SRR & CVR GOVERNMENT DEGREE COLLEGE (AUTONOMOUS)

MACHAVARAM, VIJAYAWADA-520004

DEPARTMENT OF ZOOLOGY

Minutes of
Up gradation of Syllabus Meeting
(2019-20)
Dated : 04/09/2019

Courses

III B.Sc., B.Z.C & AT.Z.C - ZOOLOGY & AQUACULTURE TECHNOLOGY-SEMESTER-VI
(W.E.F.2017-18)

I.B.SC (AT.Z.C)-EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY SEMESTER-II
(W.E.F.2019-20)

SYLLABUS, BLUE PRINT & MODEL QUESTION PAPERS

(AS *PER CBCS AND SEMESTER SYSTEM*)

SRR & CVR GOVT. DEGREE COLLEGE
(Autonomous)
NAAC accredited with 'B+' Grade
Machavaram, Vijayawada – 520 004, Krishna District.
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Dr. Velaga Joshi, Principal
M.A.(Phil.), M.A.(His), M.A. (M.C.J.), B.L., M.Phil., Ph.D.

MINUTES OF THE MEETING UPGRADATION OF SYLLABUS ZOOLOGY

A meeting on upgradation of syllabus in the subject of **ZOOLOGY** was held on **04th September 2019** in Room No: **Zoology Department**, for Subject-Zoology and Aquaculture Technology syllabus, Semester-VI and Semester II in I. B.Sc (AT.Z.C) in the Course-**Embedded Course in Aquaculture Technology** under the chairmanship of Dr. M. Vijaya Kumar, Head of the Zoology Department. **The following members attended the meeting:**

1. **Dr. M.VIJAYA KUMAR** **(In-charge of the Department & Chairman, BoS)**
   Lecturer in Zoology
   SRR & CVR GDC (A) Vijayawada

2. **Dr.K.VEERAIAH** **(University Nominee)**
   Professor
   Department of Zoology & Aquaculture
   Acharya Nagarjuna University. Guntur.AP

3. **Dr.CH.TULASI MASTANAMMA** **(Subject Expert)**
   Lecturer in Zoology
   Govt. Degree College for Women (A)
   Guntur

4. **Dr.N.SREENIVAS** **(Subject Expert)**
   Lecturer in Zoology
   PR Govt.(A) College
   Kakinada.AP

5. **Sri.A.RAGHURAM REDDY** **(Special Member)**
   Neelagri Foundation
   Atmakur,Guntur

6. **G.VANI** **(Faculty Member)**
   Lecturer in Zoology
   SRR & CVR GDC (A), Vijayawada

7. **K. DURGA RAO** **(Faculty Member)**
   Lecturer in Zoology
   SRR & CVR GDC (A), Vijayawada

8. **SK.PARVEEN** **(Faculty Member)**
   Lecturer in Zoology
   SRR & CVR GDC (A), Vijayawada

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MINUTES OF THE MEETING UPGRADATION OF SYLLABUS ZOOLOGY

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1. **Dr. M.VIJAYA KUMAR** — **(In-charge of the Department & Chairman, BoS)**
   Lecturer in Zoology
   SRR & CVR GDC (A) Vijayawada
   M.V 4/9/19
2. **Dr.K.VEERAIAH** — **(University Nominee)**
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7. **K. DURGA RAO** — **(Faculty Member)**
   Lecturer in Zoology
   SRR & CVR GDC (A), Vijayawada
8. **Sk.Parveen** — **(Faculty Member)**
   Lecturer in Zoology
   SRR & CVR GDC (A), Vijayawada

AGENDA

- Approval of syllabus for Semester VI for the academic year 2019-20.
- Approval of syllabus for I. B.SC (AT.Z.C)-Embedded Course in Aquaculture Technology-Semester II
- To approve the Question papers blue print and model papers
- To approve validity of this syllabus for next three years.
- To divide 100 marks into internal 40 marks and external 60 marks for theory.
- The pass mark is 40% i.e., 24 out of 60 for External and 16 out of 40 for Internal.
- To divide 50 marks into internal 25 marks and external 25 marks for Practical's.
- The pass mark is 40% i.e., 10 out of 25 for External and Internal.
- To evaluate internal assessment, Assignment/Viva/Assessment /Seminar/Project /Field note/Two mid examinations.
- To approve the list of paper setters and examiners
- To approve other academic activities of the department
- For approval of any other matter with the permission of the Chairperson.

The Chairperson welcomed the members and initiated discussion on the syllabus for VI semesters. He apprised the members about the guidelines of the UGC and the CCE regarding the framing of syllabus and the recommended evaluation ratio for internal and external examinations. The members discussed in detail the various aspects presented before them and unanimously resolved the following:

RESOLUTIONS

1. Resolved to adopt the present University CBCS syllabus for semester VI with suggested modifications, and adopt the same syllabus for Aquaculture Technology as proposed by APSCHE.
2. Resolved to approve the division of marks for internal and external examination along with the suggested blue print and model paper.
3. Resolved to divide 100 marks into internal 40 marks and external 60 marks for theory. and the pass mark is 40% i.e., 24 out of 60 for External and 16 out of 40 for Internal.
4. Resolved to divide 50 marks into internal 25 marks and external 25 marks for Practical's. and the pass mark is 40% i.e., 10 out of 25 for External and Internal.
5. Resolved to use Virtual class room, ICT, Computer/Internet assisted learning for students regularly for teaching learning process.
6. Resolved to conduct student centric activities like Quiz, Group discussion etc
7. Resolved to arrange Field trips Surveys, Society outreach programmes etc.
8. Resolved to continue the certificate course in vermincompost approved in 2017-18
9. Resolved to conduct Guest Lectures, Student Seminars, Study Projects etc
10. Resolved to use Learning Management System LMS
11. Resolved to approve the list of paper setters and examiners submitted by the department.
12. Resolved to opt IMMUNOLOGY Paper VII-A as subject elective for Zoology subject.
13. Resolved to opt AQUACULTURE Papers VIII B-1, VIII B-2, VIII B-3 as Cluster Elective papers
14. Resolved to opt ORNAMENTAL FISHERY Paper VII A as subject elective for Aquaculture Technology students
15. Resolved to opt POST HARVEST TECHNOLOGY Papers VIII-1A, VIII-1B, VIII-1C as Cluster Elective papers for Aquaculture Technology students.
16. Resolved to include the following Additional Inputs-
    a. Transplantation Immunology –in Unit V, Immunology Paper VII A
    b. SONAR Navigation system- in Unit II, Principals of Aquaculture VIII B-1
    c. Waste management- in Unit-II, Aquaculture Management Paper-VIII B-2
    d. Cold storage units- Unit III, Post Harvest Technology Paper- VIII B-3
17. Resolved to adopt the syllabus framed by CCE for Embedded Course in Aquaculture Technology and modify present University CBCS syllabus in Zoology and Aquaculture Technology syllabus so as to incorporate the Apprenticeship Programe.
18. Further the committee resolved to give empowerment for any small changes to the Chairman in up gradation of the syllabus.

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III B.Sc BZC & ATZC

SEMESTER-VI

ZOOLOGY –SUBJECT ELECTIVE

PAPER – VII-A

IMMUNOLOGY

Periods: 60 **Max. Marks: 100**

Unit - I

Overview of Immune system

Introduction to basic concepts in Immunology

Innate and adaptive immunity

Cells and organs of Immune system

Cells of immune system

Organs of immune system

Unit - II

Antigens

Basic properties of antigens

B and T cell epitopes, haptens and adjuvants

Factors influencing immunogenicity

Unit - III

Antibodies

Structure of antibody

Classes and functions of antibodies

Monoclonal antibodies

Unit - IV

Working of Immune system

Structure and functions of major histocompatibility complexes

Exogenes and Endogenes pathways of antigen presentation and processing

Basic properties and functions of cytokines

Unit - V

Immune system in health and disease

Classification and brief description of various types of hyper sensitivities

Introduction to concepts of autoimmunity and immunodeficiency

Vaccines

General introduction to vaccines

Types of vaccines

*** ADDITIONAL INPUT:** Transplantation Immunology

Reference Books:

1. Richard A. Glodsby, Thomas J Kind, Barbara A. Osborne, Janis Kuby, Immunology, 5th ed, Freeman and Co. New York
2. Ivan Roitt, Immunology, 4th ed, Johanthan Brostoff, Moshy, London.
3. Kindt, T. J., Goldsby, R. A., Osborne, B. A., Kuby, J. (2006). VI Edition. Immunology. W.H. Freeman and Company.
4. Delves, P. J., Martin, S. J., Burton, D. R., Roitt, I.M. (2006). XI Edition. Roitt's Essential Immunology, Blackwell Publishing. *

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III B.Sc BZC & ATZC
ZOOLOGY PRACTICAL SYLLABUS
SEMESTER-VI
PAPER – VII-A
IMMUNOLOGY

Periods: 24 **Max. Marks: 50**

1. Demonstration of lymphoid organs (as per UGC guidelines)

2. Histological study of spleen, thymus and lymph nodes (through prepared slides)

3. Blood group determination

4. Demonstration of

a. ELISA

b. Immunoelectrophoresis

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SEMESTER-VI
ZOOLOGY- SUBJECT ELECTIVE
PAPER – VII-A
IMMUNOLOGY

INTERNAL MARKS ALLOTMENT

Zoology Theory- Internal		**Total Marks: 40**
1. Internals (2)	:	10 marks
2. Assignments (2)	:	5x2=10 marks
3. Project	:	10 marks
4. Seminar	:	5 marks
5. Attendance	:	5 marks

EXTERNAL MARKS ALLOTMENT

Zoology Theory- External **Total Marks: 60**

Section –A

I. Short Answer questions (Any 5 from given 10) 5x4=20
1 to 10

Section –B

II. Essay Questions (With internal choice) 5x8=40
11 to 15

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SEMESTER-VI
ZOOLOGY –ELECTIVE - PAPER – VII-A
IMMUNOLOGY

PRACTICAL MARKS ALLOTMENT

Zoology Practical's - External

Time: 3 hrs.		**Total Marks: 25**
1.Major experiment	:	8 marks
2.Minor experiment	:	6 marks
3.Identification	:	6 marks
4.Viva voce	:	5 marks

Zoology Practical's - Internal

		Total Marks: 25
1.Assessment	:	10 marks
2.Record	:	10 marks
3.Field note book	:	5 marks

Question Paper Blue Print

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III B.Sc BZC & ATZC
SEMESTER-VI
ZOOLOGY-SUBJECT ELECTIVE
PAPER – VII-A
IMMUNOLOGY

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A **Short Questions**			**Section B** **Essay Questions**		
	NO OF QUESTIONS	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**	**NO OF QUESTIONS**	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

Section-A: Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

Section-B: Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

Total : 60 Marks

Model Question Paper

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III B.Sc BZC & ATZC

SEMESTER-VI

ZOOLOGY-SUBJECT ELECTIVE

PAPER – VII-A

IMMUNOLOGY

Time: 3 hrs **Max Marks: 60**

SECTION-A

I. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x4=20**

1. Phagocytosis భక్షకక్రియ
2. Passive Immunity ఆర్జిత అసంక్రమ్యత
3. Haptens and adjuvants హేప్టేన్స్ మరియు ఎడ్జువెంట్లు
4. Interferon's ఇంటర్ పెరాన్లు
5. Ig G structure. ఐ.జి.జి నిర్మాణం
6. Applications of M.C.A యం.సి.ఎ. అనువర్తనాలు
7. Functions of MHC ఎమ్.హెచ్.సి. ప్రయోజనాలు
8. Action of cytokines. సైటోకైన్సు ప్రభావం
9. Delayed hypersensitivity కణమధ్యవరితత్వ అధిసునితత్వం
10. RRACoombs ఆర్.ఆర్. ఎ. కూంబ్స్

SECTION-B

II. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x8=40**

11. (a) What is the difference between Innate and Adaptive immunity.
సహజ మరియు ఆర్జిత రోగ నిరోధకత మధ్య బేధాలు వ్రాయండి

(OR)

(b)Explain Primary group of immune system organs
ప్రాధమిక వ్యాధి నిరోధక అవయువాలు గురించి తెల్పండి

12. (a)Explain types of antigens
వివిధ రకాల ప్రతిజనకాలు గురించి తెల్పండి

(OR)

(b)What are the properties of T-cell Epitopes
టి- కణాల ఎపిటోప్స్ ధర్మాలు గురించి వ్రాయండి

13. (a) Explain the structure of an typical antigen
సాధారణ యాంటిజెన్ యొక్క నిర్మాణాన్ని వివరించండి

(OR)

(b)What are the functions of Immunoglobulin's-Explain?
ఇమ్యునోగ్లోబిన్స్ విధులు గురించి తెల్పండి

14. (a) Explain Endogene Pathway of antigen
ప్రతిరక్షక ఎండోజీన్ విధానం గురించి తెల్పండి

(OR)

(b)What are the functions of Cytokines-Explain?
సైటోకైన్సు విధులను గురించి తెల్పండి

15. (a) Explain types of hyper sensitivities
వివధ రకాల అతి సూక్ష్మగ్రాహ్యత గురించి తెల్పండి

(OR)

(b) Explain types of Vaccines.
వివధ రకాల వ్యాధి నిరోధక టీకాల గురించి తెల్పండి

ZOOLOGY SYLLABUS FOR CLUSTER ELECTIVE –VIII-B:
SEMESTER-VI
AQUACULTURE

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III B.Sc BZC
SEMESTER-VI
ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-1
PRINCIPLES OF AQUACULTURE

Periods:60 **Max.Marks:100**

Unit – I

1.1 Introduction / Basics of Aquaculture

1.1.1 Definition, Significance and History of Aquaculture
1.1.2 Present status of Aquaculture – Global and National scenario
1.1.3 Major cultivable species for aquaculture: freshwater, brackish water and marine.
1.1.4 Criteria for the selection of species for culture

Unit – II

2.1 Types of Aquaculture

2.1.1 Freshwater, Brackishwater and Marine
2.1.2 Concept of Monoculture, Polyculture,Composite culture, Monosex culture and Integrated fish farming

2.2Culture systems

2.2.1 Ponds, Raceways, Cages, Pens, Rafts and water recirculating systems

2.3Culture practices

2.3.1Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.

ADDITIONAL INPUT: SONAR Navigation system

Unit – III

3.1 Design and construction of aquafarms

3.1.1Criteria for the selection of site for freshwater and brackish water pond farms
3.1.2 Design and construction of fish and shrimp farms

3.2 Seed resources

3.2.1 Natural seed resources and Procurement of seed for stocking: Carp and shrimp

3.3 Nutrition and feeds

3.3.1 Nutritional requirements of a cultivable fish and shellfish
3.3.2 Natural food and Artificial feeds and their importance in fish and shrimp culture

Unit – IV

4.1Management of carp culture ponds

4.1.1 Culture of Indian major carps: Pre-stocking management – Dewatering, drying, ploughing/desilting; Predators, weeds and algal blooms and their control, Liming and fertilization; Stocking management – Stocking density and stocking; Post-stocking management – Feeding, water quality, growth and health care; and Harvesting ofponds

4.2Culture of giant freshwater prawn, *Macrobrachium rosenbergii*

Unit – V

5.1Culture of shrimp (*Penaeus monodon* or *Litopenaeus vannamei*)

5.2 Culture of pearl oysters

5.3 Culture of seaweeds-species cultured, culture techniques, important by-products, prospects

5.4 Culture of ornamental fishes – Setting up and maintenance of aquarium; and breeding.

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SEMESTER-VI
ZOOLOGY –CLUSTER ELECTIVE
- PAPER – VIII-B-1
PRINCIPLES OF AQUACULTURE
PRACTICALS

Periods : 24 **Max.Marks : 50**

Cultivable fishes

1. Identification and study of important cultivable and edible fishes - Any ten
2. Identification and study of important cultivable and edible crustaceans - Any five
3. Identification and study of common aquarium fishes – Any five
4. General description and recording biometric data of a given fish.

Diseases

1. Identification and study of fish and shrimp diseases - Using specimens / pictures
2.External examination of the diseased fish – diagnostic features and procedure.
3. Autopsy of fish – Examination of the internal organs.
4. Determination of dosages of chemicals and drugs for treating common diseases.

Pond Management

1. Water Quality -Determination of temperature, pH, salinity in the pond water sample; Estimation of dissolved oxygen, free carbondioxide, total alkalinity, total hardness, phosphates and nitrites.
2. Soil analysis – Determination of soil texture, pH, conductivity, available nitrogen, available phosphorus and organic carbon.
3. Identification and study of common zooplankton, aquatic insects and aquatic weeds – Each 5

REFERENCES BOOKS

1. Bardach, JE *et al*. 1972. *Aquaculture – The farming and husbandry of freshwater and marine organisms*, John Wiley & Sons, New York.
2. Bose AN et al.1991. *Coastal aquaculture Engineering*. Oxford & IBH Publ.Co.Pvt.Ltd.
3. Chakraborty C & Sadhu AK. 2000. *Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn.* Daya Publ. House.
4. FAO. 2007. *Manual on Freshwater Prawn Farming*.
5. Huet J. 1986. *A text Book of Fish Culture*. Fishing News Books Ltd.
6. ICAR. 2006. *Hand Book of Fisheries and Aquaculture*. ICAR.
7. Ivar LO. 2007. *Aquaculture Engineering*. Daya Publ. House.
8. Jhingran V.G. 2007. *Fish and Fisheries of India*. Hindustan Publ. Corporation, India.
9. Landau M. 1992. *Introduction to Aquaculture*. John Wiley & Sons.
10. Lovell RT.1998. *Nutrition and Feeding of fishes*. Chapman & Hall.
11. Mcvey JP. 1983. *Handbook of Mariculture*. CRC Press.
12. MPEDA: *Handbooks on culture of carp, shrimp, etc*.
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14. Pillay TVR.1990. *Aquaculture- Principles and Practices*, Fishing News Books Ltd., London.
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16. Rath RK. 2000. *Freshwater Aquaculture*. Scientific Publ.
17. Stickney RR. 1979. *Principles of Warmwater Fish Culture*, John Wiley & Sons
18. Wheaton FW. 1977. *Aquacultural Engineering*. John Wiley & Sons.

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III B.Sc BZC
SEMESTER-VI
ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-1
PRINCIPLES OF AQUACULTURE

INTERNAL MARKS ALLOTMENT

Zoology Theory- Internal	**Total Marks: 40**
1. Internals (2)	: 10 marks
2. Assignments (2)	: 5x2=10 marks
3. Project	: 10 marks
4. Seminar	: 5 marks
5. Attendance	: 5 marks

EXTERNAL MARKS ALLOTMENT

Zoology Theory- External **Total Marks: 60**

Section –A

I. Short Answer questions (Any 5 from given 10) 5x4=20
1 to 10

Section –B

II. Essay Questions (With internal choice) 5x8=40

11 to 15

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc BZC
SEMESTER-VI
ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-1
PRINCIPLES OF AQUACULTURE

PRACTICAL MARKS ALLOTMENT

Zoology Practical's - External

Time: 3 hrs.		**Total Marks: 25**
1.Major experiment	:	8 marks
2.Minor experiment	:	6 marks
3.Identification	:	6 marks
4.Viva voce	:	5 marks

Zoology Practical's - Internal

		Total Marks: 25
1. Assessment	:	10 marks
2. Record	:	10 marks
3. Field note book	:	5 marks

Question Paper Blue Print

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III B.Sc BZC
SEMESTER-VI
ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-1
PRINCIPLES OF AQUACULTURE

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A **Short Questions**			**Section B** **Essay Questions**		
	NO OF QUESTIONS	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**	**NO OF QUESTIONS**	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

Section-A: Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

Section-B: Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

I. Short Questions : 5 x 4 = 20
II. Essay Questions : 5 x 8 = 40

Total : 60 Marks

Model Question Paper

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III B.Sc BZC
SEMESTER-VI
ZOOLOGY –CLUSTER ELECTIVE
PAPER – VIII-B-1
PRINCIPLES OF AQUACULTURE

Time: 2½ hrs **ax Marks: 60**

SECTION-A

I. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x4=20M**

1. Characters to be present in cultivable fishes పెంపకపు చేపల ప్రధాన లక్షణలు
2. Brackish water fishes ఉప్పునీటి చేపలు
3. Monoculture మోనోకల్చర్
4. Intensive fish culture సాంద్ర చేపల పెంపకము
5. Natural seed resources of fish చేపల విత్తనల యొక్కసహజ వనరులు
6. Criteria for selection of site for Brackish water pond ఉప్పునీటి చెరువుల నిర్మాణానికి స్థల ఎంపిక
7. Algal blooms ఆల్గల్ బ్లూమ్స్
8. Liming సున్నం చల్లడం
9. Economic importance of seaweeds సముద్రపు కలుపు మొక్కల యొక్క ఆర్థిక ప్రాముఖ్యత
10. Artificial pearl culture కృత్రిమ ముత్యాపు చెప్పల పెంపకము

SECTION-B

II. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x8=40M**

11. (a) Define Aquaculture. Explain the significance and History of Aquaculture
ఆక్వాకల్చర్‌ను నిర్వచించండి. ఆక్వాకల్చర్ యొక్క ప్రాముఖ్యత మరియు చరిత్రను వివరించండి

Or

(b) Explain major cultivable species of freshwater fishes
మంచినీటి చెరువులలో పెంచే వివిధ రకాల చేపలను వివరించండి

12. (a) Write an essay on Integrated fish culture
సమగ్ర చేపల పెంపకము పై ఒక వ్యాసం వ్రాయండి

Or

(b) Explain pen culture and cage culture
పెన్ పెంపకము మరియు కేజ్ పెంపకమును వ్రాయండి

13. (a) Write an essay on design and construction of fish farm
చేపల చెరువుల రూపకల్పన మరియు నిర్మాణంపై ఒక వ్యాసం వ్రాయండి

Or

(b) Explain the natural food and artificial feeds and their importance in fish culture
చేపల పెంపక చెరువులలో అందించ బడే సహజ మరియు కృత్రిమ ఆహారాలు మరియు వాటి ప్రాముఖ్యతను వివరించండి

14. (a) Write an essay on pre stocking management of major carps
ప్రధాన కార్ప్ల యొక్క ప్రీ స్టాకింగ్ నిర్వహణపై ఒక వ్యాసం వ్రాయండి

Or

(b) Write an essay on culture of Macrobrachium rosenbergi
మాక్రోబ్రాచియం రోసెన్‌బెర్గి పెంపకము పై ఒక వ్యాసం వ్రాయండి

15. (a) Explain the culture of seaweeds
సముద్రపు కలుపు మొక్కల యొక్క పెంపకము పై ఒక వ్యాసం వ్రాయండి

Or

(b) Write an essay on ornamental fish culture
ఆక్వేరియం చేపల పెంపకము పై ఒక వ్యాసం వ్రాయండి

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SEMESTER-VI

ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-2

AQUACULTURE MANAGEMENT

Periods : 60 **Max.Marks : 100**

Unit – I

1.1Breeding and Hatchery Management

1.1.1 Bundh Breeding and Induced breeding of carp by Hypophysation; and use of synthetic hormones

1.1.2Types of fish hatcheries; Hatchery management of Indian major carps

1.1.3 Breeding and Hatchery management of *Penaeus monodon*/ *Litopenaeus vannamei*

1.1.4 Breeding and Hatchery management of giant freshwater prawn.

Unit – II

2.1 Water quality Management

2.1.1Water quality and soil characteristics suitable for fish and shrimp culture

2.1.2 Identification of oxygen depletion problems and control mechanisms in culture ponds

2.1.3 Aeration: Principles of aeration and Emergency aeration

2.1.4 Liming materials, Organic manures and Inorganic fertilizers commonly used and their implications in fish ponds

ADDITIONAL INPUT: Waste management in aquaculture

Unit – III

3.1 Feed Management

3.1.1Live Foods and their role in shrimp larval nutrition.

3.1.2 Supplementary feeds: Principal foods in artificial diets; Types of feeds; Feed additives and Preservatives; role of probiotics.

3.1.3 Feed formulation and manufacturing; Feed storage

3.1.4 Feeding strategies: Feeding devices, feeding schedules and ration size; Feed evaluation- feed conversion efficiencies and ratios

Unit – IV

4.1 Disease Management

4.1.1 Principles of disease diagnosis and health management;

4.1.2 Prophylaxis, Hygiene and Therapy of fish diseases

4.1.3 Specific and non-specific defense systems in fish; Fish immunization and vaccination

4.1.4Etiology, Symptoms, prophylaxis and therapy of common fish diseases in fish ponds

4.1.5Etiology, Symptoms, prophylaxis and therapy of common shrimp diseases in shrimp ponds

Unit – V

5.1 Economics and Marketing

5.1.1 Principles of aquaculture economics – Capital costs, variable costs, cost-benefit analysis

5.1.2Fish marketing methods in India; Basic concepts in demand and price analysis

5.2 Fisheries Extension

5.1.3 Fisheries Training and Education in India; Role of extension in community development.

5.3 Fish Genetics

5.1.4 Genetic improvement of fish stocks – Hybridization of fish.

5.1.5 Gynogenesis, Androgenesis, Polyploidy, Transgenic fish, Cryopreservation of gametes, Production of monosex and sterile fishes and their significance in aquaculture.

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SEMESTER-VI

ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-2

AQUACULTURE MANAGEMENT

PRACTICALS

Periods :24 **Max.Marks : 50**

Nutrition

1. Identification and study of Live food organisms – Any five
2. Formulation and preparation of a balanced fish feed
3. Estimation of Proximate composition of aquaculture feeds – Proteins, carbohydrates, lipids, moisture, ash content.
4. Gut content analysis to study artificial and natural food intake.

Post harvest Technology

1. Evaluation of fish/ fishery products for organoleptic, chemical and microbial quality.
2. Preparation of dried, cured and fermented fish products, examination of salt, protein, moisture in dried / cured products, examination of spoilage of dried / cured fish products, marinades, pickles, sauce.
3. Preparation of isinglass, collagen and chitosan from shrimp and crab shell. ?
4. Developing flow charts and exercises in identification of hazards – preparation of hazard analysis worksheet, plan form and corrective action procedures in processing of fish.

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SEMESTER-VI
ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-2
AQUACULTURE MANAGEMENT

INTERNAL MARKS ALLOTMENT

Zoology Theory- Internal	**Total Marks: 40**
1. Internals (2)	: 10 marks
2. Assignments (2)	: 5x2=10 marks
3. Project	: 10 marks
4. Seminar	: 5 marks
5. Attendance	: 5 marks

EXTERNAL MARKS ALLOTMENT

Zoology Theory- External **Total Marks: 60**

Section –A

III. Short Answer questions (Any 5 from given 10) 5x4=20
1 to 10

Section –B

IV. Essay Questions (With internal choice) 5x8=40
11 to 15

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AQUACULTURE MANAGEMENT

PRACTICAL MARKS ALLOTMENT

Zoology Practical's - External

Time: 3 hrs.		**Total Marks: 25**
1.Major experiment	:	8 marks
2.Minor experiment	:	6 marks
3.Identification	:	6 marks
4.Viva voce	:	5 marks

Zoology Practical's - Internal

		Total Marks: 25
1.Assessment	:	10 marks
2.Record	:	10 marks
3.Field note book	:	5 marks

Question Paper Blue Print

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ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-2
AQUACULTURE MANAGEMENT

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A Short Questions			Section B Essay Questions		
	NO OF QUESTIONS	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**	**NO OF QUSTIONS**	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**
UNIT –I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

Section-A: Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

Section-B: Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

I. Short Questions : 5 x 4 = 20
II. Essay Questions : 5 x 8 = 40

Total : 60 Marks

Model Question Paper

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ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-2

AQUACULTURE MANAGEMENT

Time: 2½ hrs **Max Marks: 60**

SECTION-A

I. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x4=20M**

1. Bundh breeding బండ్ పెంపకం
2. Induced breeding ప్రేరేపిత జననం
3. Water quality నీటి నాణ్యత
4. .Liming ముగ్గు చలుట
5. Types of feeds మేతలలో రకాలు
6. Probiotics ప్రోబయోటిక్స్
7. Fish Immunization ఫిష్ ఇమ్యునైజేషన్
8. Explain Disease Management principles in fish culture.
   చేపల పెంపకంలో వ్యాధి నిరోధక యాజమాన్య పధతులు గురించి తెల్పండి
9. Cost-benefit analysis వినిమయం-ప్రయోజన విశ్లేషణ
10. Transgenic fish జన్యుపరివర్తన చేప

SECTION – B

II. Answer any FIVE of the following **5x8 = 40M**
Draw neat labeled diagram wherever necessary.

11. (a) Describe hatchery management of Indian major carps.
    భారతదేశపు ప్రధాన మేజర్ కార్ప్ ల హేచరీ యాజమాన్య పధతులు వివరించండి.

    (or)

    (b) Describe breeding and hatchery management of Penaeus monodon.
    పెనియస్ మోనోడాన్ నందలి బ్రీడింగ్ మరియు హేచరీ యాజమాన్య పధతులు వివరించండి

12. (a) Describe water quality and soil characteristics suitable for fish culture.
    చేపల పెంపకంనకు అనువైన నీటి నాణ్యత మరియు నేల లక్షణాలను వివరించండి.

    (or)

    (b) Explain principles of aeration and emergency aeration.
    ఏరియేషన్ సూత్రాలను మరియు అత్యవసర ఏరియేషన్ గురించి తెల్పండి

13. (a) Describe role of supplementary feeding in aquaculture.
ఆక్వాకల్చర్‌లో అనుబంధ ఆహారం పాత్రను వివరించండి.

(or)

(b) Explain the feed formulation and manufacturing
ఫీడ్ సూత్రీకరణ మరియు తయారీని వివరించండి

14. (a) Explain symptoms, prophylaxis and therapy of any four common diseases in fishes.
చేపలలో ఏవైన నాలుగు సాధారణ వ్యాధుల లక్షణాలు, రోగనిరోధకత మరియు చికిత్సను వివరించండి

(or)

(b) Explain symptoms, prophylaxis and therapy of any four common diseases in shrimps
రొయ్యలలో ఏదైనా నాలుగు సాధారణ వ్యాధుల లక్షణాలు, రోగనిరోధకత మరియు చికిత్సను వివరించండి

15. (a) Write an essay on demand and price analysis in aquaculture.
గిరాకి మరియు సరపరా మధ్య గల విశ్లషణగురించి వ్రాయండి

(or)

(b) Explain Fisheries training and Education in India.
భారతదేశంలో గల మత్య శిక్షణ మరియు విద్య గురించి తెల్పండి

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ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-3
POSTHARVEST TECHNOLOGY

Periods : 60 **Max.Marks : 100**

Unit – I

1.1 Handling and Principles of fish Preservation

1.1.1 Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.

1.1.2 Principles of preservation– cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to lowradiation of gamma rays.

Unit – II

2.1 Methods of fish Preservation

2.1.1 Traditional methods - sun drying, salt curing, pickling and smoking.

2.1.2 Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, Irradiation and Accelerated Freeze drying (AFD).

Unit – III

3.1 Processing and preservation of fish and fish by-products

3.1.1Fish products – fish minced meat, fish meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.

3.1.2 Fish by-products – fish glue, ising glass, chitosan, pearl essence, shark fins, fish leather and fish maws.

3.2Seaweed Products

3.2.1Preparation of agar, algin and carrageen. Use of seaweeds as food for humanconsumption, in diseasetreatment and preparation of therapeutic drugs.

ADDITIONAL INPUT: Cold storage units

Unit – IV

4.1Sanitation and Quality control

4.2.1 Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.

4.2.2 Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

4.2 Regulatory affairs in industries

Unit – V

5.1 Quality Assurance, Management and Certification

5.1.1Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.

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

REFERENCE BOOKS

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ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-3

POSTHARVEST TECHNOLOGY

PRACTICAL - III

Max Marks-50

Project Work

1. Visit to a fish breeding centre / fish farms and submit a project report

   or
2. Visit to a feed manufacturing unit and submit a project report

   or
3. Visit to a shrimp hatchery / shrimp farms and submit a project report

   or
4. Visit to a shrimp processing unit and submit a project report

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POSTHARVEST TECHNOLOGY

INTERNAL MARKS ALLOTMENT

Zoology Theory- Internal	**Total Marks: 40**
1. Internals (2)	: 10 marks
2. Assignments (2)	: 5x2=10 marks
3. Project	: 10 marks
4. Seminar	: 5 marks
5. Attendance	: 5 marks

EXTERNAL MARKS ALLOTMENT

Zoology Theory- External **Total Marks: 60**

Section –A

1. Short Answer questions (Any 5 from given 10) 5x4=20
   1 to 10

Section –B

2. Essay Questions (With internal choice) 5x8=40
   11 to 15

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POSTHARVEST TECHNOLOGY

PRACTICAL MARKS ALLOTMENT

Zoology Practical's - External

Time: 3 hrs. **Total Marks: 25**

1.Major experiment	:	8 marks
2.Minor experiment	:	6 marks
3.Identification	:	6 marks
4.Viva voce	:	5 marks

Zoology Practical's - Internal

Total Marks: 25

1.Assessment	:	10 marks
2.Record	:	10 marks
3.Field note book	:	5 marks

Question Paper Blue Print

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POSTHARVEST TECHNOLOGY

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A **Short Questions**			**Section B** **Essay Questions**		
	NO OF QUESTIONS	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**	**NO OF QUESTIONS**	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**
UNIT –I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

Section-A: Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

Section-B: Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

Total : 60 Marks

Model Question Paper

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

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ZOOLOGY –CLUSTER ELECTIVE - PAPER – VIII-B-3

POSTHARVEST TECHNOLOGY

Time: 2½ hrs **Max Marks: 60**

SECTION-A

I. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x4=20**

1. Handling of fresh fish తాజా చేపలను పట్టుకొను విధానము
2. Rigor mortis రిగర్ మోర్టిస్
3. Smoking ధూమీకరణము
4. Canning డబ్బాలలో భద్రపరచుట
5. Fish oil చాప నూనె
6. Sea weeds which are useful for human consumption
   మానవ వినియోగానికి ఉపయోగపడే సముద్ర కలుపు మొక్కలు
7. Personal hygiene in processing plants ప్రాసెసింగ్ ప్లాంట్లలో వ్యక్తిగత పరిశుభ్రత
8. Regulatory affairs in industry పరిశ్రమలో రెగ్యులేటరీ వ్యవహారాలు
9. Good Laboratory Practices GLPs మంచి ప్రయోగశాల పద్ధతులు
10. Codex alimentarius కోడెక్స్ ఎలిమెంటేరియస్

SECTION-B

II. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x8=40**

11. (a) Describe the spoilages in marine fish.
    సముద్రపు చేప కుళ్ళుపోవు విధానము వివరించండి.

(OR)

(b) Write an essay on Principles of preservation in fish
చేపలు నిల్వచేయు పద్ధతుల గూర్చి వ్రాయండి

12. (a) What are the Traditional methods used in preservation.
    సాంప్రదాయ పద్ధతులలో చేపలు నిల్వచేయు పద్ధతుల గూర్చి వ్రాయండి

(OR)

(b) What are the advanced methods used in preservation.
అధునాతన పద్ధతులలో చేపలు నిల్వచేయు పద్ధతుల గూర్చి వ్రాయండి

13. (a) Write about the different types of fish by products
వివిధ రకాలైన చేపల ఉత్పత్తుల గురించి వ్రాయండి

(OR)

(b) Write in detail about the preparation of agar
అగర్ తయారీ విధానము వ్రాయండి

14. (a) Explain about Environmental hygiene in processing plants
ఆహార పదార్థాల ప్రాసెసింగ్ పరిశ్రమలో పర్యవరణ పరిశుభ్రతకు తీసుకోవలసిన నాణ్యత ప్రమాణల గూర్చి వివరించండి

(OR)

(b) Write about the Quality control in fish and fish products
చేప మరియు చేపల ఉత్పత్తులలో నాణ్యత నియంత్రణ గురించి వ్రాయండి

15. (a) Explain Good Manufacturing Practices GMPs in processing plants
ఆహార పదార్థాల ప్రాసెసింగ్ పరిశ్రమలో మంచి తయారీ పద్ధతులను వివరించండి

(OR)

(b) Explain Hazard Analysis and critical control points in sea food safety
సముద్ర ఆహార భద్రతలో హాజార్డ్ విశ్లేషణ మరియు క్లిష్టమైన నియంత్రణ పాయింట్లను వివరించాలా

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SRR & CVR GOVERNMENT DEGREE COLLEGE (AUTONOMOUS)

VIJAYAWADA

DEPARTMENT OF ZOOLOGY

(2019-20)

NEW COURSE- AQUACULTURE TECHNOLOGY

(AS PER APSCHE w.e.f 2017-18)

III B.Sc., (AT.Z.C)

SEMESTER-VI

Syllabus, Blue Print and Model question papers

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc ATZC
AQUACULTURE TECHNOLOGY - SUBJECT ELECTIVE SYLLABUS
SEMESTER-VI
PAPER-VII A
ORNAMENTAL FISHERY

UNIT I: INTRODUCTION

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

UNIT II: FRESH WATER ORNAMENTAL FISHES

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

UNIT III: MARINE ORNAMENTAL FISHES

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

UNIT IV: AQUARIUM MANAGEMENT

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

UNIT V: COMMERCIAL PRODUCTION OF AQUARIUM FISH AND PLANTS

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

REFERENCES:

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

PRESCRIBED BOOK(S):

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

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc ATZC
AQUACULTURE TECHNOLOGY - SUBJECT ELECTIVE SYLLABUS
SEMESTER-VI
PAPER-VII A
ORNAMENTAL FISHERY

PRACTICAL SYLLABUS

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

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY

INTERNAL MARKS ALLOTMENT

SEMESTER-VI
SUBJECT ELECTIVE
PAPER-VII A
ORNAMENTAL FISHERY

Theory- Internal		**Total Marks: 40**
1. Internals (2)	:	10 marks
2. Assignments (2)	:	10 marks
3. Project	:	10 marks
4. Seminar	:	5 marks
5. Attendance	:	5 marks

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

Theory- External **Total Marks: 60**

Section –A

I.	Short Answer questions (Any 5 from given 10) 1 to 10	5x4=20

Section –B

II.	Essay Questions (With internal choice) 11 to 15	5x8=40

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER VI
SUBJECT ELECTIVE
PAPER-VIIA
ORNAMENTAL FISHERY

Practical's - External

Time: 3 hrs. **Total Marks: 25**

1. Major experiment	:	8 marks
2. Minor experiment	:	6 marks
3. Identification	:	6 marks
4. Viva voce	:	5 marks

Practical's – Internal **Total Marks: 25**

1. Assessment	:	10 marks
2. Record	:	10 marks
3. Field note book	:	5 marks

Question Paper Blue Print

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY
SEMESTER VI
SUBJECT ELECTIVE
PAPER-VIIA
ORNAMENTAL FISHERY

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A **Short Questions**			**Section B** **Essay Questions**		
	NO OF QUESTIONS	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**	**NO OF QUESTIONS**	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

Section-A: Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

Section-B: Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc ATZC
AQUACULTURE TECHNOLOGY - SUBJECT ELECTIVE
SEMESTER VI – PAPER-VIIA
ORNAMENTAL FISHERY

Time: 3 hrs **Max Marks: 60**

SECTION-A

I. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x4=20**

1. Present status of aquarium in India
2. Nitrogen cycle
3. Gold fish
4. Larval feeds
5. Use of anaesthetics
6. Natural breeding in marine ornamental fish
7. Tetras
8. Design of ornamental unit
9. Bat fish
10. Eichhornia

SECTION-B

II. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x8=40**

11. a. Explain various accessories used in aquarium
(or)
b. Explain any four water quality parameters used in fresh water aquarium

12. a. Explain brood stouc development in ornamental fish
(or)
b. Describe any four live bearers of ornamental fish

13. a. Describe collection & transportation of live fish
(or)
b. Explain major marine ornamental fish resources of india

14. a. Explain any four common diseases in aquarium fish
(or)
b. Describe any three water quality parameters used in marine aquarium fishes

15. a. Explain commercial production of gold fish
(or)
b. Explain production of aquarium plants

AQUACULTURE TECHNOLOGY
SYLLABUS FOR CLUSTER ELECTIVE –VIII-1
SEMESTER-VI

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc ATZC

SEMESTER VI

CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY

PAPER VIII – 1A

FISH PROCESSING TECHNOLOGY

Unit 1

Introduction: Principles of fish preservation. Importance of hygiene and sanitation in fish handling. Quality of water and ice in fish handling and processing. Preparation of ice. Different types of ice used in the seafood industry and their merits. Preservation by refrigerated seawater and chilled sea water

Unit 2

Freezing and Canning: Fundamental principles involved in chilling and freezing of fish and fishery products. Various freezing methods. Freezing of shrimps and fishes. Changes during the cold storage of fish and fishery products. Principles involved in canning of fish. Different types of containers. Different stages of canning of Tuna. Retortable pouch processing.

Unit 3

Drying, Smoking and Freeze-drying: (9 Hrs) Principles of smoking, drying and salting of fish, factors affecting drying. Traditional drying / curing methods. Different types of drying. Drying of fish and prawns. Packing and storage of dried products. Spoilage of dried products. Preventive measures. Standards for dry fish products. Cold smoking. Principles of freeze drying. Accelerated freeze drying and packing of freeze dried products. Modern methods of preservation by irradiation and modified atmospheric storage.

Unit 4

Packing, Cold Storage and Export of Fishery Products: Functions of packing. Different types of packing materials and its quality evaluation. Packing requirements for frozen and cured products. Statutory requirements for packing. Labeling requirements. Different types of cold storages. Insulated and refrigerated vehicles.

Unit 5

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

Reference Books:

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

Text books:

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

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1-POST HARVEST TECHNOLOGY

Practical-I
Title: Fish Processing Technology and Quality Control

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. Organoloptic analysis of fish
7. Preparation of fishery by products
8. Preparation of shark fin rays fish maws, chitin, fish wafer
9. Fish pickling
10. Value added fishery products, fish curry, cutlets fish finger.
11. Preparation of surimi

Filed visit:

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

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY
INTERNAL MARKS ALLOTMENT
III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY
PAPER VIII – 1A
FISH PROCESSING TECHNOLOGY

Theory- Internal **Total Marks: 40**

1. Internals (2)	:	10 marks
2. Assignments (2)	:	10 marks
3. Project	:	10 marks
4. Seminar	:	5 marks
5. Attendance	:	5 marks

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

Theory- External **Total Marks: 60**

Section –A

I.	Short Answer questions (Any 5 from given 10) 1 to 10	5x4=20

Section –B

II.	Essay Questions (With internal choice) 11 to 15	5x8=40

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER VI

CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY

Practical-I

Title: Fish Processing Technology and Quality Control

Practical's - External

Time: 3 hrs.		**Total Marks: 25**
1. Major experiment	:	8 marks
2. Minor experiment	:	6 marks
3.Identification	:	6 marks
4. Viva voce	:	5 marks

Practical's – Internal		**Total Marks: 25**
1. Assessment	:	10 marks
2. Record	:	10 marks
3. Field note book	:	5 marks

Question Paper Blue Print

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY

SEMESTER VI
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY
PAPER VIII – 1A
FISH PROCESSING TECHNOLOGY

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A **Short Questions**			**Section B** **Essay Questions**		
	NO OF QUESTIONS	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**	**NO OF QUESTIONS**	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

Section-A: Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

Section-B: Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY
III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY
PAPER VIII – 1A
FISH PROCESSING TECHNOLOGY

Time: 3 hrs **Max Marks: 60**

SECTION-A

I. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x4=20**

1. Types of ice used in sea food industry
2. Chilled sea water preservation
3. Canning
4. Types of containers
5. Smoking
6. Traditional drying
7. Low density poly ethylene(LDPE) & High density poly ethylene(HDPE)
8. Insulated vehicles
9. Marine insurance
10. Export incentives

SECTION-B

I. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x8=40**

11. a. Describe three methods of storing fish in ice on fishing vessels
(or)
b. Explain importance of hygiene & sanitation in fish handling
12. a. Explain principle, methods & application in freezing of fish
(or)
b. Explain principles involved in canning of fish
13. a. Explain salting & drying methods in fish preservation
(or)
b. Explain different packing & storage methods of fish & prawn dried products
14. a. Explain packing used in freshwater fish processing
(or)
b. Describe different types of cold storages
15. a. Discuss export documents & procedures of fish & prawn
(or)
b. Discuss tariff & non-tariff barriers in exporting fish & prawn

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1-POST HARVEST TECHNOLOGY
PAPER VIII – 1B
FISHERY MICROBIOLOGY AND FISHERY BY-PRODUCTS

Unit 1:

Introduction: History and development of microbiology –Different members of the microbial community – General characteristics of bacteria, fungi, viruses, algae and protozoans.

Ultrastructure of prokaryotic cell – structure and function of bacterial cell wall, plasmamembrane, capsule, flagella and endospore. Structure of fungi and yeast cell. Ultrastructure of virus – classification of viruses, Llfe cycle bacteriophages - lytic and lysogenic cycle.

Unit 2:

Aquatic Microbiology: Microflora of aquatic environment, Different culture techniques.

Nutrition and growth of bacteria – different types of media for isolation of bacteria and fungi.

Isolation, enumeration, preservation and maintenance of cultures. Routine tests for identification of bacteria – morphological, cultural biocehemical and serological. Basics of mycological and virologial techniques.

Unit 3:

Fish Microbiology: Perishability of seafood – Fish as an excellent medium for growth of microorganisms. Spoilage microflora of fish and shellfish. Intrinsic and extrinsic factors affecting spoilage.

Unit 4:

Fishery By-Products: Fish meal, fish protein concentrate, shark fin rays, fish maws, isinglass, fish liver oil, fish body oil, fish hydrolysates, chitin, chitosan, glucosamine hydrochloride, squalene, pearl essence, ambergris, gelatin, beche-de-mer, fish silage, fish ensilage and seaweed products like agar, alginic acid and carragenan.

Unit 5:

Value Added Products. Value addition in sea food. Different types of value added products from fish and shell fishes – status of value addition in Indian seafood sector. Advantages of value addition. Fish mince and Surimi. Analog and fabricated products. Preparation of coated fishery products. Different types of batter and breading and its applications. Preparation of products viz. fish / prawn pickle, fish wafers, prawn chutney powder, fish soup powder, fish protein hydrolysate, fish stacks, fillets, fish curry, mussel products, marinated products.

Text Books:

1. Pelzar, Reid & Chan – Microbiology
2. Prescolt, 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 Pangborm,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

Reference Books

1. Kreuzer,R. Fishery Products.
2. Borgstrom,G .Fish as Food
3. Suzuki,T. Fish and Krill Protein: Processing Technology

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1-POST HARVEST TECHNOLOGY

Practical II
Title: Fishery Microbiology and Quality Control

Experiments/Activities

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. Evaluation of fish / fishery products for organoleptic, chemical and microbial quality

Collection:

1. Collection of fishery by-products

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III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY
INTERNAL MARKS ALLOTMENT

SEMESTER VI
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY
PAPER VIII – 1B
FISHERY MICROBIOLOGY AND FISHERY BY-PRODUCTS

Theory- Internal		**Total Marks: 40**
1. Internals (2)	:	10 marks
2. Assignments (2)	:	10 marks
3. Project	:	10 marks
4. Seminar	:	5 marks
5. Attendance	:	5 marks

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

Theory- External **Total Marks: 60**

Section –A

I.	Short Answer questions (Any 5 from given 10) 1 to 10	5x4=20

Section –B

II.	Essay Questions (With internal choice) 11 to 15	5x8=40

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER VI

CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY

Practical II

Title: Fishery Microbiology and Quality Control

Practical's - External

Time: 3 hrs. **Total Marks: 25**

1. Major experiment	:	8 marks
2. Minor experiment	:	6 marks
3.Identification	:	6 marks
4. Viva voce	:	5 marks

Practical's – Internal **Total Marks: 25**

1.Assessment	:	10 marks
2.Record	:	10 marks
3.Field note book	:	5 marks

Question Paper Blue Print

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY
SEMESTER VI
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY
PAPER VIII – 1B
FISHERY MICROBIOLOGY AND FISHERY BY-PRODUCTS

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A **Short Questions**			**Section B** **Essay Questions**		
	NO OF QUESTIONS	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**	**NO OF QUESTIONS**	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

Section-A: Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

Section-B: Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY
III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY
PAPER VIII – 1B
FISHERY MICROBIOLOGY AND FISHERY BY-PRODUCTS

Time: 3 hrs **Max Marks: 60**

SECTION-A

I. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x4=20**

1. Endospore
2. Structure of prokaryotic cell
3. Anaerobic media
4. Oxidase test
5. Luminescent bacteria
6. Oxygen concentration
7. Fish liver oil
8. pearl essence
9. Advantages of value addition products
10. Fish mince

SECTION-B

II. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x8=40**

11. a. Describe the structure & function of plasma membrane
(or)
b. Explain lifecycle of bacteriophage with lytic & lysogenic cycles
12. a. Explain different types of media for isolation for bacteria
(or)
b. Explain different culture techniques & isolation of fungi
13. a. Explain spoilage microflora of shell fish
(or)
b. Describe extrinsic factors affecting fish spoilage
14. a. Explain any four fish by products
(or)
b. Explain production of agar
15. a. Describe the status of value addition & advantages Indian seafood sector
(or)
b. Explain battered & breaded fish products

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1-POST HARVEST TECHNOLOGY
PAPER VIII – 1C
QUALITY CONTROL IN PROCESSING PLANTS

Unit I:
Quality management, total quality concept and application in fish trade. Quality assessment of fish and fishery products - physical, chemical, organoleptic and microbiological. Quality standards. Quality Assurance. Inspection and quality assurance:

Unit 2:
Fish inspection in India, process; water quality in fishery industry, product quality, water analysis, treatments, chlorination, ozonisation, UV radiation, reverse osmosis, techniques to remove pesticides and heavy metals.

Unit 3:
Sensory evaluation of fish and fish products, basic aspects, different methods of evaluation, taste panel selection & constitution, statistical analysis Quality problem in fishery products: good manufacturing practices. HACCP and ISO 9000 series of quality assurance system, validation and audit. national and international standards, EU regulation for fish export trade,

Unit 4:
IDP and SAT formations in certification of export worthiness of fish processing units, regulations for fishing vessels pre-processing and processing plants, eu regulations. Factory sanitation and hygiene: National and international requirements, SSOP.

Unit 5:
Hazards in sea foods: Sea food toxins, biogenic amines, heavy metals and industrial pollutants. Infection and immunity, Microbial food poisoning, bacteria of public health significance in fish / fishery products / environments - Salmonella, Clostridia, Staphylococcus ,E. coli, Streptococcus, Vibrio, Aeromonas, Listeria, Yersinia, Bacillus. Laboratory techniques for detection and identification of food poisoning bacteria. Mycotoxins in cured fish, bacterial associated with fish disease.

Reference Books
1. Ellis Harward. 18 Felix S, Riji John K, Prince Jeyaseelan MJ & Sundararaj V. 2001 Bacterial Fish Pathogens (Diseases in Farm and Wild)
2. Fish Disease Diagnosis and Health Management. Fisheries College and Research Institute, T.N. Veterinary and Animal Sciences University. Thoothukkudi. Inglis V, Roberts RJ & Bromage NR. 1993.

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY

Practical III – PROJECT WORK

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY
INTERNAL MARKS ALLOTMENT
III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY
PAPER VIII – 1C
QUALITY CONTROL IN PROCESSING PLANTS

Theory- Internal	**Total Marks: 40**	
1. Internals (2)	:	10 marks
2. Assignments (2)	:	10 marks
3. Project	:	10 marks
4. Seminar	:	5 marks
5. Attendance	:	5 marks

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

Theory- External **Total Marks: 60**

Section –A

I.	Short Answer questions (Any 5 from given 10) 1 to 10	5x4=20

Section –B

II.	Essay Questions (With internal choice) 11 to 15	5x8=40

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY

PRACTICAL MARKS ALLOTMENT

III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY

Practical III – PROJECT WORK

Practical's – External-Project Report Submission/Viva voce **Total Marks: 25**

Practical's – Internal-Field Notes **Total Marks: 25**

Question Paper Blue Print

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY
III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY
PAPER VIII – 1C
QUALITY CONTROL IN PROCESSING PLANTS

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A **Short Questions**			**Section B** **Essay Questions**		
	NO OF QUESTIONS	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**	**NO OF QUESTIONS**	**MARKS ALLOTED FOR EACH QUESTION**	**TOTAL MARKS**
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

Section-A: Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

Section-B: Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY
III B.Sc ATZC
SEMESTER VI
CLUSTER ELECTIVE – 1- POST HARVEST TECHNOLOGY
PAPER VIII – 1C
QUALITY CONTROL IN PROCESSING PLANTS

Time: 3 hrs **Max Marks: 60**

SECTION-A

I. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x4=20**

1. Organoleptic quality assessment of fish
2. Fish infection
3. Chlorination
4. Reverse osmosis
5. E.V Regulations in fish export trade
6. HACCP
7. Evaluation of fish products
8. SSOP
9. Biogenic amines
10. Mycotoxins in cured fish

SECTION-B

II. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x8=40**

11. a. Describe the chemical & microbiological methods in quality assessment of fish
    (or)
    b. Explain quality assurance of sea food products
12. a. Explain different steps in fish processing
    (or)
    b. Explain various techniques to remove heavy metals
13. a. Explain sensory evaluation of fish & fish products
    (or)
    b, Explain various good manufacturing practices in processing plant
14. a. Describe IDP & SAT formation in certificate of fish processing units
    (or)
    b. Write an essay on fish factory sanitation & hygiene
15. a. Explain different sea food toxins & heavy metals
    (or)
    b. Describe laboratory techniques for detection of various bacteria in food

SRR & CVR GOVERNMENT DEGREE COLLEGE
(AUTONOMOUS)

MACHAVARAM, VIJAYAWADA-520004

DEPARTMENT OF ZOOLOGY

MINUTES OF THE MEETING

UP GRADATION OF SYLLABUS MEETING

(2019-20)

DATED : 04/09/2019

Course: **B.Sc (AT.Z.C)**

EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY

Subject: **ZOOLOGY & AQUACULTURE TECHNOLOGY**

SEMESTER-II

SYLLABUS, BLUE PRINT & MODEL QUESTION PAPERS

(AS *PER CBCS AND SEMESTER SYSTEM*)

(W.E.F.2019-20)

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
ZOOLOGY- SYLLABUS (w.e.f -2019-20)
SEMESTER-II
PAPER – II
CYTOLOGY, GENETICS AND EVOLUTION

Periods : 60 **Max. Marks :100**

Unit - I

1.1 Cytology - I

1.1.1 Electron microscopic structure of cell
1.1.2 Plasma membrane - Fluid mosaic model
Transport functions of plasma membrane
1.1.3 Structure and functions of cell organelles - Endoplasmic reticulum, Golgi body, Ribosomes, Lysosomes and Mitochondria

1.2 Cytology - II

1.2.1 Nucleus
1.2.2 Chromosomes - Structure, types, functions

Unit - II

2.1 Biomolecules

2.1.1 Carbohydrates - Classification of carbohydrates
Structure of glucose
2.1.2 Proteins - Classification of proteins
General properties of amino acids
2.1.3 Lipids - Classification of lipids

2.2 Nucleic acids

2.2.1 Deoxyribo Nucleic Acid - Structure, replication
2.2.2 Ribo Nucleic Acid - Structure, types

Unit - III

3.1 Genetics - I

3.1.1 Mendel's work on transmission on traits
3.1.2 Principles of inheritance
3.1.3 Incomplete dominance and codominance
3.1.4 Lethal alleles, Epistasis, Pleiotropy

Unit - IV

4.1 Genetics - II

4.1.1 Sex determination
4.1.2 Sex linked inheritance
4.1.3 Linkage and crossing over
4.1.4 Extra chromosomal inheritance
4.1.5 Human karyotyping

Unit - V

5.1 Evolution

5.1.1 Origin of life
5.1.2 Lamarckism, Darwinism, Neo - Darwinism
5.1.3 Variations, isolating mechanisms, natural selection
5.1.4 Types of natural selection (directional, stabilising, disruptive)
5.1.5 Artificial selection and forces of evolution
5.1.6 Speciation (Allopatric and Sympatric)
5.1.7 Macro evolutionary principles (Example : Darwin's finches)

Reference Books:

- Genetics by P.K. Gupta Rastogi Publications
- A Text Book of Genetics by Dr. Veer Bala Rastogi
- Genetics by P.S.Varama
- Principles of Genetics by Basu M Hassain
- Text Book of molecular Biology K.Sivaram Sastry,G.Padmanaban, C.Subramanyam
- Cell Biology by C.B. Power
- An introduction to General Biology-B.S.Tomer and Dr. S.P Singh
- Cell Biology by K.G. Purohit
- Cytology, Genetics and Organic evolution by Dr. Ramesh Chand
- Evolution Genetics and Man by T. Dobzhansky
- Organic Evolution by Dr. Veer Bala Rastogi

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
ZOOLOGY PRACTICAL SYLLABUS (w.e.f -2019-20)
SEMESTER-II
PAPER – II
CYTOLOGY, GENETICS AND EVOLUTION

Periods:24 **Max. Marks:50**

I. Cytology
1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis and Meiosis with prepared slides
3. Mounting of salivary gland chromosomes of *Chiranomous*

II. Genetics
1. Study of Mendelian inheritance using suitable examples
2. Study of linkage recombination, gene mapping using the data
3. Study of human karyotypes

III. Evolution
1. Study of fossil evidences
2. Study of homology and analogy from suitable specimens and pictures
3. Phylogeny of horse with pictures
4. Darwin's finches (pictures)
5. Visit to natural history museum and submission of report

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
ZOOLOGY THEORY
INTERNAL MARKS ALLOTMENT

SEMESTER-II
PAPER – II
CYTOLOGY, GENETICS AND EVOLUTION

Zoology Theory- Internal		**Total Marks: 40**
1. Internals (2)	:	10 marks
2. Assignments (2)	:	5x2=10 marks
3. Project	:	10 marks
4. Seminar	:	5 marks
5. Attendance	:	5 marks

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
ZOOLOGY THEORY
EXTERNAL MARKS ALLOTMENT
SEMESTER-II
PAPER – II
CYTOLOGY, GENETICS AND EVOLUTION

Zoology Theory- External **Total Marks: 60**

Section –A

I. Short Answer questions (Any 5 from given 10) 5x4=20
1 to 10

Section –B

II. Essay Questions (With internal choice) 5x8=40

11 to 15

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)

ZOOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-II

PAPER – II

CYTOLOGY, GENETICS AND EVOLUTION

Zoology Practical's - External

Time: 3 hrs.		**Total Marks: 25**
1. Major experiment	:	8 marks
2. Minor experiment	:	6 marks
3. Identification	:	6 marks
4. Viva voce	:	5 marks

Zoology Practical's - Internal

		Total Marks: 25
1. Assessment	:	10 marks
2. Record	:	10 marks
3. Field note book	:	5 marks

Question Paper Blue Print

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)

ZOOLOGY THEORY

SEMESTER-II

PAPER – II

CYTOLOGY, GENETICS AND EVOLUTION

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A Short Questions			Section B Essay Questions		
	NO OF QUESTIONS	MARKS ALLOTED FOR EACH QUESTION	TOTAL MARKS	NO OF QUESTIONS	MARKS ALLOTED FOR EACH QUESTION	TOTAL MARKS
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

Section-A: Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

Section-B: Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

1. Short Questions : 5 x 4 = 20
2. Essay Questions : 5 x 8 = 40

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
ZOOLOGY
SEMESTER-II
PAPER – II
CYTOLOGY, GENETICS AND EVOLUTION

Time: 2½ hrs **Max Marks: 60**

SECTION-A

I. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x4=20**

1. Difference between Prokaryotes and Eukaryotes ప్రోకార్యోటిస్ మరియు యూకరేటిస్ మధ్యగల బేధలు
2. Mycoplasma మైకోప్లాస్మా
3. Lysosomes లైసోజోములు
4. Ribosomes రైబోసోములు
5. Epistatis ఎపిస్టాసిస్
6. Pleiotropy ప్లియోట్రోపి
7. Downs syndrome డౌన్స్ సిండ్రోమ్
8. Colour Blindness వర్ణఅంధత్వం
9. Speciation జాతుల ఉత్పత్తి
10. Hardy Weinberg Law హార్డీ వీన్‌బర్గ్ నియమం

SECTION-B

II. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x8=40**

11. (a) Describe the ultra structure of a Eukaryotic cell
నిజకేంద్రక కణం యొక్క అతి సూక్ష్మ నిర్మాణం వివరించండి

(or)

(b) Give an account on structure and functions of plasma membrane
ప్లాస్మా త్వచం యొక్క నిర్మాణం మరియు విధులను వివరించండి

12. (a) Describe the structure and functions of Endoplasmic Reticulum .
అంతర్జీవద్రవజాలం యొక్క నిర్మాణం మరియు విధులను వివరించండి.

(or)

(b) Give an account of the structure and functions of Nucleus.
కేంద్రకం యొక్క నిర్మాణం మరియు విధుల గురించి తెలియజేయండి.

13. (a) Explain mendals laws of heredity with suitable examples
మెండల్స్ అనువంశిక సూత్రాలను తగిన ఉదాహరణలతో వివరించండి

(or)

(b) Explain Incomplete dominance and Co dominance with examples.
అసంపూర్ణ బహిర్గత్వం మరియు సహ బహిర్గత్వంను ఉదాహరణలతో వివరించండి.

14. (a) What are sex chromosomes ? Explain their role in determination of sex.
లైంగిక ప్రోమోజోమలు అంటే ఏమిటి? లైంగిక నిర్ణయ ప్రోమోజోమలు ఫలితాన్ను వివరించండి.

(or)

(b) Explain about Extra chromosomal inheritance in paramecium.
పారమీషియం నందు కణజీవద్రవ ఆనువంశికత్ గురించి వివరించండి.

15. (a) Write as essay on isolation.
వివకత్ పై వ్యాసం
వ్రాయండి. (or)

b) What is macro evolution? Explain it with adaptive radiation in Darwins finches (birds).
సూల పరిణామం అంటే ఎమిటి? డారివ న్స ఫించ్ స్ (పక్షులు) లో అనుకూల వికిర్ణం గురించి వివరించండి.

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
AQUACULTURE TECHNOLOGY SYLLABUS (w.e.f -2019-20)
SEMESTER-II
PAPER – II
BIOLOGY OF FIN FISH & SHELL FISH

Periods: 60 **Max. marks: 100**

UNIT- I

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.
1-2 Fish, Crustaceans and Molluscs of commercial importance
1-3 Sense organs of fishes, crustaceans and molluscs
1-4 Specialized organs in fishes – electric organ, venom and toxins
1-5 Buoyancy in fishes- swim bladder and mechanism of gas secretion

UNIT-II: FOOD, FEEDING AND GROWTH

2-1 Natural fish food, feeding habits, feeding intensity, stimuli for feeding, utilization of food, 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 regulation, Growth rate measurement – scale method, otolith method, skeletal parts as age indicators
2-3 Genetic, biotic & ecological factors in determining the longevity of fishes, lengthfrequency method, age composition, age-length keys, absolute and specific growth, back calculation of length and growth, annual survival rate, asymptomatic length, fitting of growth curve
2-4 Length-weight relationship, condition factor/Ponderal index, relative condition factor

UNIT-III: REPRODUCTIVE BIOLOGY

3-1 Breeding in fishes, breeding places, breeding habits & places, breeding in natural environment and in artificial ponds, courtship and reproductive cycles
3-2 Induced breeding in fishes
3-4 Breeding in shrimp, oysters, mussels, clams, pearl oyster, pila, freshwater mussel and cephalopods

UNIT – IV: DEVELOPMENT

4-1 Parental care in fishes, ovo-viviparity, oviparity, viviparity, nest building and brooding
4-2 Embryonic and larval development of fishes
4-3 Embryonic and larval development of shrimp, crabs and molluscs of commercial importance
4-4 Environmental factors affecting reproduction and development of cultivable aquatic fin & shell fish

UNIT-V: HORMONES & GROWTH

5-1 Endocrine system in fishes

5-2 Neurosecretary cells, androgenic gland, ovary, Y-organ, chromatophores, pericardial glands and cuticle.
5-3 Molting, molting stages, metamorphosis in crustacean shell fish

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I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
AQUACULTURE TECHNOLOGY SYLLABUS (w.e.f -2019-20)
SEMESTER-II
PAPER – II
BIOLOGY OF FIN FISH & SHELL FISH
PRACTICAL SYLLABUS

Periods: 24 **Max. Marks: 50**

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 and other crustaceans
6. Study of eggs of fishes, shrimps, prawns and other crustaceans
7. Study of oyster eggs
8. Embryonic and larval development of fish
9. Study of gonadal maturity and fecundity in fishes and shellfish
10. Observation of crustacean larvae
11. Observation of molluscan larvae
12. Study of nest building and brooding of fishes

Laboratory record work shall be submitted at the time of practical examination

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, VolI. Invertebrates (eds. Marshal AJ & Williams). ELBS & Mc Millan & Co.

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
AQUACULTURE TECHNOLOGY SYLLABUS (w.e.f -2019-20)
SEMESTER-II
PAPER – II
BIOLOGY OF FIN FISH & SHELL FISH

INTERNAL MARKS ALLOTMENT

Theory- Internal	**Total Marks: 40**	
1. Project	:	10 marks
2. Assignments (2)	:	5x2=10 marks
3. Internals (2) Best of Two	:	10 marks
4. Seminar	:	5 marks
5. Viva voce	:	5 marks

EXTERNAL MARKS ALLOTMENT

Theory- External **Total Marks: 60**

Section –A

I.	Short Answer questions (Any 5 from given 10) 1 to 10	5x4=20

Section –B

II.	Essay Questions (With internal choice) 11 to 15	5x8=40

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
AQUACULTURE TECHNOLOGY SYLLABUS (w.e.f -2019-20)
SEMESTER-II
PAPER – II
BIOLOGY OF FIN FISH & SHELL FISH

PRACTICAL MARKS ALLOTMENT

Practical's - External

Time: 3 hrs. **Total Marks : 25**

1. Identification of mouth/appendages parts	:	6 marks
2. Gut analysis/length-weight relationship/ Study of eggs	:	6 marks
3.Identification/observation (2)	:	5 marks(2x21/2)
4.Record	:	5 marks
5.Viva voce	:	3 marks

Practical's - Internal

Total Marks: 25

1.Assessment including viva voce	:	6 marks
2.Record	:	6 marks
3.Field note book	:	5 marks
4.Project	:	8 marks

Question Paper Blue Print

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
AQUACULTURE TECHNOLOGY SYLLABUS (w.e.f -2019-20)
SEMESTER-II
PAPER – II
BIOLOGY OF FIN FISH & SHELL FISH

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Section A Short Questions			Section B Essay Questions		
	NO OF QUESTIONS	**MARKS ALLOTED**	**TOTAL MARKS**	**NO OF QUESTIONS**	**MARKS ALLOTED**	**TOTAL MARKS**
UNIT -I	02	4	8	02	8	16
UNIT-II	02	4	8	02	8	16
UNIT-III	02	4	8	02	8	16
UNIT-IV	02	4	8	02	8	16
UNIT-V	02	4	8	02	8	16

Section-A: Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered.

Section-B: Questions numbers 11 to 15,

Internal Choice (either / or) and 5 Questions has to be answered.

I. Short Questions : 5 x 4 = 20
II. Essay Questions : 5 x 8 = 40

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc AT.Z.C (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
AQUACULTURE TECHNOLOGY SYLLABUS (w.e.f -2019-20)
SEMESTER-II
PAPER – II

BIOLOGY OF FIN FISH & SHELL FISH

Time: 2½ hrs **Max Marks: 60**

SECTION-A

I. Answer any FIVE of the following
Draw labeled diagrams wherever necessary **5x4=20**

1. Electric organs.
2. Swim bladder in fishes
3. Natural fish food
4. Length-weight relationship
5. Breeding places
6. Induced breeding
7. Nest building
8. Ovo-viviparity
9. Neurosecretary cells
10. Moulting stages.

II. Answer any FIVE of the following: **5x8=40**
Draw labeled diagrams wherever necessary

11. a. Describe general characters of fishes and classify up to class level.
(or)
b. Explain fin fish and shell fish commercial importance.

12. a. Explain different methods to estimate fish age and growth
(or)
b. Explain different factors in fish longevity

13. a. Write an essay on different breeding habitats.
(**or)**
b. Explain Breeding in shrimp

14. a. Describe embryonic and larval development in fishes.
(or)
b. Explain environmental factors effecting on fin fish in reproduction and development.

15. a. Role of Endocrine hormones in fishes.
(or)
b. Describe metamorphosis in crustecean.

Signatures of the Memebers in BOS/Upgradation

1. **Dr. M.VIJAYA KUMAR** **(Chairman)**
   Lecturer in Zoology
   SRR & CVR GDC (A) Vijayawada

2. **Dr.K.VEERAIAH** **(University Nominee)**
   Professsor
   Department of Zoology & Aquaculture
   Acharya Nagarjuna University.
   Guntur.AP

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