOUS)  
NAAC "A" GRADE**

**KAKINADA**



**XXII-BOARD OF STUDIES**

**B.VOC COMMERCIAL AQUACULTURE**

DEPARTMENT OF ZOOLOGY AND AQUACULTURE

**2021-22**

**(CHOICE BASED CREDIT SYSTEM)**

P.R.GOV'T.COLLEGE (AUTONOMOUS)KAKINADA.  
2021 -22 XXI BOARD OF STUDIES MEETING.  
DEPARTMENT OF ZOOLOGY AND AQUACULTURE (COMMERCIAL AQUACULTURE)

The members present have discussed the syllabi and model question papers (Theory and Practical) related to I to VI semesters in Commercial Aquaculture and made the following Resolutions.

**Resolution I:** Resolved to Continue CBCS System as instructed by Commissioner of Collegiate Education ( CCE ), Amravathi .

**Resolution II:** Resolved to implement 60% external and 40% internal marks for both theory and practicals from the academic year 2018-19 for III and IV semesters along with I and II semesters.

**Resolution III:** Resolved to split 40 marks of theory internal as 20 marks for mid exams and 20 marks for Continuous Comprehensive Evaluation (seminar/assignment/quiz/group discussion).

**Resolution IV:** Resolved to conduct practical examination also at the end of III and IV semesters along with I and II semesters

**Resolution V :** Resolved to follow Adikavi Nanayya University zoology UG syllabus for III and IV semesters along with I & II semesters

**Resolution VI :** Resolved to introduce Question Bank for all the semesters, Module wise- Essay & Short Answer Questions.

**Resolution VII :** Resolved to continue the same paper setters and examiners for all the semesters.

**Resolution VIII:** Resolved to include Blue Prints for model question papers for all semesters.

**Resolution IX :** Resolved to Adapt the guidelines of Authorities with respect reducing approved curriculum to Minimum Course curriculum for all semesters due to Covid Lockdown

**Resolution X :** Resolved to Adapt Extra Credits for **MOOCS, Arpit** like online courses, Certificate courses as per the Academic Council Decisions and also to adapt I year syllabus intotto as prescribed by the Higher officials

**Chairperson  
Board of Studies  
Dept. of Zoology**

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) SYLLABUS AND NAME OF THE PAPERS**  
**NSDC, NSQF & ASCI - LEVELS OF ASSESSMENT – 2021-22**

| S.No | VOCATIONAL COMPONENT |   | Marks           | Credits                                  | GENERAL COMPONENT                                  |            | Marks | Credits |
|------|----------------------|---|-----------------|--|--|------------|-------|---------|
| I    | I Year               |   | First Semester  |  |  |            |       | (28)    |
| 1.   | Core I               | Biology of Fin fishes and shell fishes    | 100             | 4  | Major I  | Zoology    | 100   | 4       |
|      |                      | Lab                                       | 50              | 1  |  | Practical  | 50    | 1       |
| 2.   | Core II              | Principles of Aquaculture                 | 50              | 2  | Major II   | Chemistry  | 100   | 4       |
|      |                      | Lab/ind.training                          | 50              | 1  |  | Practical  | 50    | 1       |
|      |                      |   |                 | Languages                                | English  | 100        | 3     |         |
|      |                      |   |                 |  | Language T/H/S                                     | 100        | 3     |         |
|      |                      |   |                 | Life skills and skill development course | (CSS)-Comp   | 50         | 2     |         |
|      |                      |   |                 |  | ( Plant Nursery)-Bot. dept                         | 50         | 2     |         |
| II   |                      |   | Second Semester |  |  |            |       | (30)    |
| 1.   | Core III             | Freshwater, Brackishwater and Mariculture | 100             | 4  | Major I  | Zoology    | 100   | 4       |
|      |                      | Lab                                       | 50              | 1  |  | Practical  | 50    | 1       |
| 2.   | Core IV              | Crafts and Gears in Fisheries             | 50              | 2  | Major II   | Chemistry  | 100   | 4       |
|      |                      | Lab/ind.training                          | 50              | 1  |  | Practical  | 50    | 1       |
|      |                      |   |                 | Languages                                | English  | 100        | 3     |         |
|      |                      |   |                 |  | Language T/H/S                                     | 100        | 3     |         |
|      |                      |   |                 | Life skills and skill development course | (ICT)-Computer dept                                | 50         | 2     |         |
|      |                      |   |                 |  | (Diary techniques)- Zoology dept                   | 50         | 2     |         |
|      |                      |   |                 |  | (Fruit & Veg preservation)- Botany dept            | 50         | 2     |         |
| III  | II Year              |   | Third Semester  |  |  |            |       | (30)    |
|      | Core V               | Aquaculture Nutrition                     | 100             | 4  | Major I  | Zoology    | 100   | 4       |
|      |                      | Lab                                       | 50              | 1  |  | Practical  | 50    | 1       |
|      | Core VI              | Inland and Marine Fisheries               | 50              | 2  | Major II   | Chemistry  | 100   | 4       |
|      |                      | Lab/ind.training                          | 50              | 1  |  | Practical  | 50    | 1       |
|      |                      |   |                 | Languages                                | English  | 100        | 3     |         |
|      |                      |   |                 |  | Language T/H/S                                     | 100        | 3     |         |
|      |                      |   |                 | Life skills and skill development course | (Environment education)- Zoology dept.             | 50         | 2     |         |
|      |                      |   |                 |  | (Personality development and leadership)-Eng dept. | 50         | 2     |         |
|      |                      |   |                 |  | (Environment audit)- Chemistry dept.               | 50         | 2     |         |
| IV   |                      |   | Fourth Semester |  |  |            |       | (30)    |
|      | Core VII             | Pathology in Aquaculture                  | 100             | 4  | Major I  | Zoology I  | 100   | 4       |
|      |                      | Practical                                 | 50              | 1  |  | Practical  | 50    | 1       |
|      | Core VIII            | Fisheries Management                      | 100             | 4  |  | Zoology II | 100   | 4       |
|      |                      | Practical                                 | 50              | 1  |  | Practical  | 50    | 1       |
|      |                      |   |                 | Major II                                 | Chemistry I  | 100        | 4     |         |
|      |                      |   |                 |  | Practical  | 50         | 1     |         |
|      |                      |   |                 |  | Chemistry II                                       | 100        | 4     |         |
|      |                      |   |                 |  | Practical  | 50         | 1     |         |

## OLD PATTERN SYLLABUS FOR V and VI Semesters

### III B.VOC COMMERCIAL AQUACULTURE

| S.NO      | CORE SUBJECTS        |  | MARKS | CREDITS | NON-CORE  | MARKS | CREDITS |
|-----------|----------------------|--|-------|---------|-----------|-------|---------|
| <b>1.</b> | <b>Semester - V</b>  |  |       |         |           |       |         |
|           | CORE-XIII            | Fishery microbiology and by-products           | 100   | 4       | Zoology   | 100   | 4       |
|           | CORE-XIV             | Fish processing technology and quality control | 100   | 4       | Chemistry | 100   | 4       |
|           | CORE-XV              | Project  | 100   | 4       |           |       |         |
| <b>2.</b> | <b>Semester - VI</b> |  |       |         |           |       |         |
|           | CORE-XVI             | Aquaculture Engineering                        | 100   | 4       | Zoology   | 100   | 4       |
|           | CORE-XVII            | Fisheries Extension and marketing              | 100   | 4       | Chemistry | 100   | 4       |
|           | CORE-XVIII           | Project  | 100   | 4       |           |       |         |

**XXI-BOARD OF STUDIES MEETING 2021-2022**  
**CHOICE BASED CREDIT SYSTEM**  
**(WITH EFFECTIVE FROM 2020-2021)**

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Online approval of the BOS is done with the following Members.

| Sl.no | Name and affiliation  | Designation                  | Signature |
|-------|---|------------------------------|-----------|
| 01    | B.Chakravarthi<br>Lecturer in-charge<br>Dept of zoology<br>P.R.Govt College (A)<br>Kakinada.    | Lecture in-charge            |           |
| 02    | Dr.K. Ramesh Babu<br>Prof. in Zoology<br>Dept. of Zoology<br>Andhra University<br>Visakhapatnam | Vice-Chancellor's<br>Nominee |           |
| 03    | Dr. K. Ramaneswai<br>Prof. in Zoology<br>Adikavi Nannayya University<br>Rajamahendravaram       | Subject Expert               |           |
| 04    | Dr.P.John Kiran<br>Assistant Professor in<br>Zoology<br>GDC, Perumallapuram                     | Subject Expert               |           |
| 05    | K.Narasimha Murthy  | Industrial Nominee           |           |

| <b>DEPARTMENTAL STAFF</b>   | <b>MEMBER</b>             |
|---|---------------------------|
| 1. B.Chakravarthi<br>Lecturer in-Charge<br>Dept.of Zoology<br>P.R.Govt College (A)<br>Kakinada      | Member& Lecture in-Charge |
| 2. Dr. N. Srinivas<br>Lecturer in zoology<br>P.R.Govt College (A)<br>Kakinada                       | Member                    |
| 3. B.Ahmad Ali Baba<br>Lecturer in zoology<br>P.R.Govt College (A)<br>Kakinada                      | Member                    |
| 4. Dr.P. Kiran Kumar<br>Lecturer in Zoology<br>P.G Co-ordinator<br>P.R.Govt College (A)<br>Kakinada | Member& P.G Co-ordinator  |
| 5. B. Elia<br>Lecturer in Zoology<br>P.R.Govt College (A)<br>Kakinada                               | Member                    |
| 6. SK. Madina Saheb<br>Lecturer in Zoology (Contract)<br>P.R.Govt College (A)<br>Kakinada           | Member                    |
| 7. P.Vijaya Chandrika<br>Lecturer in Zoology (Guest)<br>P.R.Govt College (A)<br>Kakinada            | Member                    |
| 8. B.Devi<br>Lecturer in Zoology (Guest)<br>P.R.Govt College (A)<br>Kakinada                        | Member                    |
| 9. Y.Gowthami<br>Lecturer in Zoology (Guest)<br>P.R.Govt College (A)<br>Kakinada                    | Member                    |
| 10. I.Santhi Grace<br>Lecturer in Zoology (Guest)<br>P.R.Govt College (A)<br>Kakinada               | Member                    |
| 11. G. Bhuvan Teja  | Member                    |

Lecturer in Zoology(Guest)  
P.R.Govt College (A)  
Kakinada

12. K.Anusha

Lecturer in Zoology(Guest)  
P.R.Govt College (A)  
Kakinada

Member

**PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA  
DEPARTMENT OF ZOOLOGY AND AQUACULTURE**

**LIST OF EXAMINERS**

| <b>S.No</b> | <b>Name of the Examiners</b> | <b>Subject</b> | <b>Name of the College</b> |
|-------------|------------------------------|----------------|----------------------------|
| 01          | Prof. G. Mani                | Zoology        | GDC (M), Srikakulam        |
| 02          | D. K. Rama Rao               | Zoology        | VSK College , Vizag        |
| 03          | Dr. R. Ramachandra Rao       | Zoology        | GDC, Rajam                 |
| 04          | K. Sujatha                   | Zoology        | GDC (W),Srikakulam         |
| 05          | N. Suneetha                  | Zoology        | SRR&CVR GDC (A)            |
| 06          | M. Vijaya Kumar              | Zoology        | SRR&CVR GDC (A)            |
| 07          | Dr. G Vijaya Prathap         | Zoology        | GDC ,Yalamanchala          |
| 08          | A. Arjuna apparao            | Zoology        | GDC ,Yalamanchala          |
| 09          | Dr. Samuel Devid Raj         | Zoology        | Dr. VSK GDC (A)            |
| 10          | Dr. R. Praveen Dathu         | Zoology        | GDC ,Thiruvuru             |
| 11          | Dr. V. Sandhya               | Zoology        | GDC,kaikaluru              |
| 12          | Dr.Y.PoliNaidu               | Zoology        | GDC,Srikakulam             |
| 13          | Dr.P.JohnKiran               | Zoology        | GDC Perumallapuram         |
| 14          | Dr.P Jaya                    | Zoology        | Dr. V. S. K(A) Vizag       |
| 15          | Dr. P. R Vani                | Zoology        | Dr.V.S.K(A)Vizag           |
| 16          | Smt. M. Vasantha Lakshmi     | Zoology        | ASD Women's(A) Kakinada    |
| 17          | Dr. G. Sithamma              | Zoology        | Dr. KV R (W),Karnool       |
| 18          | M.Himasridevi                | Zoology        | SKRCollege(W),Rajahmandry  |
| 19          | Dr.P.S.C.H.PDeepikaRani      | Zoology        | SKRCollege(W),Rajahmandri  |
| 20          | M.Kasma                      | Zoology        | SKRCollege(W),Rajahmandri  |



PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS)  
KAKINADA  
DEPARTMENT OF ZOOLOGY AND AQUACULTURE

*LIST OF QUESTION PAPER SETTERS*

**DEPARTMENT OF ZOOLOGY**

| <b>S.N</b> | <b>Name of the Examiners</b> | <b>Subject</b> | <b>Name of the College</b> |
|------------|------------------------------|----------------|----------------------------|
| 01         | Dr.Samuel Devid Raj          | Zoology        | V.S.K. College(A) , Vizag  |
| 02         | Dr.P.R Vani                  | Zoology        | V.S.K. College(A) , Vizag  |
| 03         | Dr.Y. Poli Naidu             | Zoology        | GDC, Srikakulam            |
| 04         | Dr. P. John Kiran            | Zoology        | GDC, Perumallapuram        |
| 05         | Smt. M. Vasantha Lakshmi     | Zoology        | A.S.D Women's College (A)  |
| 06         | Dr. P Jaya                   | Zoology        | Dr. VSK College(A), Vizag. |
| 07         | Dr. G. Mani                  | Zoology        | GDC (M) Srikakulam         |
| 08         | D. K. Rama Rao               | Zoology        | Dr. VSK (A) Vizag          |
| 09         | P.S.C.H.P Deepika Rani       | Zoology        | SKRCollege(W),Rajahmandri  |
| 10         | Dr. G Vijaya Prathap         | Zoology        | GDC,Yalamanchala           |
| 11         | A. Arjun Apparao             | Zoology        | GDC,Yalamanchala           |
| 12         | Dr. Praveen Dathu            | Zoology        | GDC,Thiruvuru              |
| 13         | Dr. V Sandhya                | Zoology        | GDC,kaikaluru              |
| 14         | Dr.G.Sithamma                | Zoology        | GDC,Thiruvuru              |

**Lecturer in charge-PG Dept of Zoology**

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

**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**

**B.VOC (Commercial Aquaculture) Semester-I**

**TITLE: BIOLOGY OF FIN FISH AND SHELL FISH - Core: I**

**SYLLABUS**

| <b>OBJECTIVES:</b>  | <b>LEARNING OUTCOMES</b>  |
|---|---|
| <p>To introduce the learner to general morphology and taxonomy of fin &amp; Shell fishes. To study the Biological, Morphological and physiological characteristics of fish &amp; shellfish</p> <p>To provide the knowledge on the taxonomic characteristics of the fin &amp; Shellfishes</p> <p>To give an introduction to Fresh water aquaculture practices.</p> | <p>By the end of the course the student will be equipped with the knowledge of taxonomy, morphology &amp; physiology of fin &amp; Shellfishes.</p> <p>Knowledge on the basic taxonomic tools for the identification of fin &amp; shell fishes will be learnt by the student.</p> <p>At the end of the course student can able to gain the knowledge on the fresh water aquaculture practices.</p> |

**UNIT-I: GENERAL CHARACTERS & CLASSIFICATION OF CULTIVABLE FIN & SHELL FISH**

- 1.1 General Characters and classification of fishes, crustaceans and molluscs up to the level of Class. Fish, Crustaceans and Molluscs of commercial importance.
- 1.2 Specialized organs in fishes – electric organs, Sound producing organs, Poison glands in fishes and Bioluminescence in fishes.
- 1.3. Buoyancy in fishes- swim bladder and mechanism of gas secretion

**UNIT-II: FOOD, FEEDING AND GROWTH**

- 2.1. Natural fish food, feeding habits, gut content analysis, structural modifications in relation to feeding habits, forage ratio and food selectivity index
- 2.2 Principles of Age and growth determination; Growth rate measurement – scale method, otolith method, skeletal parts as age indicators
- 2.3 Genetic, biotic & ecological factors in determining the longevity of fishes, length- frequency method, age composition, age-length keys, absolute and specific growth, annual survival rate, Length-weight relationship, condition factor.

**UNIT-III: REPRODUCTIVE BIOLOGY**

- 3.1 Breeding in fishes, breeding places, breeding habits & places, courtship and reproductive cycles
- 3.2 Induced breeding in fishes
- 3.3 Breeding in shrimp, pearl oyster, pila, and cephalopods
- 3.4 Parental care in fishes, ovo-viviparity, oviparity, viviparity, nest building and brooding, Embryonic and larval development of fishes and Shrimp.

**UNIT – IV: DEVELOPMENT, HORMONES AND GROWTH**

- 4.1 Environmental factors affecting reproduction and development of cultivable aquatic fin & shell fish
- 4.2 Endocrine system in fishes - Neurosecretory cells, androgenic gland, ovary,
- 4.3 Chromatophores, pericardial glands and cuticle.
- 4.4 Molting, molting stages, metamorphosis in crustacean shell fish

**PRESCRIBED BOOK(S):**

1. Bone Q et al., 1995. Biology of fishes, Blackie academic & professional, LONDON
2. Saxena AB 1996. Life of Crustaceans. Anmol Publications Pvt.Ltd., New Delhi

**REFERENCES:**

1. Tandon KK & Johal MS 1996. Age and Growth in Indian Fresh Water Fishes. Narendra Publishing House, New Delhi.
2. Raymond T et al., 1990. Crustacean Sexual Biology, Columbia University Press, New York
3. Guiland J.A (ed) 1984. Penaeid shrimps- Their Biology and Management.
4. Barrington FJW 1971. Invertebrates: Structure and Function.ELBS
5. Parker F & Haswell 1992. The text book of Zoology, Voll. Invertebrates (eds. Marshal AJ & Williams). ELBS & Mc Millan & Co.

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-I**  
**TITLE: BIOLOGY OF FIN FISH AND SHELL FISH - Core: I**

**BLUE PRINT FOR QUESTION PAPER SETTER**

| <b>MODULE NO.</b>                   | <b>ESSAY QUESTIONS<br/>10 MARKS</b> | <b>SHORT ANSWER<br/>QUESTIONS<br/>5 MARKS</b> | <b>VERY SHORT<br/>ANSWER<br/>QUESTIONS<br/>2 MARKS</b> | <b>MARKS ALLOTTED<br/>TO THE UNIT</b> |
|-------------------------------------|-------------------------------------|---|--|---------------------------------------|
| MODULE                              | 02                                  | 01  | 02   | 29                                    |
| MODULE – II                         | 01                                  | 01  | 02   | 19                                    |
| MODULE – III                        | 01                                  | 02  | 02   | 24                                    |
| MODULE – IV                         | 01                                  | 02  | 02   | 24                                    |
| <b>Total no. of<br/>Questions</b>   | <b>05</b>                           | <b>06</b>                                     | <b>08</b>  |                                       |
| <b>Total Marks including choice</b> |                                     |   |  | <b>96</b>                             |

**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-I Paper-I**  
**Semester End Examinations**  
**BIOLOGY OF FIN FISH & SHELL FISH CORE: I**

**MODEL QUESTION PAPER**

**Time: 2 ½ hrs.**

**Max Marks: 60**

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**SECTION –I**

**Answer any SIX of the following**  
**6x5=30Marks**

**(Draw labelled diagrams wherever necessary)**

1. Commercial importance of molluscs
2. Buoyancy in fishes
3. Gut content analysis
4. Length frequency method
5. Breeding habits in fishes
6. Ovo-viviparity, oviparity and viviparity
7. Y- organ and Chromatophores
8. Molting and molting stages

**SECTION –II**

**Answer any THREE the questions each question**  
**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

9. Write an essay on General characters of fish
10. Write an essay on Principles of age determination and growth
11. Write an essay on Induced breeding in fishes
12. Write an essay on Endocrine system in fishes

## **QUESTION BANK CORE: I - BIOLOGY OF FIN FISH & SHELL FISH**

### **ESSAY ANSWER QUESTIONS:**

1. Classification fishes and shell fish
2. General characters of shell fish
3. Commercial importance of shell fish
4. Buoyancy in fishes
5. Natural fish feed and feeding habits
6. Structure and modifications in relation to feeding
7. Age and growth determination
8. Length frequency method
9. Length weight relationship
10. Ecological factors in longevity of fishes
11. Breeding in fishes
12. Breeding places and breeding habits
13. Reproductive cycles
14. Parental care in fishes
15. Endocrine system in fishes
16. Reproduction and development of cultivable fish and shell fish
17. Metamorphosis in crustaceans
18. Molting and molting stages
19. Environmental factors effective reproduction.
20. Chromatophores and pericardial glands .

### **SHORT ANSWER QUESTIONS:**

1. General characters of shell fish
2. Commercial importance of fish
3. Classification shell fish
4. Mechanism of gas secretion
5. Gut content analysis
6. Structural modifications in fishes
7. Growth rate measurement
8. Scale method and otolith method as age indicators
9. Age composition and age length keys
10. Annual survival rate
11. Length frequency method
12. Breeding in fishes
13. Breeding places and breeding habits
14. Reproductive cycles
15. Breeding in shrimp /perl oyster
16. ovo – viviparity , viviparity and oviparity
17. next building brooding
18. Chromatophores
19. Moulting and stages
20. Neuro secretory cells androgenic gland and ovary

**SEMESTER – I PAPER-I**  
**BIOLOGY OF FIN FISH & SHELL FISH**

**PRACTICALS:**

1. Study of mouth parts in herbivorous and carnivorous fishes
2. Comparative study of digestive system of herbivorous and carnivorous fishes
3. Length-weight relationship of fishes
4. Gut content analysis in fishes and shrimp
5. Mouth parts and appendages of cultivable prawns, shrimps
6. Study of eggs of fishes, shrimps, prawns
7. Study of oyster eggs
8. Embryonic and larval development of fish
9. Observation of crustacean larvae
10. Study of nest building and brooding of fishes

**SEMESTER – I PAPER-I**  
**BIOLOGY OF FIN FISH & SHELL FISH**

**PRACTICAL MODAL PAPER**

|      |                                |               |
|------|--------------------------------|---------------|
| I.   | Gut content analysis in fishes | 10marks       |
| II.  | Identification of spotters     | 5X4 = 20marks |
|      | A Crustacean of larva          |               |
|      | B. Study of eggs (Oyster)      |               |
|      | C. Study of eggs (fish)        |               |
|      | D. Appendages of shrimp        |               |
| III. | Record                         | 5marks        |
| IV.  | Internal assessment            | 15marks       |
|      | Total                          | 50 marks      |

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-I**  
**TITLE: PRINCIPLES OF AQUACULTURE - Core: II**  
**SYLLABUS**

| OBJECTIVES  | LEARNING OUTCOMES   |
|---|---|
| To study the aquatic environment their components.<br>To study the pond ecosystem<br>To study the cultivable fresh water fishes | By the end of the course the student will be equipped with the aquatic ecosystem<br>Knowledge on the pond ecosystem will be learnt by the student.<br>Knowledge on the cultivable fishes will be learnt by the student. |

**UNIT-I: INTRODUCTION**

- 1-1 Concept of Blue Revolution - History and definition of Aquaculture
- 1.2 Scope of Aquaculture at global Level, India and Andhra Pradesh
- 1.3 Different Aquaculture systems – Pond, Cage, Pen, Running water, Extensive, Intensive and & Semi-Intensive Systems and their significance.
- 1.4 Monoculture, Polyculture and Monosex culture systems

**UNIT-II: POND ECOSYSTEM**

- 2.1 General Concepts of Ecology, Carrying Capacity and Food Chains
- 2.2 Lotic and lentic systems, streams and springs
- 2.3 Nutrient Cycles in Culture Ponds – Phosphorus, Carbon and Nitrogen  
Importance of Plankton and Benthos in culture ponds, and algal blooms
- 2.4 Concepts of Productivity

**UNIT-III: TYPES OF FISH PONDS and CONSTRUCTION**

- 3.1 Functional classification of ponds - head pond, hatchery, nursery ponds rearing, production, stocking and quarantine ponds
- 3.2 Fish Hatchery design
- 3.3 Important factors in the construction of an ideal fish pond – site selection, nature of the soil, water resources, topography. Lay out and arrangements

**UNIT- IV: POND PREPARATION AND MANAGEMENT**

- 4.1 Pond preparation for stocking, Need of fertilizer and manure application in culture ponds
- 4.2 Physico-chemical conditions of soil and water optimum for culture –temperature, depth, turbidity, light, water and shore currents, PH, DOD, CO<sub>2</sub> and nutrients; measures to increase oxygen and reduce ammonia & hydrogen sulphide in culture ponds; correction of PH
- 4.3 Eradication of predators and weed control – weed plants in culture ponds, aquatic weeds, weed fish, toxins used for weed control and control of predators



**PRESCRIBED BOOK(S):**

1. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi
2. Pillay TVR, 1996. Aquaculture Principles and Practices, Fishing News Books Ltd., London

**REFERENCES:**

1. Pillay TVR & M.A.Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London
2. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & Sons Inc. 1981
3. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company.
4. Bose AN et.al., 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt.Ltd.

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-I**  
**TITLE: PRINCIPLES OF AQUACULTURE - Core: II**

**BLUE PRINT FOR QUESTION PAPER SETTER**

| <b>MODULE NO.</b>                   | <b>ESSAY QUESTIONS<br/>10 MARKS</b> | <b>SHORT ANSWER<br/>QUESTIONS<br/>5 MARKS</b> | <b>VERY SHORT<br/>ANSWER<br/>QUESTIONS<br/>2 MARKS</b> | <b>MARKS ALLOTE<br/>TO THE UNIT</b> |
|-------------------------------------|-------------------------------------|---|--|-------------------------------------|
| <b>MODULE – I</b>                   | 02                                  | 01  | 02   | 29                                  |
| <b>MODULE – II</b>                  | 01                                  | 01  | 02   | 19                                  |
| <b>MODULE – III</b>                 | 01                                  | 02  | 02   | 24                                  |
| <b>MODULE – IV</b>                  | 01                                  | 02  | 02   | 24                                  |
| <b>Total no.of<br/>Questions</b>    | <b>05</b>                           | <b>06</b>                                     | <b>08</b>  |                                     |
| <b>Total Marks including choice</b> |                                     |   |  | <b>96</b>                           |

**NOTE:** The question paper setters are requested to kindly adhere to the format given in the above table.

**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-I**  
**Semester End Examinations**  
**TITLE: PRINCIPLES OF AQUACULTURE - Core: II**  
**MODEL QUESTION PAPER**

**Time: 2 hrs.**

**Max Marks: 50**

**SECTION –I**

**Answer any SIX of the following**

**4x5 = 20Marks**

**(Draw labeled diagrams wherever necessary)**

1. Scope of aquaculture at global level
2. Extensive farming
3. Lotic and lentic systems
4. Site selection
5. Nursery ponds
6. Aquatic weeds and their control

**SECTION –II**

**Answer Any THREE of the following**

**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

9. Write an essay on Concept of blue revolution
10. Write an essay on General concepts of Ecology
11. Write an essay on Construction of an ideal fish pond
12. Write an essay on Physico-chemical conditions of soil and water in pond

**QUESTION BANK      PRINCIPLES OF AQUACULTURE - Core: II****ESSAY ANSWER QUESTIONS:**

1. Concept of blue revolution
2. Scope of aqua culture at global level
3. Different aqua culture systems
4. Poly culture
5. General concepts of ecology
6. Nutrient cycles in culture ponds
7. Concepts of productivity
8. Classification of ponds
9. Construction of an ideal pond
10. Fish hatchery design
11. Pond preparation for stocking
12. Physico-chemical conditions of soil and water optimum for culture
13. Eradication of predators and weed control
14. Measures to increase oxygen and reduce ammonia and hydrogen sulphide in culture ponds

**SHORT ANSWER QUESTIONS:**

1. Definition of aquaculture
2. Aqua culture in AP state
3. Extensive, Intensive, semi intensive
4. Poly culture and monosex culture
5. Pond cage and pen culture
6. Carrying capacity and food chain
7. Lentic systems
8. Carbon and nitrogen cycles
9. Algal blooms and culture ponds
10. Importance of planktons and benthos
11. Classification of ponds
12. Nursery ponds rearing
13. Site selection and water resources
14. Quarantine ponds
15. Need of fertilizer and manure applications
16. PH, BOD, COD
17. Aquatic weeds
18. Toxins used for weed control
19. Control of predators
20. Weed plants and culture ponds

**Lab/Industrial training/Institutional training**

- Any 3 field visits  
Or
- 15 days Industrial training  
Or
- Lab work related to the concerned paper  
Or
- Mini Project with presentation

Note: For 50 Marks

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-II**  
**TITLE: FRESHWATER, BRACKISHWATER AND MARICULTURE - Core: III**  
**SYLLABUS**

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| <b>OBJECTIVES:</b>  | <b>LEARNING OUT COME</b>   |
|---|--|
| To provide basic biology of the species used for brackish water aquaculture and mariculture.<br>To provide a basic idea about various Mariculture practices.<br>To provide basic information on fishing methods | Knowledge on the biology and biological cycle of the brackish water & marine cultivable species will be learnt.<br>Knowledge on the Mariculture will be learnt by the student.<br>Knowledge on different fishing methods |

**UNIT-1: INTRODUCTION TO FRESHWATER AQUACULTURE**

- 1-1 Status, scope and prospects of fresh water aquaculture in the world, India and AP. Different fresh water aquaculture systems
- 1-2 Introduction, history, development and present status of brackish water farming in India. Brackish water as a medium for aquaculture, ecological factors – abiotic and biotic factors.

**UNIT-II: CARP CULTURE**

- 2-1 Major cultivable Indian carps Labeo, Catla and Cirrhinus & Minorcarps. Exotic fish species introduced to India – Tilapia, Pangassius and Clarius sp. Nursery, rearing and grow out in ponds.
- 2-2 Composite fish culture system of Indian and exotic carps
- 2-3 Impact of exotic fish, Compatibility of Indian and exotic carps and competition among them
- 2-4 Selection of site, general planning and design of brackish water farms

**UNIT-III: CULTURE OF AIR-BREATHING AND COLD WATER FISH**

- 3-1 Recent developments in the culture of clarius, anabas, murrels,
- 3-2 Advantages and constraints in the culture of air-breathing and cold water fishes- seed resources, feeding, management and production
- 3-3 Special systems of Aquaculture- brief study of culture in running water, recirculatory systems, cages and pens, sewage-fed fish culture

**UNIT-IV: Mariculture**

- 4-1 Ecological subdivisions of the sea. Selection of site and selection of materials for sea farming.
- 4-2 Different designs of open sea farming structures – construction of cages – bioengineering problems and solutions – scope of open sea farming in India.
- 4-3 Present status and recent developments in mariculture.

**PRESCRIBED BOOK(S):**

1. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi
2. Sena de silva, trevor a anderson 1995. Fish nutrition in aquaculture. Chapman & Hall,
3. Guiland J.A (ed) 1984. Penaeid shrimps- Their Biology and Management.
4. Barrington FJW 1971. Invertebrates: Structure and Function. ELBS
5. Parker F & Haswell 1992. The text book of Zoology, Voll. Invertebrates

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-II**  
**TITLE: FRESHWATER, BRACKISHWATER AND MARICULTURE - Core: III**  
**BLUE PRINT FOR QUESTION PAPER SETTER**

| <b>MODULE NO.</b>                   | <b>ESSAY QUESTIONS<br/>10 MARKS</b> | <b>SHORT ANSWER<br/>QUESTIONS<br/>5 MARKS</b> | <b>VERY SHORT<br/>ANSWER<br/>QUESTIONS<br/>2 MARKS</b> | <b>MARKS<br/>ALLOTTED TO<br/>THE UNIT</b> |
|-------------------------------------|-------------------------------------|---|--|---|
| <b>MODULE – I</b>                   | 02                                  | 01  | 02   | 29  |
| <b>MODULE – II</b>                  | 01                                  | 01  | 02   | 19  |
| <b>MODULE – III</b>                 | 01                                  | 02  | 02   | 24  |
| <b>MODULE – IV</b>                  | 01                                  | 02  | 02   | 24  |
| <b>Total no. of<br/>Questions</b>   | <b>05</b>                           | <b>06</b>                                     | <b>08</b>  |   |
| <b>Total Marks including choice</b> |                                     |   |  | <b>96</b>                                 |

**NOTE:** The question paper setters are requested to kindly adhere to the format given in the above table.



**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-II**  
**Semester End Examinations**

**TITLE: FRESHWATER, BRACKISHWATER AND MARICULTURE - Core: III**  
**MODEL QUESTION PAPER**

**Time: 2 ½ hrs.**

**Max Marks: 60**

**SECTION –I**

**Answer any SIX of the following**

**6x5 = 30Marks**

**(Draw labeled diagrams wherever necessary)**

1. Scope of fresh water aquaculture at global level
2. Primary producers
3. Site selection
4. Cage culture and pen culture
5. Abiotic and biotic factors
6. Ecological factors
7. Present status of fresh water farming
8. Fresh water aquaculture systems

**SECTION –II**

**Answer Any THREE of the following**

**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

9. Describe the general planning and design of brackish water farms
10. Write an essay on shrimp farming culture practices
11. Write an essay on recent developments in mariculture
12. Write an essay on Monoculture and polyculture
13. Explain about Nursery, rearing and grow out in ponds

QUESTION BANK **FRESHWATER, BRACKISHWATER AND MARICULTURE** Core: III

**ESSAY ANSWER QUESTIONS:**

1. Introduction, history, development and present status of brackishwater farming in India.
2. Describe the general planning and design of brackishwater farms.
3. Explain the Biology and culture systems of *Lates calcarifer*.
4. Nursery, rearing and grow out in ponds, cages and pens.
5. Write an essay on shrimp farming culture practices.
6. Explain the pond design, management of crab farm and culture practices.
7. Explain the ecological subdivisions of the sea.
8. Write an essay on recent developments in mariculture.
9. Abiotic and biotic factors.
10. Monoculture and polyculture
11. Brackishwater farming
12. Ecological factors
13. *Mugil cephalus*
14. Biology of *Litopenaeus vannamei*
15. Semi-intensive culture
16. Open sea farming
17. Cage culture and pen culture
18. Scope of open sea farming in India

**SHORT ANSWER QUESTIONS:**

1. Present status of fresh water farming
2. Brackishwater fisheries
3. Abiotic and biotic factors
4. Marine sub-divisions
5. Primary producers
6. Monoculture and polyculture
7. Cage culture and pen culture
8. Different culture systems
9. Ecological factors
10. Open sea farming
11. Site selection of the sea farming
12. Cage culture
13. Mullet
14. Zoea larvae
15. brackishwater shrimps

**SEMESTER – II PAPER-III**

**CORE 3: FRESHWATER, BRACKISHWATER AND MARICULTURE**  
**PRACTICALS SYLLABUS**

**PRACTICALS: (Any 8 as per the local Industry needs and Requirement)**

1. Identification of important cultivable carps
2. Identification of important cultivable air-breathing fishes
3. Identification of important cultivable fresh water prawns
4. Identification of different life history stages of fish
5. Identification of different life history stages of fresh water prawn
6. Collection and study of weed fish
  7. Identification of commercially viable crabs – *Scylla cerrata*, *Portunus pelagicus*, *P.sanguinolentus*, *Neptunus pelagicus*, *N. Sanguinolentus*
8. Identification of lobsters – *Panulirus polyphagus*, *P.ornatus*, *P.homarus*, *P.sewelli*, *P.penicillatus*
9. Identification of oysters of nutritional significance – *Crossostrea madrasensis*, *C.gryphoides*, *C. cucullata*, *C.rivularis*, *Picnodonta*
10. Identification of mussels and clams
11. Identification of developmental stages of oysters
12. Field visit to aqua farm and study of different components like dykes etc.

**SEMESTER – II PAPER-III**

**CORE 3: FRESHWATER, BRACKISHWATER AND**  
**MARICULTURE**  
**PRACTICAL MODAL PAPER**

I. Identify the following specimens and write a short notes on their commercial Importance

5x4=20M

- a. Carp
- b. Freshwater prawn
- c. Stages of prawn
- d. Crab
- e. Oysters
- f. Mussel/clam

II. Record 05M

III. Internal assessment 15M

Total

50 marks

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-II**  
**TITLE: CRAFTS AND GEARS IN FISHERIES - Core: IV**  
**SYLLABUS**

| OBJECTIVES:   | LEARNING OUT COME   |
|---|---|
| To develop basic knowledge about various crafts<br>To understand operation of various fishing gears<br>To create awareness about fish finding devices | Student will learn the knowledge on the crafts.<br>Mechanism involved in the operation of the fishing gear will be learnt by the student.<br>Tools for the identification of fishery resources will be learnt by the student. |

**UNIT I: Inland Fishing Crafts and Gears**

- 1.1. Introduction, Different types of fishing crafts and gears in India; Crafts- Rafts, Boats; Gears-Trap net, Hand net, Drag net, fixed net and miscellaneous types.
- 1.2. Boat building materials - wood, steel, FRP, ferro-cement, aluminum etc.

**UNIT II: Marine Fishing Crafts and Gears**

- 2.1. Introduction, - crafts of the east coast and west coast. Gears-Fixed nets, Trawl nets, shore seines, drift nets, cast nets, trap nets, dip nets (scoop nets), long line and hooks.
- 2.2. Factors affecting the design of fishing gears and fish catching methods. Fishing accessories.
- 2.3. Introduction to netting materials - natural and synthetic fishing gear materials. Yarn numbering systems.

**UNIT III: Active Fishing Gears, Passive Gears and Unconventional Fishing methods**

- 3.1. Active fishing gears, passive gears
- 3.2. Destructive and Prohibited fishing practices, fishing methods like electrical fishing, light fishing; Angling (line fishing) poisoning and use of dynamites.

**UNIT IV: Fish Finding Devices and Conservation.**

- 4.1. Introductory information on echo-sounder, sonar, global positioning systems, remote sensing.
- 4.2. Potential fishing zones (EEZ) Turtle Exclusion Devices (TED) - By-catch Reduction Devices (BRD).

**PRESCRIBED BOOK(S):**

1. Boopendranath, M.R., Meenakumari, B., Joseph, J., Sankar, T.V., Pravin,P., and Edwin, L. (Eds.) 2002, Riverine and Reservoir Fisheries of India, Society of Fisheries Technologists (India), Cochin.
2. Brandt. A. v. (1984) Fish catching methods of the world. Fishing News Books Ltd., London: 432 p.
3. George V.C. (1971) An account of the inland fishing gears and methods of India. Spl. Bull.No.1.CIFT
4. Hameed, M.S. and Boopendranath, M.R. (2000) Modern Fishing Gear Technology, Daya Publishing House, Delhi:186p.
5. Klust, G. (1982) Netting materials for fishing gear, FAO Fishing Manual, Fishing News Books (Ltd)., Farnham,192p.

**B.VOC (Commercial Aquaculture) Semester-II**  
**TITLE: CRAFTS AND GEARS IN FISHERIES - Core: IV**  
**BLUE PRINT FOR QUESTION PAPER SETTER**

| <b>MODULE NO.</b>                   | <b>ESSAY QUESTIONS<br/>10 MARKS</b> | <b>SHORT ANSWER<br/>QUESTIONS<br/>5 MARKS</b> | <b>VERY SHORT ANSWER<br/>QUESTIONS<br/>2 MARKS</b> | <b>MARKS ALLOTTED<br/>TO THE UNIT</b> |
|-------------------------------------|-------------------------------------|---|--|---------------------------------------|
| <b>MODULE – I</b>                   | 02                                  | 01  | 02   | 29                                    |
| <b>MODULE – II</b>                  | 01                                  | 01  | 02   | 19                                    |
| <b>MODULE – III</b>                 | 01                                  | 02  | 02   | 24                                    |
| <b>MODULE – IV</b>                  | 01                                  | 02  | 02   | 24                                    |
| <b>Total no. of Questions</b>       | <b>05</b>                           | <b>06</b>                                     | <b>08</b>  |                                       |
| <b>Total Marks including choice</b> |                                     |   |  | <b>96</b>                             |

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**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-II**  
**Semester End Examinations**  
**TITLE: CRAFTS AND GEARS IN FISHERIES - Core: IV**  
**MODEL QUESTION PAPER**

**Time: 2 hrs.**

**Max Marks: 50**

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**SECTION –I**

**Answer any SIX of the following**  
**= 20Marks**

**4x5**

**(Draw labeled diagrams wherever necessary)**

1. Mechanized boat
2. Fishing accessories
3. Modern fishing gears
4. Traditional fishing gears
5. Electrical fishing
6. Remote sensing & Echo-sounder

**SECTION –II**

**Answer Any THREE of the following**  
**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

9. Give an account of the different types of fishing crafts in India? Explain the traditional methods.
10. What is netting material? Explain the natural and synthetic fishing gear materials.
11. Explain the factors affecting the design of fishing gears and methods
12. Explain the design and operation of different types of fishing gears.
13. What is the conservation? Explain the potential fishery zones

QUESTION BANK    **CORE IV: CRAFTS AND GEARS IN FISHERIES**

**ESSAY ANSWER QUESTIONS:**

1. Give an account of the different types of fishing crafts in India? Explain the traditional methods.
2. What is netting material? Explain the natural and synthetic fishing gear materials.
3. Active fishing gears, passive gears
4. Explain the factors affecting the design of fishing gears and methods.
5. Describe the modern fishing gears.
6. Explain the design and operation of different types of fishing gears.
7. What is the conservation? Explain the potential fishery zones.
8. Mechanized boat
9. Fishing accessories
10. Modern fishing gears
11. Traditional fishing gears
12. Prohibited fishing practices
13. Electrical fishing
14. Remote sensing
15. Active gears
16. Passive gears
  - a. Potential fishing zones (EEZ)
17. Turtle Exclusion Devices (TED) -
18. By-catch Reduction Devices (BRD)

**SHORT ANSWER QUESTIONS:**

1. Purse seiners
2. FRP
3. RCC
4. Dol net
5. Dip net
6. Cast net
7. Dynamites
8. Echo-sounder
9. light fishing
10. Traditional fishing gears
11. Prohibited fishing practices
12. Electrical fishing
13. Remote sensing
14. Active gears
15. Passive gears
16. Potential fishing zones (EEZ)



**Lab/Industrial training/Institutional training**

- Any 3 field visits  
Or
- 15 days Industrial training  
Or
- Lab work related to the concerned paper  
Or
- Mini Project with presentation

Note: For 50 Marks

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-III**  
**TITLE: AQUACULTURE NUTRITION - Core: V**  
**SYLLABUS**

| OBJECTIVES:   | LEARNING OUT COME   |
|---|---|
| To provide a basic understanding about fish nutrition.<br>Provide the knowledge on the Fish feeding physiology, nutritional requirements. | Student will learn the concept of the fish nutrition,.<br>Knowledge on the physiology of fish feeding and nutritional requirements will be learnt by the students.<br>Knowledge on the fish feed composition formulation and balanced diet will be learned. |

**UNIT I: Biochemical aspects, Feed ingredients & feed requirements of Fish**

- 1.1 Protein and amino acid requirement, carbohydrate and lipid requirement, Essential fatty acids, Non protein nitrogen sources.
- 1.2 Vitamin and mineral requirements, vitamin C for fish and shell fishes.
- 1.3 Anti-nutritional factors. Compounded feeds, pellets, crumbles and microencapsulated feed. Storage, quality standards, proximate composition & chemical evaluation.
- 1.4 Different feed ingredients- animal, plant, microbial origin, SCP, silages, fermented products.

**UNIT II: Feed & Feed Manufacturing**

- 2.1. Different forms of feed-fodders, mash, pellets, floating and sinking feeds. Feed formulation - methods, square method.
- 2.2. Feed manufacturing processes, Extrusion, Pelletization.
- 2.3. Quality problems- toxins, pests, rancidity.

**UNIT III: Feed Management & Feed Quality**

- 3.1. Feed schedule in finfish and shellfish, Protein requirements of finfish and shellfish
- 3.2. Artificial feed formulations of different cultural species
- 3.3. Wet feed, dry feed and larval feeds; advantages and disadvantages in culture farms.
- 3.4. Feed energetic, feed conversion efficiency, protein efficiency ratio, feed conversion ratio, net protein utilization, leaching, water stability. Quality standards.

**UNIT IV: Larval nutrition**

(10Hours)

- 4.1. Larval stages, nutritional requirements of fish and shellfish larvae, quality requirements of larval feeds (particle size, digestibility).
- 4.2. Natural food and its importance in aquaculture, nutritional quality of commonly used fish food organisms, bioenrichment, biofilm/periphyton and its uses.

**PRESCRIBED BOOK(S):**

1. Brown E.E Fish Farming Handbook
2. Milne P.H. Fish and shell fish farming in coastal waters
3. CMFRI manual on research methods for fish and shellfish nutrition
4. Borgstorm,G. Fish as Food
5. Heen,E and Kreuzer,R. Fish in Nutrition
6. Shepherd,J and Brommage,W. Intensive Fish Farming Techniques
7. Hephher,B. and Pruginin,Y. Commercial Fish Farming

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-III**  
**TITLE: AQUACULTURE NUTRITION - Core: V**  
**BLUE PRINT FOR QUESTION PAPER SETTER**

| <b>MODULE NO.</b>                   | <b>ESSAY QUESTIONS<br/>10 MARKS</b> | <b>SHORT ANSWER<br/>QUESTIONS<br/>5 MARKS</b> | <b>VERY SHORT ANSWER<br/>QUESTIONS<br/>2 MARKS</b> | <b>MARKS ALLOTTED<br/>TO THE UNIT</b> |
|-------------------------------------|-------------------------------------|---|--|---------------------------------------|
| <b>MODULE – I</b>                   | 02                                  | 01  | 02   | 29                                    |
| <b>MODULE – II</b>                  | 01                                  | 01  | 02   | 19                                    |
| <b>MODULE – III</b>                 | 01                                  | 02  | 02   | 24                                    |
| <b>MODULE – IV</b>                  | 01                                  | 02  | 02   | 24                                    |
| <b>Total no. of Questions</b>       | <b>05</b>                           | <b>06</b>                                     | <b>08</b>  |                                       |
| <b>Total Marks including choice</b> |                                     |   |  | <b>96</b>                             |

**NOTE:** The question paper setters are requested to kindly adhere to the format given in the above table.

**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-III**  
**Semester End Examinations**  
**TITLE: AQUACULTURE NUTRITION - Core: V**  
**MODEL QUESTION PAPER**

**Time: 2 ½ hrs.**

**Max Marks: 60**

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**SECTION –I**

Answer any **SIX** of the following **6x5**  
= **30Marks**

**(Draw labeled diagrams wherever necessary)**

1. Non protein nitrogen
2. Preservatives
3. Fermented products
4. Feed formulation
5. Floating and sinking
6. Feed energetic
7. Larval nutrition
8. Square method
9. Rancidity

**SECTION –II**

Answer Any **THREE** of the following  
**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

10. Describe the essential fatty acids.
11. Write an essay on anti nutritional factors.
12. Write an essay storage and transportation of feeds.
13. Explain the feed conversion efficiency.
14. Write essay on natural food and its importance in aquaculture.

## QUESTION BANK

AQUACULTURE NUTRITION, CORE-V**ESSAY ANSWER QUESTIONS:**

1. Describe the essential fatty acids.
2. Write an essay on anti nutritional factors.
3. Write an essay storage and transportation of feeds
4. Describe the shrimp feeds in India.
5. Explain the feed conversion efficiency.
6. Write essay on natural food and its importance in aquaculture.
7. Write about the vitamin and mineral requirements in feed
8. Write about quality problems, toxins and rancidity
9. Explain briefly about different forms of feed fodders
10. Write about artificial feed production and different culture species
11. Write bridgly about bio-enrichment, biofilm/periphyton and its uses
12. Describe the feed manufacturing process

**SHORT ANSWER QUESTIONS:**

1. Non protein nitrogen
2. Preservatives
3. Fermented products
4. Feed formulation
5. Floating and sinking
6. Feed energetic
7. Larval nutrition
8. Carbohydrate
9. Vitamin
10. Define SCP
11. Pellets
12. Square method
13. Rancidity
14. Check trays
15. Shrimp
16. Protein efficiency diseases
17. Feed schedule
18. Bio-film
19. Quality standards
20. Wet feed and dry feed
21. Preservatives
22. Fermented products
23. Feed formulation
24. Floating and sinking
25. SCP

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-III**  
**TITLE: AQUACULTURE NUTRITION - Core: V**  
**PRACTICAL SYLLABUS**

**PRACTICALS: (Any 8 as per the local Industry needs and Requirement)**

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
12. Visit to a farm for studying feeding practices

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-III**  
**TITLE: AQUACULTURE NUTRITION - Core: V**  
**PRACTICAL MODEL PAPER**

**Time 2hrs**

**Max Marks 50**

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|  |           |
|--|-----------|
| I. Estimate Protein content in aquaculture feeds. Write procedure<br>M | 10        |
| II. Estimate the Ash content in aquaculture feed. Write procedure      | 10 M      |
| III. Different Feed formulation identification using charts            | 05 M      |
| IV. Record   | 05 M      |
| V. Field Note book   | 05 M      |
| VI. Internal assessment  | 15 M      |
| <b>Total</b>   | <b>50</b> |

**marks**



**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-III**  
**TITLE: INLAND AND MARINE FISHERIES - Core: VI**  
**SYLLABUS**

| OBJECTIVES:  | LEARNING OUT COME  |
|--|--|
| To study the Riverine, Reservoir and Estuarine fisheries.      | Student learns the knowledge on the inland fishery resources               |
| To understand pelagic fishery resources and demersal resources | Student learns the knowledge on the pelagic and demersal fishery resources |

**UNIT I: Riverine and Estuarine Fisheries**

- 1.1. Riverine fisheries – Major river systems in India, important characteristic features of Rivers.
- 1.2. Estuarine fisheries- definition, Ecological significance of estuary, Biota of estuary, classification and categories of estuaries- capture fisheries- resident and migrant species.
- 1.3. Fishing methods, recent statistics of catches.

**UNIT II: Reservoir and Lacustrine Fisheries**

- 2.1. Reservoir fisheries- Major reservoirs in India- important characteristic features of reservoirs.
- 2.2. Lacustrine fisheries- definition, Types of lakes based on circulation, nutrients and surface temperature.
- 2.3. Fishing methods, recent statistics of catches.

**UNIT III: Marine Fisheries- Coastal fisheries**

- 3.1. Introduction – Stratification of marine habitat; Groups of marine fishes;
- 3.2. Coastal fisheries – Elasmobranch fishery; Teleost fishery- Sardines, Anchovies, Mackerel, Mumbai duck, Catfishes, Eels, Ribbon fish, Perches, Mulletts, Polnemids, Pomfrets, Scianids, Seer fishes, Flying fishes
- 3.3. Methods of fishing - Recent catch statistics of pelagic fisheries.

**UNIT IV: Marine Fisheries- Demersal Resources & Deep Sea Resources**

- 4.1. Major demersal resource groups- elasmobranchs, cephalopods, silver bellies, flat fishes, crabs, sciaenids, pomfrets, bombay duck, prawns, lobsters, molluscan resources.
- 4.2. Methods of fishing, recent catch statistics. Fishery of mud banks.
- 4.3. Major deep sea resources - status of deep sea fishing in India; Fishing regulations.

**PRESCRIBED BOOK(S):**

1. Jhingran, V.G. 1993. Fish and fisheries of India. Hindustan Publishing Corporation (India), New Delhi.
2. Ricker, W.E. 1984. Methods for assessment of fish production in freshwaters. Blackwell Publications.
3. Srivastava, C.B.L., 1985. Textbook of Fishery Science and Indian Fisheries. Kutub Mahal Publications, Allahabad.
  4. S.S. Khanna. An introduction to fishes
5. Kurian, C.V. and Sebastian, V.O. 1986. Prawns and prawn fishery of India.  
Hindustan Publishing Corporation (India), New Delhi.
6. Yadav, B.N. Fish and Fisheries. Daya Publishing House

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-III**  
**TITLE: INLAND AND MARINE FISHERIES - Core: VI**  
**BLUE PRINT FOR QUESTION PAPER SETTER**

| <b>MODULE NO.</b>                   | <b>ESSAY QUESTIONS<br/>10 MARKS</b> | <b>SHORT ANSWER<br/>QUESTIONS<br/>5 MARKS</b> | <b>VERY SHORT<br/>ANSWER QUESTIONS<br/>2 MARKS</b> | <b>MARKS<br/>ALLOTTED TO<br/>THE UNIT</b> |
|-------------------------------------|-------------------------------------|---|--|---|
| <b>MODULE – I</b>                   | 02                                  | 01  | 02   | 29  |
| <b>MODULE – II</b>                  | 01                                  | 01  | 02   | 19  |
| <b>MODULE – III</b>                 | 01                                  | 02  | 02   | 24  |
| <b>MODULE – IV</b>                  | 01                                  | 02  | 02   | 24  |
| <b>Total no. of<br/>Questions</b>   | <b>05</b>                           | <b>06</b>                                     | <b>08</b>  |   |
| <b>Total Marks including choice</b> |                                     |   |  | <b>96</b>                                 |

**NOTE:** The question paper setters are requested to kindly adhere to the format given in the above table.

**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-III**  
**Semester End Examinations**  
**TITLE: INLAND AND MARINE FISHERIES - Core: VI**  
**MODEL QUESTION PAPER**

**Time: 2 hrs.**

**Max Marks: 50**

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**SECTION –I**

**Answer any SIX of the following** **4x5 =**  
**20Marks**  
**(Draw labeled diagrams wherever necessary)**

1. Capture fisheries
2. Deep resources
3. Fishing gear
4. Reservoir
5. Cephalopods
6. Flying fish
7. Elasmobranches

**SECTION –II**

**Answer Any THREE of the following**  
**3x10=30 Marks**  
**(Draw diagrams wherever necessary)**

8. Write essay on major riverine systems in India.
9. Define estuary? Write about the classification of estuaries?
10. Write about major pelagic resource groups
11. Describe the fishing methods? Write about recent catch statistics.
12. Write essay on fishing policies and problems.

**ESSAY ANSWER QUESTIONS:**

1. Write essay on major riverine systems in India.
2. Define estuary? Write about the classification of estuaries?
3. Write about major pelagic resource groups.
4. Describe the fishing methods? Write about recent catch statistics.
5. Write essay on fishing policies and problems.
6. Explain the estimation of fish landing.
7. Write about major demersal resources groups
8. Write a brief note a classification and categories of estuaries
9. Write about major deep sea resources
10. Describe the stratification of marine habitat and groups of marine fisheries
11. Write a briefly note on Indian coastal fisheries
12. Explain briefly about the status of deep sea fishing in India
13. Define about Lakesterine fishes and types of lakes
14. Write about the ecological significance and biota of estuaries

**SHORT ANSWER QUESTIONS:**

1. Capture fisheries
2. Cold water fisheries
3. Migrant fisheries
4. Fishing zones
5. Mud banks
6. Deep resources
7. Deep sea fishing
8. Inland fish
9. Cast net
10. Fishing gear
11. Reservoir
12. Migration
13. Anadromous
14. Pomfrets
15. Cephalopods
16. Molluscan resources
17. Anchovies
18. Flying fish
19. Elasmobranchs
20. Marine habitat

**Lab/Industrial training/Institutional training**

- Any 3 field visits  
Or
- 15 days Industrial training  
Or
- Lab work related to the concerned paper  
Or
- Mini Project with presentation

Note: For 50 Marks

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-IV**  
**TITLE: PATHOLOGY IN AQUACULTURE - Core: VII**  
**SYLLABUS**

| OBJECTIVES  | LEARNING OUT COME   |
|---|---|
| <ul style="list-style-type: none"> <li>➤ To understand the various types of diseases among the cultivable fishes, to learn and apply methods of control and precaution of diseases.</li> <li>➤ To understand the tools for diagnosis, and disease management strategies available today.</li> </ul> | <ul style="list-style-type: none"> <li>➤ Knowledge on the diseases will be learnt.</li> <li>➤ Precautionary measures will be known to prevent the spread of the disease.</li> <li>➤ Knowledge on the diagnostic tools will be learnt.</li> <li>➤ Environmental quality disease free practice will be learnt.</li> </ul> |

**UNIT I: Pathology and Parasitology**

- 1.1. Introduction to fish diseases –Definition and categories of diseases – Disease and environment. pathology and parasitology.
- 1.2. Stress as a factor in the occurrence of diseases. Parasitism – host-parasite relationship.

**UNIT II: Fungal and Viral Diseases**

- 2.1. Fungal diseases (finfish) – Saprolegniosis, brachiomyxosis, ichthyophthirius diseases.
- 2.2. Lagenidium diseases – Fusarium disease Viral diseases (finfish) – IPN, IHN, Viral Hemorrhagic Septicemia, Spring Viremia of carps – Major CCVD, Carp lymphocytes.
- 2.3. Major shrimp viral diseases – *Baculovirus penaeii*, Monodon Baculovirus, Baculoviral midgut necrosis, IHHNV, Hepatopancreatic parvo like virus, Yellow head baculovirus, white spot baculovirus.

**UNIT III: Bacterial, Protozoan and Metazoan Diseases.**

- 3.1. Common bacterial diseases (Enteric red mouth disease, Bacterial cold water disease, furunculosis, vibriosis, dropsy and Gill and fin rot) their diagnosis and treatment.
- 3.2. Protozoan diseases- Ichthyophthiriasis, Costiasis, whirling diseases, trypanosomiasis.
- 3.3. Metazoan Diseases- diseases caused by annelids, helminthes, crustaceans and molluscs.

**UNIT IV: Nutritional diseases & Immunology**

- 4.1. Nutritional pathology – lipid liver degeneration, Vitamin and mineral deficiency diseases.
- 4.2. Nutritional cataract. Genetically and environmentally induced diseases.
- 4.3. Defense mechanism in fish and shell fish, Application and development of vaccines.
- 4.4. Diagnostic tools – immune detection- DNA/RNA techniques.
- 4.5. General preventive methods and prophylaxis. Methods of pathological examination of fish and infectious diseases, BMP in Aquaculture.

**PRESCRIBED BOOK(S):**

1. R. Ramachandran Nair Encyclopedia of fish disease –
2. K.P. Biswas Prevention and control of fish and Prawn diseases –
3. B.K. Mishra, P. Swain, P.K.Sahoo, B.K.Das, N.Sarangi. Disease management in FW Pisciculture –
4. Wheaton, F.W. Aquacultural Engineering
5. Bose et al. Coastal Aquacultural Engineering



**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-IV**  
**TITLE: PATHOLOGY IN AQUACULTURE - Core: VII**  
**BLUE PRINT FOR QUESTION PAPER SETTER**

| <b>MODULE NO.</b>                   | <b>ESSAY QUESTIONS<br/>10 MARKS</b> | <b>SHORT ANSWER<br/>QUESTIONS<br/>5 MARKS</b> | <b>VERY SHORT<br/>ANSWER QUESTIONS<br/>2 MARKS</b> | <b>MARKS<br/>ALLOTTED TO<br/>THE UNIT</b> |
|-------------------------------------|-------------------------------------|---|--|---|
| <b>MODULE – I</b>                   | 02                                  | 01  | 02   | 29  |
| <b>MODULE – II</b>                  | 01                                  | 01  | 02   | 19  |
| <b>MODULE – III</b>                 | 01                                  | 02  | 02   | 24  |
| <b>MODULE – IV</b>                  | 01                                  | 02  | 02   | 24  |
| <b>Total no. of<br/>Questions</b>   | <b>05</b>                           | <b>06</b>                                     | <b>08</b>  |   |
| <b>Total Marks including choice</b> |                                     |   |  | <b>96</b>                                 |

**NOTE:** The question paper setters are requested to kindly adhere to the format given in the above table.

**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-IV**  
**Semester End Examinations**  
**TITLE: PATHOLOGY IN AQUACULTURE - Core: VII**  
**MODEL QUESTION PAPER**

**Time: 2 ½ hrs.**

**Marks: 60**

**Max**

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**SECTION –I**

**Answer any SIX of the following**  
**30Marks**

**6x5 =**

**(Draw labeled diagrams wherever necessary)**

1. Fish diseases
2. Brachiomycosis
3. Metazoan diseases
4. Bacterial diseases
5. Nutritional cataract
6. Diagnostic tools
7. Sustainable aquaculture
8. CCVD & IHN

**SECTION –II**

**Answer Any THREE of the following**  
**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

9. What is parasitism? Explain the host parasite relationship.
10. Write an essay on shrimp viral diseases and prophylaxis.
11. Explain about the protozoan diseases and their treatment.
12. Describe the vitamin deficiency diseases.
13. Explain the diagnostic tools of immunology.

**QUESTION BANK PATHOLOGY IN AQUACULTURE, CORE-VII****ESSAY ANSWER QUESTIONS:**

1. What is parasitism? Explain the host parasite relationship.
2. Write an essay on shrimp viral diseases and prophylaxis.
3. Explain about the protozoan diseases and their treatment.
4. Describe the vitamin deficiency diseases.
5. Explain the diagnostic tools of immunology.
6. Write essay on fish health management.
7. Explain the defence mechanism in fish and shellfish
8. Write briefly about the common bacterial diseases in fish
9. Explain the general preventive methods of prophylaxis
10. Explain about the metazoan diseases
11. Describe the nutritional pathology
12. Define fish diseases and explain briefly about fungal diseases

**SHORT ANSWER QUESTIONS:**

1. Fish diseases
2. Brachiomycosis
3. Metazoan diseases
4. Bacterial diseases
5. Nutritional cataract
6. Diagnostic tools
7. Sustainable aquaculture
8. Pathology
9. Parasitism
10. Define CCVD
11. Define IHN
12. Trypanosomiasis
13. Vitamin
14. Aflatoxin
15. DNA
16. Whirling diseases
17. BMP in aquaculture
18. Vaccines
19. Parasitology
20. Lagenidium diseases
21. CCVD
22. IHN
23. Immunology

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-IV**  
**TITLE: PATHOLOGY IN AQUACULTURE - Core: VII**  
**PRACTICAL SYLLABUS**

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

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-IV**  
**TITLE: PATHOLOGY IN AQUACULTURE - Core: VII**

**PRACTICAL MODEL PAPER**

1. Dissect and display the external lesions of fish/prawn. Draw a neat labelled diagram      10M
  
2. Identification of spotters  
4X5=20M
  
- A)...
- B)...
- C)...
- D)...
- E)...
  
3. Record      05M
  
4. Continuous Internal Assessment      15M
  
  
- Total      50M**

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**  
**B.VOC (Commercial Aquaculture) Semester-IV**  
**TITLE: FISHERIES MANAGEMENT - Core: VIII**  
**SYLLABUS**

| OBJECTIVES  | LEARNING OUT COME   |
|---|---|
| <ul style="list-style-type: none"> <li>➤ To understand the various types of diseases among the cultivable fishes, to learn and apply methods of control and precaution of diseases.</li> <li>➤ To understand the tools for diagnosis, and disease management strategies available today.</li> </ul> | <ul style="list-style-type: none"> <li>➤ Knowledge on the diseases will be learnt.</li> <li>➤ Precautionary measures will be known to prevent the spread of the disease.</li> <li>➤ Knowledge on the diagnostic tools will be learnt.</li> <li>➤ Environmental quality disease free practice will be learnt.</li> </ul> |

**UNIT I: Introduction**

- 1.1 Definitions and approaches, scope and importance of management. Management as an art of science-comparative management
- 1.2 Functions of managers- Environment impact management, Functions of Managers- Planning, organizing, staffing, directing and controlling. Contributions of Henry Fayol to the scientific techniques of management

**UNIT II: Human resource management**

2.1 Man power planning and recruitment- Organizational development. Training, Motivation, Leadership, Organizational communication, conflicts and decision making.

2.2 Human resource development and its role in the context of fisheries sector. Important institutions involved in human resource development in fisheries sector

**UNIT III: Processing Sector Management**

3.1 Organizational setup in processing industries, state fisheries department.

3.2 Role of EIA, MPEDA and CIFT in the processing industry

3.3 Trade and exports- Export of marine products- trends and present status – India's share in the international trade of sea foods

**UNIT IV: Fisheries Acts**

- 4.1 Indian fisheries Act, National institutions of Governance in marine affairs of India- criteria for regulation of fishing effort.
- 4.2 Code of conduct for responsible fisheries, WTO, Important acts pertaining to fisheries in Andhra Pradesh – Marine Fisheries Act.

**UNIT V: Co-operations and Agencies in fisheries**

5.1 Definition, Principles of co-operations, Role of National cooperative development corporation (NCDC), Matsyafed, National Federation of Fishermen cooperations, FFDA, BFFDA, FIRMA

5.2 Problems of Fishery cooperations. Cooperations and their importance in fish production and marketing. Role of NABARD and SIDBI

**PRESCRIBED BOOK(S):**

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

**P.R. Govt. College (Autonomous), Kakinada**  
**DEPARTMENT OF ZOOLOGY AND AQUACULTURE**

**B.VOC (Commercial Aquaculture) Semester-IV**  
**TITLE: FISHERIES MANAGEMENT - Core: VIII**

**BLUE PRINT FOR QUESTION PAPER SETTER**

| <b>MODULE NO.</b>                   | <b>ESSAY QUESTIONS<br/>10 MARKS</b> | <b>SHORT ANSWER<br/>QUESTIONS<br/>5 MARKS</b> | <b>VERY SHORT<br/>ANSWER QUESTIONS<br/>2 MARKS</b> | <b>MARKS<br/>ALLOTTED TO<br/>THE UNIT</b> |
|-------------------------------------|-------------------------------------|---|--|---|
| <b>MODULE – I</b>                   | 02                                  | 01  | 02   | 29  |
| <b>MODULE – II</b>                  | 01                                  | 01  | 02   | 19  |
| <b>MODULE – III</b>                 | 01                                  | 02  | 02   | 24  |
| <b>MODULE – IV</b>                  | 01                                  | 02  | 02   | 24  |
| <b>Total no. of<br/>Questions</b>   | <b>05</b>                           | <b>06</b>                                     | <b>08</b>  |   |
| <b>Total Marks including choice</b> |                                     |   |  | <b>96</b>                                 |

**NOTE:** The question paper setters are requested to kindly adhere to the format given in the above table.



**P.R. Govt. College (Autonomous), Kakinada**  
**B.VOC (Commercial Aquaculture) Semester-IV**  
**Semester End Examinations**  
**TITLE: FISHERIES MANAGEMENT - Core: VIII**

**MODEL QUESTION PAPER**

**Time: 2 ½ hrs.**

**Max Marks: 60**

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**SECTION –I**

**Answer any SIX of the following**

**6x5= 30Marks**

**(Draw labeled diagrams wherever necessary)**

1. Definition of fisheries management
2. Scientific techniques of management
3. Training and motivation
4. MPEDA and CIFT
5. Marine fisheries act
6. Matsyafed
7. Importance in fish production and marketing
8. Role of NABARD and SIDBI

**SECTION –II**

**Answer Any THREE of the following**

**3x10=30 Marks**

**(Draw diagrams wherever necessary)**

9. Describe the scope and importance of fisheries management
10. Explain about Human resource management
11. Describe the criteria for regulation of fishing effort
12. Write about the important role of NCDC
13. Write a brief note on marine fisheries act

**QUESTION BANK PATHOLOGY IN AQUACULTURE, CORE-VIII****ESSAY ANSWER QUESTIONS:**

1. Describe the scope and importance of fisheries management
2. Define management and explain about functions of managers
3. Write about the Environmental impacts of fisheries management
4. Explain about Human resource management
5. Describe organizational development
6. Write about the role of HRD in the context of fisheries sector
7. Explain briefly about processing sector management
8. Explain briefly about the role of EIA and MPEDA in processing industry
9. Write about the India's share in the international trade of sea foods.
10. Write about Indian fisheries act
11. Describe the criteria for regulation of fishing effort
12. Write about the important acts of fisheries in Andhra Pradesh
13. Write a brief note on marine fisheries act
14. Write the definition and principles of cooperatives
15. Write about the important role of NCDC
16. Write the role of FFDA, BFFDA and FIRMA
17. What are problems of fisheries cooperatives

**SHORT ANSWER QUESTIONS:**

1. Definition of fisheries management
2. Planning and organizing
3. Staffing, directing and controlling
4. Scientific techniques of management
5. Training and motivation
6. Organizational communication
7. MPEDA and CIFT
8. Export of marine products
9. Present status of marine production in india
10. Indian fisheries act
11. Marine fisheries act
12. NCDC
13. Matsyafed
14. BFFDA and FIRMA
15. Importance in fish production and marketing
16. Role of NABARD and SIDBI

**Lab/Industrial training/Institutional training**

- Any 3 field visits  
Or
- 15 days Industrial training  
Or
- Lab work related to the concerned paper  
Or
- Mini Project with presentation

Note: For 50 Marks

# **III B.VOC COMMERCIAL**

## **AQUACULTURE**

### **OLD PATTERN SYLLABUS**

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

Bachelor of Vocational course (Commercial Aquaculture)

Semester-V,

Core-XIII Fishery Microbiology and Fishery By-Products

Syllabus

CREDITS 4

| OBJECTIVES   | LEARNING OUT COME  |
|--|--|
| <ul style="list-style-type: none"> <li>➤ To develop understanding about various microorganisms</li> <li>➤ To develop understanding about the microbiology of culture pond</li> <li>➤ To understand the role of microbes in nutrient cycling in a pond</li> <li>➤ To develop understanding about perishability of seafood and the importance of better time/ temperature management of aquaculture produce</li> </ul> | <ul style="list-style-type: none"> <li>➤ Student will learn the perception of the microorganisms.</li> <li>➤ Knowledge on the various microorganisms and its growth in culture ponds.</li> <li>➤ Student will stabilize the role of microorganism and its importance.</li> <li>➤ Knowledge on the spoilage of fish, Perishability and management factors will be learned.</li> </ul> |

**Module 1: Introduction of Microbiology**

**Hrs.14**

- 1.1. History and development of microbiology-Contributions of Louis Pasteur, Koch. General characteristics of bacteria, fungi, viruses, algae and protozoans.
- 1.2. Microscopy- general principles; bright field, dark field, phase contrast and electron microscopy.
- 1.3. Structure of fungi and yeast cell. Ultrastructure of virus and bacteria - classification of viruses. Life cycle of bacteriophages-lytic and lysogenic cycle.

**Module 2: Aquatic Microbiology**

**Hrs.14**

- 2.1. Microflora and fauna of aquatic environment. Effect of environmental factors on microbiology of fish culture pond.
- 2.2. Prokaryotic growth - characteristic features of bacterial growth curve.
- 2.3. Autochthonous and Allochthonous microorganisms in culture pond. Health significant bacteria in culture pond.

**Module 3: Fish Microbiology**

**Hrs.14**

- 3.1. Fish as an excellent medium for growth of microorganisms.
- 3.2. Perishability of sea food - Spoilage microflora of fish and shell fish.
- 3.3. Intrinsic and extrinsic factors affecting spoilage of fish and shell fish.

**Module 4: Fishery By-Products and value added products**

**Hrs.14**

- 4.1. Fish By-Products - Fish meal, isinglass, fish oils, fish glue, fish manure, chitin, chitosan, fish silage, fish ensilage, aesthetic values of fish.
- 4.2. Value addition in sea food - different types of value added products from fish and shell fishes. Advantages of value addition.
- 4.3. Processing of Frozen Surimi

### **Internal Evaluation**

- Assignment
- Seminars
- Quiz
- Field visits

### **Suggested reading**

#### **Core reading**

1. Pelzar, Reid & Chan – Microbiology
2. Prescott, Harley & Klein – Microbiology
3. Adelogerg, Ingra & Wheates – Introduction to Microbial World
4. Windsor and Barlow. Introduction to Fishery Byproducts.
5. CIFT. Proceedings on Summer Institute on Non-traditional Diversified Fish Products & Byproducts.
6. Anon. Productivity in Aquatic Bodies.
7. Chincheste, C.O. and Graham, H.D. Microbial Safety of Fishery Products.
8. Amerine, M.A. and Pangborn, R.M. Principles of Sensory Evaluation of Foods.
9. Connell, J.J. Control of Fish Quality
10. Bigh, E.G. Seafood Science and Technology
11. Gopakumar, K. Tropical Fishery Products

#### **Supplementary Reading**

- 1) Kreuzer, R. Fishery Products.
- 2) Borgstrom, G. Fish as Food

#### **Advanced Reading**

- 1) Suzuki, T. Fish and Krill Protein: Processing Technology

**P.R.GOVERNMENT COLLEGE (A), KAKINADA**  
**III B.Voc., (COMMERCIAL AQUACULTURE), SEMESTER-V,**  
**CORE-XIII FISHERY MICROBIOLOGY AND BY-PRODUCTS**  
**BLUE PRINT FOR QUESTION PAPER SETTER**

|                    | <b>ESSAY QUESTIONS</b> | <b>SHORT ANSWER QUESTIONS</b> | <b>VERY SHORT ANSWER QUESTIONS</b> |
|--------------------|------------------------|-------------------------------|------------------------------------|
| <b>MODULE-I</b>    | 01                     | 02                            | 03                                 |
| <b>MODULE-II</b>   | 02                     | 01                            | 03                                 |
| <b>MODULE- III</b> | 01                     | 02                            | 03                                 |
| <b>MODULE-IV</b>   | 02                     | 02                            | 03                                 |

**NOTE:** The question paper setters are requested to kindly adhere to the format given in the above table.

**P.R.GOVERNMENT COLLEGE (A), KAKINADA**  
**CHOICE BASED CREDIT SYSTEM**  
**III B.Voc., COMMERCIAL AQUACULTRE SEMESTER-V, 2020-21**  
**MODEL QUESTION PAPER**

**TITLE: FISHERY MICO BIOLOGY AND BY-PODUCTS, CORE-XIII**

**Time: 3 hrs.**

**Marks: 60**

**PART – 1**

**Note: Answer any THREE questions choosing at least one question from each section**

**3 x 10 = 30**

**SECTION- A**

1. Write an essay on history of microbiology and their contributions.
2. Describe the microflora and fauna in culture ponds.
3. Explain the prokaryotic growth and their growth curve.

**SECTION- B**

4. Describe the Intrinsic and Extrinsic factors of spoilage of fish.
5. Write an essay on Fishery By-products.
6. Give an account on processing of Frozen Fish Surimi.

**Part – II**

Answer any **FOUR** Questions

**4x5=20**

7. Electron microscopy
8. Ultra structure of Virus
9. Autochthonous microorganisms
10. Perishability of sea food
11. Fish as excellent medium for microorganisms
12. Different types of value added products
13. Advantages of value addition

**Part – III**

Answer any **TEN** Questions

**10x2=20**

14. Virus
15. Phase contrast
16. Yeast cell
17. Microflora
18. Significant bacteria
19. Prokaryotic cell
20. Perishability
21. Humidity
22. Intrinsic factors
23. Fish Glue
24. Surimi
25. Fish manure



## Question Bank

### 10 marks

1. Explain about the Ultrastructure of prokaryotic cell.
2. Define microbes? Explain about the different types of microbes.
3. Explain the microflora of aquatic environment.
4. Give an account on different types of media preparation for bacterial culture.
5. Write an essay on history of microbiology and their contributions.
6. Describe the microflora and fauna in culture ponds.
7. Explain the prokaryotic growth and their growth curve.
8. Describe the Intrinsic and Extrinsic factors of spoilage of fish.
9. Write an essay on Fishery By-products.
10. Give an account on processing of Frozen Fish Surimi.
11. How to explain the basics of mycological and virological techniques.
12. Explain about the different types of culture techniques in microbiology.
13. Describe the Fish as an excellent medium for growth of microorganisms.
14. How to spoilage fish? Explain the spoilage of microflora of fish and shellfish.
15. Explain about the Fishery By-products.
16. Describe the fishery value added products.
17. Explain the fish mince and surimi products.
18. Give an account on the preparation of coated fishery products.

### 5 Marks and 2 Marks

1. General characters of Algae
2. Prokaryotics
3. Ultra structure of virus
4. Life cycle of bacteriophages
5. Structure of fungi
6. Aquatic environment
7. Identification of Bacteria
8. Perishability of seafood
9. Intrinsic factors
10. Extrinsic factors
11. By-Products
12. Advantages of value addition
13. Seaweed products
14. Chitin and chitosan
15. Pearlessence
16. Fish liver oil
17. Fish fillets
18. Electron microscopy
19. Ultra structure of Virus
20. Autochthonous microorganisms
21. Perishability of sea food
22. Fish as excellent medium for microorganisms
23. Different types of value added products
24. Advantages of value addition

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

Bachelor of Vocational course (Commercial Aquaculture) Semester-V,

**Core- XIV Fish Processing Technology and Quality Control**

**Syllabus**

**CREDITS 4**

| OBJECTIVES  | LEARNING OUT COME  |
|---|--|
| <p>To empower students with present day technologies involved in fish processing and to provide a firm understanding on the various quality requirements in seafood industry.</p> | <p>Students will lean on various fish/prawn processing and technologies. Knowledge on some quality measures will be learned.</p> |

**Module 1: Introduction of Fish Processing and Freezing Hrs.14**

- 1.1. Introduction of fish processing global supply and demand. Principles of fish preservation-Precautions taken in handling fish in the fishing vessel, landing center and processing plant.
- 1.2. Fundamental principles involved in chilling and freezing of fish and fishery products. Various freezing construction and methods used in shrimps and fishes.
- 1.3. Preservation by refrigerated seawater and chilled sea water.

**Module 2: Preservation techniques of Finfish/Shell Fish processing Hrs.14**

- 2.1. Principles of preservative methods - Drying, Salting, Smoking and Canning.
- 2.2. Principles of freeze drying. Accelerated freeze drying and packing of freeze dried products.
- 2.3. Modern methods of preservation by irradiation and modified atmospheric storage.

**Module 3: Packing and labeling, storage and Export of Fishery Products Hrs.14**

- 3.1. Packing requirements and regulations. Labeling of fish and fishery products.
- 3.2. Different types of cold storages. Requirements in retail outlet; Insulated and refrigerated vehicles.
- 3.3. Export of fishery products from India - major countries, important products, export documents and procedures.

**Module 4: Quality Assurance and Quality Control Hrs.14**

- 4.1. Quality Assurance - Concepts of Hazard Analysis Critical Control Point (HACCP), Good Manufacturing Practice (GMP), Sanitary Standard Operating Procedure (SSOP). Determining the quality assurance of sea food.
- 4.2. Quality control - Basic concepts and quality control of fish processing. Salient features of sea food quality and factors.
- 4.3. Standards of Sea food.

### **Internal Evaluation**

- Assignment
- Seminars
- Quiz
- Field visits

### **Suggested reading**

#### **Core reading**

1. Fish Processing Technology - T.K.Govindan
2. Fish Processing Technology - Ed. K. Gopakumar
3. Post Harvest Technology - K.K. Balachandran
4. Seafood Processing - V. Venugopal

#### **Supplementary Reading**

1. Fish Processing Technology - Ed. G.M. Hall - Chapman & Hall,  
Madras
2. Tropical Fishery Products - K. Gopakumar

#### **Advanced Reading**

1. Kreuzer,R. Fishery Products.
2. Borgstrom,G .Fish as Food

**P.R.GOVERNMENT COLLEGE (A), KAKINADA**  
**III B.Voc., (COMMERCIAL AQUACULTURE), SEMESTER-V,**

**CORE-XIV FISH PROCESSING AND QUALITY CONTROL**

**BLUE PRINT FOR QUESTION PAPER SETTER**

|                    | <b>ESSAY QUESTIONS</b> | <b>SHORT ANSWER QUESTIONS</b> | <b>VERY SHORT ANSWER QUESTIONS</b> |
|--------------------|------------------------|-------------------------------|------------------------------------|
| <b>MODULE-I</b>    | 01                     | 02                            | 03                                 |
| <b>MODULE-II</b>   | 02                     | 01                            | 03                                 |
| <b>MODULE- III</b> | 01                     | 02                            | 03                                 |
| <b>MODULE-IV</b>   | 02                     | 02                            | 03                                 |

**NOTE:** The question paper setters are requested to kindly adhere to the format given in the above table.

**P.R.GOVERNMENT COLLEGE (A), KAKINADA**  
**CHOICE BASED CREDIT SYSTEM**  
**III B.Voc., COMMERCIAL AQUACULTRE SEMESTER-V, 2020-21**  
**MODEL QUESTION PAPER**  
**TITLE: FISH POCESSING AND QUALITY CONTROL, CORE-XIV**

**Time: 3 hrs.**

**Marks: 60**

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**PART – 1**

**Note: Answer any FOUR questions choosing at least one question from each section**

**4x 10 = 40**

**SECTION- A**

1. Write an essay on Principles of Fish preservation.
2. Give an account on methods of fish preservation.
3. Explain the modern methods of Fish preservation.
4. Describe the packing requirement and regulations of fish processing.
5. Write an essay on concepts of HACCP.
6. Give an account on standards of sea food.

**SECTION- B**

Answer any **FOUR** Questions

**4x5=20**

7. Lay out of processing plant and procedures
8. Various Freezing methods
9. Principles of Freeze drying
10. Types of cold storages
11. Fish export poceducers
12. SSOP
13. Concepts of Quality Control

## Question Bank

### 10 Marks

1. Give an account on Principles of fish preservation methods.
2. How to Preservation by refrigerated seawater and chilled seawater.
3. Explain about the fundamental principles involved in chilling and freezing of fish and fishery products.
4. Describe the various freezing methods.
5. Write an essay on Principles of Fish preservation.
6. Give an account on methods of fish preservation.
7. Explain the modern methods of Fish preservation.
8. Describe the packing requirement and regulations of fish processing.
9. Write an essay on concepts of HACCP.
10. Give an account on standards of sea food.
11. Describe the packing requirement and regulations of fish processing.
12. Write an essay on concepts of HACCP.
13. Give an account on standards of sea food.
14. Give an account on the accelerated freeze drying and packing dried products.
15. Explain the Modified Atmospheric Storage methods for preservation.
16. Explain the different types of drying methods.
17. Give an account on the spoilage of dried products.
18. Describe the different types of packing materials and its quality measurements.
19. Explain about the different types of cold storages.
20. Write an essay on export of fishery products from India.
21. Explain about the constraints in export including tariff and non-tariff barriers.

### 5 Marks and 2 Marks

1. Principles of fish preservation
2. Preparation of ice
3. Types of ice used in the seafood industry
4. Chilled seawater
5. Refrigerated seawater
6. Freezing methods
7. Canning
8. Retortable pouch processing.
9. Types of fish drying
10. Smoking of Fish
11. Traditional drying methods
12. Spoilage of dried fish products
13. Standards for dry fish products
14. Types of cold storage
15. Types of packing materials
16. Frozen and cured products
17. Statutory requirements for packing.
18. Labeling requirements.
19. Fisheries export products
20. Marine insurance

21. Lay out of processing plant and procedures
22. Various Freezing methods
23. Principles of Freeze drying
24. Types of cold storages
25. Fish export poceducers
26. SSOP
27. Concepts of Quality Control
28. Fish processing
29. Chilling
30. Freezing
31. MAP
32. Canning
33. Irradiation
34. MPEDA
35. EIA
36. Retail out let
37. GMP
38. HACCP

**P.R. Govt. College (A), Kakinada**  
**Bachelor of Vocational course (Commercial Aquaculture)**

**Semester-VI, Core- XV- PROJECT**

**Syllabus**

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Total 30Hours

- |   |   |
|---|---|
| 1. Training – OJT (On Job Training) in the collaborative institute or linkage organization<br>(Or) Internship in the collaborative institute or linkage organization<br>Credits | 3 |
| 2. Project/ Seminar<br>Credits  | 2 |
| 3. Field visits<br>Credit   | 1 |



**P.R. Govt. College (A), Kakinada**  
**Bachelor of Vocational course (Commercial Aquaculture)**

**Semester-VI, Core- XVI AQUACULTURE ENGINEERING**

**Syllabus**

**CREDITS 4**

| OBJECTIVES  | LEARNING OUTCOME   |
|---|--|
| <ul style="list-style-type: none"> <li>➤ To understand the knowledge about fish farm design and construction.</li> <li>➤ To establishment of various methods and equipments.</li> </ul> | <ul style="list-style-type: none"> <li>➤ Basic knowledge on fish farm design and construction will be learnt.</li> <li>➤ Knowledge on various mechanical events of fish farm/prawn culture ponds.</li> </ul> |

**Module 1: Introduction**

- 1.1. Introduction of Aquaculture engineering.
- 1.2. The farm; Technical components in a system- Land based hatchery and juvenile production farm; on growing sea cage farm.
- 1.3. Future trends and increased importance of aquaculture engineering.

**Module 2: Planning Aquaculture facilities**

- 2.1. Introduction - Planning process, site selection, production plan, room programme and necessary analysis.
- 2.2. Drawing up alternative solutions, evaluation of and choosing alternative solutions.
- 2.3. Finishing plans, detailed planning.

**Module 3: Water Transport, Water quality and water treatment**

- 3.1. Introduction - Pipe and pipe parts; Water flow and head loss in channels and pipe systems.
- 3.2. Pumps - Types of pumps; Pumping of water requires energy; Centrifugal and propeller pumps; Changing of water flow o pressure; Regulation of flow from selected pumps.
- 3.3. Increased focus on water quality; Inlet water; Outlet water; water treatment.

**Module 4: Aeration, oxygenation and Recirculation**

- 4.1. Design and construction of aerators - Basic principles; Evaluation criteria; Example of designs for different types of aerator; Oxygenation of water.
- 4.2. Recirculation and water use systems - Definitions - Degree of re-use; water exchange in relation to amount of fish; Degree of purification. Components in a re-use system; Design of a re-use system.
- 4.3. Instruments and monitoring - Measuring water quality; measuring physical conditions; counting fish; measuring fish size and total fish biomass.

### **Internal Evaluation**

- Assignment
- Seminars
- Quiz
- Field visits

### **Suggested reading**

#### **Core reading**

1. R. Ramachandran Nair Encyclopedia of fish disease -
2. K.P. Biswas Prevention and control of fish and Prawn diseases -
3. B.K. Mishra, P. Swain, P.K.Sahoo, B.K.Das, N.Sarangi. Disease management in FW Pisciculture -
- 4 Wheaton,F.W. Aquacultural Engineering
- 5 Bose et al. Coastal Aquacultural Engineering

#### **Supplementary Reading**

1. Sinderman C.J. Principle diseases of Marine fish and shell fish
2. Schaperclaus Fish Disease.

#### **Advanced Reading**

1. Roberts R.J.Fish Pathology..
2. Post, G. Text Book of Fish Health.

**P.R.GOVERNMENT COLLEGE (A), KAKINADA**  
**III B.Voc., (COMMERCIAL AQUACULTURE), SEMESTER-VI,**

**CORE-XVIAQUACULTURE ENGINEEING**

**BLUE PRINT FOR QUESTION PAPER SETTER**

|                    | <b>ESSAY<br/>QUESTI<br/>ONS</b> | <b>SHORT<br/>ANSWER<br/>QUESTIONS</b> | <b>VERY<br/>SHORT<br/>ANSWER<br/>QUESTIONS</b> |
|--------------------|---------------------------------|---------------------------------------|--|
| <b>MODULE-I</b>    | 01                              | 02                                    | 03   |
| <b>MODULE-II</b>   | 02                              | 01                                    | 03   |
| <b>MODULE- III</b> | 01                              | 02                                    | 03   |
| <b>MODULE-IV</b>   | 02                              | 02                                    | 03   |

**NOTE:** The question paper setters are requested to kindly adhere to the format given in the above table.

**P.R.GOVERNMENT COLLEGE (A), KAKINADA**  
**CHOICE BASED CREDIT SYSTEM**  
**III B.Voc., COMMERCIAL AQUACULTRE SEMESTER-V, 2020-21**  
**MODEL QUESTION PAPER**  
**TITLE: AQUACULTURE ENGINEERING, CORE-XVI**

Time: 3 hrs.

Marks: 60

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**PART – 1**

**Note: Answer any FOUR questions choosing at least one question from each section**

**4 x 10 = 40**

**SECTION- A**

1. Write an essay on Technical components of fish farm.
2. Describe the planning and site selection of fish farm.
3. Explain the necessary analyses of area constructions of pond.
4. Describe the Types of pumps and explain the Pumping of water requires energy.
5. Write an essay on design constructions of aerators.
6. Give an account on instruments for measuring water quality.

**SECTION- B**

Answer any **FOUR** Questions

**4x5=20**

7. Sea cage farming
8. Future trends-Aqua engineering
9. Drawing up alternative solutions fish farm
10. Inlet water
11. Water treatment
12. Oxygenation of water
13. Advantages and disadvantages of e-use systems

**P.R. Govt. College (A), Kakinada**  
**Bachelor of Vocational course (Commercial Aquaculture)**

**Semester-VI, Core- XVII - FISHERIES ECONOMICS AND MARKETING**

**Syllabus**

**CREDITS 4**

| OBJECTIVES   | LEARNING OUT COME  |
|--|--|
| <ul style="list-style-type: none"> <li>➤ To have an idea of basic economic principles</li> <li>➤ Understanding the principles of business</li> </ul> | <p>To know the economic analysis of various fishing, farming and processing activities</p> |

**Module 1: Principles of economics and Economy of fishermen**

1.1 Definition, subject matter and scope of economics. Law of diminishing returns, laws of increasing, constant and decreasing utility and returns.

1.2 Law of equimarginal returns. Importance of economics in aquaculture development.

Fishermen populations, GDP from fisheries sector, foreign exchange earnings and employment potential of fishing industry.

**Module 2: Prospective of Aquaculture in Socio-Economic impact & Rural Development**

2.1. Resource use and development, Socio-economic analysis, Socio-demographic Profile, work contribution.

2.2. Household expenditure, income contribution, decision making.

2.3. Female headed household, impact of different age groups, socioeconomic condition of fisherman.

**Module 3: Marketing and Planning and extension**

3.1. Markets and their kinds. Law of demand and supply, price determination, problems of fish marketing in India.

3.2. Exports of fish and fishery products, trends; and problems therein. Role of MPEDA in exports of fish and fishery products.

3.3. Fishery development plans and various schemes, with particular reference to FishFarmer's Development Agencies, their achievements.

**Module 4: Fishery co-operatives**

4.1. Functions, financial assistance, input supplies, marketing of fish. Socio-economic development.

4.2. Role of fisheries corporations and Missionary Organizations in fisheries development.

4.3. Present Economical and Trade market status of fisheries in India.

### **Internal Evaluation**

- Assignment
- Seminars
- Quiz
- Field visits

### **Suggested Seminar topics**

Primary fisheries cooperative society.

Emerging fisheries tourism.

Economics of a shrimp hatchery.

Kerala budget – allocation to fisheries.

### **Suggested Reading**

#### **Core reading**

Mithani,D.M. Principles of Economics.

Stonier,A.W and Hague,D.C. A Textbook of Economic Theory.

Anderson,L.G.The Economics of Fisheries Management.

Shang,Y.C. Aquaculture Economics.

Korakandy,R. Technological Change and the Development of Marine Fishing

Industry in India..

Ibrahim,P. Fisheries Development in India.

#### **Supplementary Reading**

Lawson,R.M. Economics of Fisheries Development.

Panayatou,T.Smallscale Fisheries in Asia.. Socio-economic Analysis and Policy

#### **Advanced Reading**

- 1) Ralph,T and Jack,W. The Economics of Fisheries, FAO

**P.R.GOVERNMENT COLLEGE (A), KAKINADA**  
**III B.Voc., (COMMERCIAL AQUACULTURE), SEMESTER-VI,**

**Core- XVII FISHERIES ECONOMICS AND MARKETING**

**BLUE PRINT FOR QUESTION PAPER SETTER**

|                    | <b>ESSAY QUESTIONS</b> | <b>SHORT ANSWER QUESTIONS</b> | <b>VERY SHORT ANSWER QUESTIONS</b> |
|--------------------|------------------------|-------------------------------|------------------------------------|
| <b>MODULE-I</b>    | 01                     | 02                            | 03                                 |
| <b>MODULE-II</b>   | 02                     | 01                            | 03                                 |
| <b>MODULE- III</b> | 01                     | 02                            | 03                                 |
| <b>MODULE-IV</b>   | 02                     | 02                            | 03                                 |

**NOTE:** The question paper setters are requested to kindly adhere to the format given in the above table.

**P.R.GOVERNMENT COLLEGE (A), KAKINADA**  
**CHOICE BASED CREDIT SYSTEM**  
**III B.Voc., COMMERCIAL AQUACULTRE SEMESTER-V, 2020-21**  
**MODEL QUESTION PAPER**  
**FISHERIES ECONOMICS AND MARKETING - CORE-XVII**  
**Time: 3 hrs. Marks: 60**

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**PART – 1**

**Note: Answer any FOUR questions choosing at least one question from each section**

**4 x 10 = 40**

**SECTION- A**

1. Write an essay on importance in economics and development of aquaculture.
2. Discuss about the socio-economic analysis and demographic profiles of Aquaculture.
3. Explain the impact of different age groups and socio-economic condition of fisher man.
4. Role of MPEDA in exports of fish and fishery products.
5. Write an essay on different plans and various schemes of fisheries.
6. Give an account on Present Economical and Trade market status of fisheries in India.

**SECTION- B**

Answer any **FOUR** Questions

**4x5=20**

7. Law of diminishing returns
8. Fishermen populations
9. Household expenditure
10. Exports of fish and fishery products
11. Problems of fish marketing in India
12. Socio-economic development.
13. Role of fisheries corporations



**P.R. Govt. College (A), Kakinada**  
**Bachelor of Vocational course (Commercial Aquaculture)**

**Semester-VI, Core- XVIII– PROJECT**

**Syllabus**

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Total 30Hours

- |   |   |
|---|---|
| 1. Training – OJT (On Job Training) in the collaborative institute or linkage organization<br>(Or) Internship in the collaborative institute or linkage organization<br>Credits | 3 |
| 2. Project/ Seminar<br>Credits  | 2 |
| 3. Field visits<br>Credit   | 1 |

**PRACTICAL PAPER I**  
**Fishery microbiology**  
**Hours 3, credits 3**

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1. Sterilization technique- dry heating, autoclaving
2. Media preparation
3. Isolation and maintenance of bacteria from fishes and water.
4. Gram staining of bacteria
5. Enumeration of bacteria by TPC method
6. Enumeration of total coli forms
7. Identification of various finfish / shellfish disease
8. parasite in fishes, protozoan, helminths, crustaceans
9. Prophylaxis for the prevention of outbreak of fish disease
10. Larval diseases

**PRACTICAL PAPER II**  
**Fish Processing and Quality control**

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**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

**Collection:**

1. Collection of fishery by-products

**Filed visit:**

1. Visit to sea food pre-processing plants
2. Visit to fish processing plants

**Institutional Visit:**

1. CIFT,
2. NIFPHATT

**PRACTICAL PAPER III**  
**SKILL COMPONENT AND BENCH WORK**

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Total 30Hours

1. Training – OJT (On Job Training) in the collaborative institute or linkage organization (Or) Internship in the collaborative institute or linkage organization 3 Credits
  
2. Project/ Seminar 2 Credits
  
3. Field visits 1 Credit

**PRACTICAL MODEL PAPER I**  
**Title: Fishery Microbiology**  
**Hours 3, credits 3**

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Examinations at the end of the VI Semester.

Internal:

Examinations at the end of the II Semester.

Internal:30 Marks, Time 1 Hour

External: 70 Marks Time 3 Hours

Major

|  |          |
|--|----------|
| 1. Identify the giving culture by gram's staining method | 20 Marks |
|--|----------|

Minor

|                                |          |
|--------------------------------|----------|
| 3. Identification diseases (5) | 30 Marks |
|--------------------------------|----------|

|                        |          |
|------------------------|----------|
| 4. Streak plate method | 10 Marks |
|------------------------|----------|

|   |  |
|---|--|
| 5. Identification of given parasites<br>10Marks |  |
|---|--|

|           |          |
|-----------|----------|
| 3. Record | 10 Marks |
|-----------|----------|

|       |          |
|-------|----------|
| Total | 70 Marks |
|-------|----------|

**PRACTICAL MODEL PAPER I**  
**Title: Fish processing and quality control**  
**Hours 3, credits 3**

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Examinations at the end of the II Semester.

Internal:

Examinations at the end of the II Semester.

Internal:30 Marks, Time 1 Hour

External: 70 Marks Time 3 Hours

|  |          |
|--|----------|
| 1. Major Dissection  | 20 Marks |
| Determination of moisture content in fish and fishery products |          |
| 3. Spotter 6 x5  | 30 Marks |
| 4. Value added products  | 10 Marks |
| 5. Fishery by-products   | 10Marks  |
| 3. Record  | 10 Marks |
| Total  | 70 Marks |

## **B.VOC ZOOLOGY**

### **NON-CORE SYLLABUS**

## B.VOC ZOOLOGY NON-CORE SYLLABUS

P.R. GOVT. COLLEGE (A), KAKINADA  
DEPARTMENT OF ZOOLOGY  
BACHELOR OF VOCATIONAL COURSE (COMMERCIAL AQUACULTURE)  
SEMESTER-V  
ZOOLOGY SYLLABUS  
Cell Biology and Histology

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### Module I

- 1.1. Cell theory
- 1.2. Structure of animal cell
- 1.3. Plasma membrane, structure and function
- 1.4. Endoplasmic Reticulum, structure and function.

### Module II

- 2.1. Golgi complex, structure and functions.
- 2.2. Lysosomes, structure and functions.
- 2.3. Mitochondria, structure and functions.
- 2.4. Ribosomes, structure and functions.

### Module III

- 3.1. Cell division
  - i) Mitosis
  - ii) Meiosis
  - iii) Cell cycle - Regulation.

### Module IV: Histology, structure and functions

- 4.1. Epithelial
- 4.2. Connective tissue
- 4.3. Muscle
- 4.4. Nerve



**P.R.GOVERNMENT COLLEGE (A), KAKINADA**  
**III B.Voc., (COMMERCIAL AQUACULTURE), SEMESTER-V,**

**ZOOLOGY**

**BLUE PRINT FOR QUESTION PAPER SETTER**

|                   | <b>ESSAY QUESTIONS</b> | <b>SHORT ANSWER QUESTIONS</b> | <b>VERY SHORT ANSWER QUESTIONS</b> |
|-------------------|------------------------|-------------------------------|------------------------------------|
| <b>MODULE-I</b>   | 01                     | 02                            | 03                                 |
| <b>MODULE-II</b>  | 02                     | 01                            | 03                                 |
| <b>MODULE-III</b> | 01                     | 02                            | 03                                 |
| <b>MODULE-IV</b>  | 02                     | 02                            | 03                                 |

**NOTE:** The question paper setters are requested to kindly adhere to the format given in the above table.

**P.R.GOVERNMENT COLLEGE (A), KAKINADA**  
**CHOICE BASED CREDIT SYSTEM**  
**III B.Voc., COMMERCIAL AQUACULTURE SEMESTER-V, 2020-21**  
**MODEL QUESTION PAPER (CELL BIOLOGY AND HISTOLOGY)**  
**Time: 3 hrs.                                  ZOOLOGY                                  Marks: 50**

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**PART – 1**

**Note: Answer any TWO questions choosing at least one question from each section**

**2 x 10 = 20**

**SECTION- A**

1. Describe the structure of plasma membrane.
2. Write essay the structure of mitochondria and its functions.

**SECTION- B**

3. Write an essay on mitosis.
4. Explain the types of epithelial tissue with examples.

**Part – II**

Answer any **FOUR** Questions

**4x5=20**

5. Cell theory
6. Endoplasmic Reticulum
7. Lysosome
8. Meosis
9. Cartilage
10. Bone
11. Nerve cell

**Part – III**

Answer any **FIVE** Questions

**5x2=10**

12. Symport
13. Antiport
14. Lysosome
15. Cristae
16. Cilia
17. Pavement epithelium
18. Tendon
19. Ligment
20. Synapse

## **BVOC ZOOLOGY NON-CORE SYLLABUS**

### **P.R.GOVERNMENT COLLEGE (A), KAKINADA CHOICE BASED CREDIT SYSTEM B.VOC-ZOOLOGY SYLLABUS (ANIMAL PHYSIOLOGY)**

#### **SEMESTER-VI**

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##### **Module I:**

- **Physiology of Digestion**
  - 1.1 Definition of digestion and types of digestion-extra and intracellular.
  - 1.2 Structure of typical digestive system of man.
  - 1.3 Digestive glands and chemical process of digestion.

##### **Module II:**

- **Physiology of respiration**
  - 2.1 Definition of respiration, types of respiration-external and internal respiration.
  - 2.2 Structure of typical respiratory system and mechanism in man.
  - 2.3 Transport of oxygen-formation of oxyhaemoglobin and affinity of hemoglobin for oxygen, Oxygen dissociation curves. Transport of CO<sub>2</sub>-Chloride shift, Bohr Effect.

##### **Module III:**

- **Physiology of excretion**
  - 3.1 Definition of excretion, classification animals based on excretory products.
  - 3.2 Ultra structure of nephron, formation of urine.
  - 3.3 Kidney stones, dialysis, hormonal regulation of kidney.

##### **Module IV:**

- **Endocrine system**
  - 4.1 Definition of hormones, scheme of hormonal action.
  - 4.2 Endocrine glands (Pituitary, Thyroid gland, Adrenal gland and pancreas).
  - 4.3 Testosterone, Progesterone, Estrogen and other hormones role in human reproduction.

**BLUE PRINT**  
**III Year B.Voc., Zoology**  
**Course: NON CORE, TITLE: ANIMAL PHYSIOLOGY**  
**At the end of VI Semester**  
**Under CBCS Pattern**

|                        | <b>ESSAY<br/>QUESTIONS</b> | <b>SHORT ANSWER<br/>QUESTIONS</b> | <b>VERY SHORT ANSWER<br/>QUESTIONS</b> |
|------------------------|----------------------------|-----------------------------------|--|
| <b>MODULE-I</b>        | 01                         | 02                                | 03                                     |
| <b>MODULE-<br/>II</b>  | 02                         | 01                                | 03                                     |
| <b>MODULE-<br/>III</b> | 01                         | 02                                | 03                                     |
| <b>MODULE-<br/>IV</b>  | 02                         | 02                                | 03                                     |

**MODEL QUESTION PAPER**  
**P R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA**  
**III Year B.Voc., NON CORE, TITLE ANIMAL PHYSIOLOGY**  
**at the end of VI Semester (CBCS) W.E.F., 2020-21**

Time 3 hrs.

Max Marks 50

**PART I**

**Note: Answer any TWO questions choosing at least one question from each section**

**2x10 = 20 Marks**

**SECTION – A**

1. Write an essay on the Carbohydrates digestion.
2. Explain the structure of nephron and write about urine formation.

**SECTION –B**

3. Describe the O<sub>2</sub> and Co<sub>2</sub> transport mechanism in respiration.
4. Define digestion and describe the human digestive system.

**PART –II**

**Answer any FOUR questions**

**4 x 5 = 20 Marks**

5. Extra and Intra cellular digestion
6. Inspiration
7. Dialysis
8. Vasopressin
9. Pancreas
10. Chloride shift
11. Adrenal gland

**PART III**

**Answer any FIVE questions**

**5 x 2 = 10 Marks**

12. Gastrin
13. Bohr effect
14. Alveoli
15. Salivary amylase.
16. Larynx
17. Kidney stones
18. Glycogenesis
19. Oxytocin
20. Urochrome

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**III Year B.Voc**

**NON CORE, ZOOLOGY ( CELL BIOLOGY & HISTOLOGY**

**At the end of VI Semester (CBCS) W.E.F., 2020-21**

**PRACTICAL SYLLABUS (at the end of V semester)**

- I. Epithelial Tissue – squamous epithelium, Columnar epithelium, ciliated columnar epithelium, cuboidal epithelium, Stratified epithelium
- II. Connective Tissue -stratified columnar, Granular epithelium, mucous tissue, lymphatic tissue, adipose tissue, fibrous tissue,
- III. Skeletal tissue, Muscles, – Bone, Hyaline cartilage, elastic cartilage, Heart, Skeletal tissue, Smooth Muscle
- IV. Nervous tissue

**PRACTICAL MODEL PAPER**

**CELL BIOLOGY & HISTOLOGY**

- |      |                               |                 |
|------|-------------------------------|-----------------|
| I.   | Identify the following slides | 5x5=25 marks    |
|      | a. Epithelial tissue          |                 |
|      | b. Connective tissue          |                 |
|      | c. Nerve tissue               |                 |
|      | d. Muscular tissue            |                 |
|      | e. Elastic cartilage          |                 |
| II.  | Record                        | 5 marks         |
| III. | viva                          | 5 marks         |
| IV.  | Internal Assessment           | 15 marks        |
|      | <b>Total</b>                  | <b>50 marks</b> |

**III Year B.Voc.,****NON CORE, ZOOLOGY ANIMAL PHYSIOLOGY****At the end of VI Semester (CBCS) W.E.F., 2020-21****PRACTICAL SYLLABUS (at the end of VI semester)**

- I. Estimation of Protein by biurate method
- II. Estimation of carbohydrates
- III. Estimation of lipids
- IV. Estimation action of salivary amylase

**PRACTICAL MODEL PAPER****ANIMAL PHYSIOLOGY**

|      |   |                 |
|------|---|-----------------|
| I.   | Estimation of Carbohydrates/Protiens/salivary amylase | 25 marks        |
| II.  | Record  | 5 marks         |
| III. | Viva  | 5 marks         |
| IV.  | Internal Assessment                                   | 15 marks        |
|      | <b>Total</b>  | <b>50 marks</b> |

THANK YOU