SRR & CVR GOVERNMENT DEGREE COLLEGE
(AUTONOMOUS)

MACHAVARAM, VIJAYAWADA-520004

DEPARTMENT OF ZOOLOGY

Minutes of
Up gradation of Syllabus Meeting
(Board of Studies in Zoology)

(2020-21)

Dated : 02/12/2020

Courses

I B.Sc-BZC (Zoology) : Semester I & II (w.e.f-2020-21)
Skill Development Course : **Dairy Technology** (In semester II)
(As per APSCHE and CBCS Pattern Semester System)

II B.Sc-EATZC (Zoology & Aquaculture) : Semester III & IV
II B.Sc-BZC (Zoology) : Semester III
III.B.Sc-BZC & ATZC (Zoology) : Semester III & V
III.B.Sc-ATZC (Aquaculture) : Semester III & V

Subjects:
ZOOLOGY & AQUACULTURE TECHNOLOGY

SYLLABUS, BLUE PRINT & MODEL QUESTION PAPERS

S.R.R. & C.V.R. GOVT. DEGREE COLLEGE

Autonomous & ISO900: 2015 Certified Institution,
NIRF -2020 ranked 101-150 band and NIRF - 2019: 151-200 rank band Institution
NAAC accredited with 'B+' Grade
Machavaram, VIJAYAWADA - 520 004. Krishna District.
Cell : 9440630271 Ph : 0866-2430060, Fax : 0866-2441092, www.srrcvr.org, srrandcvr@gmail.com

MINUTES OF UP GRADATION OF SYLLABUS MEETING
(BOARD OF STUDIES IN ZOOLOGY)

The meeting of the Board of Studies in the subject of **ZOOLOGY** was held on **02nd December 2020** through online mode in Google meet platform from the **Zoology Department** of the college for the up gradation of the syllabus for **B.Sc BZC Zoology subject syllabus for Semester I & II and Skill Development Course- Dairy Technology in semester II as per the new syllabus proposed by APSCHE with CBCS pattern and semester system, II.B.Sc EATZC Zoology and Aquaculture Technology subjects syllabus for Semester III & IV, II.B.Sc BZC Zoology-Semester-III, III.B.Sc Semester III & V –BZC & ATZC-zoology and Aquaculture technology subjects** under the chairmanship of Dr. M.Vijaya Kumar, Head of the Zoology Department.

The following members attended the meeting:

Details of the online platform: Goolge meet

[10:53 AM, 12/2/2020] Mekala Vijaya Kumar: zoologybos2020

Meeting nickname (Can only be used within SRR & CVR Government Degree College (Autonomous), Vijayawada)

Joining info

https://meet.google.com/zvp-vecx-ggn

Dial-in: (US) +1 508-686-7646 PIN: 931 339 766#

M. Vijayakumar

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)**
   Principal,
   SGK Government Degree College,
   Vinukonda,
   Guntur.AP

4. **Dr.N.SREENIVAS** **(Subject Expert)**
   Associate Professor, Dept of Zoology
   PR Govt.(A) College,
   Kakinada.AP

5. **Sri.A. RAGHURAM REDDY** **(Industrial Expert)**
   Proprietor,
   M/s Neelagri Foundation
   Atmakur,
   Guntur

6. **Sri. B.APPALA NAIDU** **(Special Member)**
   Assistant Project Manager-Tilapia Fish Project
   Rajiv Gandhi centre for Aquaculture (RGCA)
   Manikonda

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

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

9. **Sk.Parveen** **(Faculty Member)**
   Lecturer in Zoology
   SRR & CVR GDC (A),
   Vijayawada

AGENDA

1. Approval of the Syllabus, Model Question paper, Blue Print and Question Banks of the following
   - **a.** I. B.Sc BZC Semesters I & II
   - **b.** First year *Skill Development Course*-Dairy Technology of Semester- II
   - **c.** II.B.Sc BZC Semester III Zoology
   - **d.** II B.Sc EATZC Semester III & IV Embedded Aquaculture Technology (EATZC-Aquaculture Technology & Zoology).
   - **e.** III B.Sc Semester V–BZC & ATZC Zoology & Aquaculture Technology.

2. Approval of the duration of the Examination for 3 hours.
3. Approval of the Syllabus, Model Question paper, Blue Print and Question Bank of the Semester- II for Skill Development Course- Paper-Dairy Technology.
4. Approval of the stipulated Credits, Work Load, Internal Marks breakup etc...
5. Approval of Online Examination pattern in case COVID 19 doesn't subside at the time of Examinations (MCQs Pattern).

The Chairperson of the Board of Studies welcomed the members and initiated discussion on the Agenda. He apprised the members about the guidelines of the UGC, APSCHE, Krishna University 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:

The members of the BOS resolved

RESOLUTIONS

1. Resolved to approve the syllabus for I.B.Sc BZC Zoology subject for Semester I & II as per the new syllabus proposed by APSCHE and CBCS Pattern Semester System with effect from 2020-21.
2. Resolved to approve the syllabus for first year Skill Development Course- Paper Title- Dairy Technology in semester II as per the new syllabus APSCHE and CBCS Pattern Semester System with effect from 2020-21.
3. Resolved to adopt the same syllabus as approved in the previous BOS for II B.Sc-BZC-zoology for semester III, and approve the syllabus for II B.Sc Embedded Aquaculture Technology- EATZC, Zoology and Aquaculture Technology subjects for Semester III & IV.
4. Resolved to approve the syllabus as approved in the previous BOS syllabus for III. B.Sc-ATZC, Zoology and Aquaculture Technology subjects syllabus for Semester V
5. Resolved to approve the Model Question paper, Blue Print and Question Bank for the above approved syllabus.
6. Resolved to approve Online Examination pattern in case COVID 19 doesn't subside at the time of Examinations (MCQs Pattern).

7. Resolved to approve the duration of the Examination for 3 hours.
8. Resolved to approve the division of marks for internal and external examination along with the suggested blue print and model paper.
9. Resolved to approve the division of 100 marks into two components for Theory, External 60 Marks as Section-A consisting 20 Marks with Short Answer questions (Any 5 from given 10), Section-B consisting 40Marks with Essay Questions (Any 5 with internal choice from given 10)
10. Resolved to approve the division of Internal 40Marks to evaluate Internal Assessment as Two Internal exams for 10 marks, Two Assignments for 10 marks, Project work for 10 marks, Seminar for 05 marks and Attendance for 05 marks for Total of 40 marks
11. The pass mark is 40% i.e., 24 out of 60 for External and 16 out of 40 for Internal.
12. Resolved to approve the division of 50 marks into two components for Practicals, External 25 Marks as Major Experiment for 8 marks, Minor experiment for 4 marks, Identification for spotters for 8 marks, Viva voce for 5 marks.
13. Resolved to approve the division of Internal 25 Marks as Assessment for 10 marks, Record for 10 marks, Field note book for 5 marks
14. The pass mark is 40% i.e., 10 out of 25 for each External and Internal.
15. Resolved to approve the skill development course evaluation for 50 marks at the end of the semester II. The pass mark to be 40% i,e., 20marks out of 50 marks.
16. Resolved to conduct Bridge Course for one week to the newly joined first year students.
17. Resolved to use Virtual class room, ICT, Computer/Internet assisted learning for students regularly for teaching learning process.
18. Resolved to conduct student centric activities like Quiz, Group discussion etc
19. Resolved to arrange Field trips Surveys, Society outreach programmes etc.
20. Resolved to conduct Guest Lectures, Student Seminars, Study Projects etc
21. Resolved to give Assignments in the form of Critical, Innovative, Text book and Internet based.
22. Resolved to use Learning Management System LMS developed by CCE, AP
23. Resolved to advise the entire Faculty to apply for financial assistance to conduct Seminars/Workshops/Conferences /MRP's, etc.,
24. Resolved to approve the list of paper setters and examiners submitted by the department
25. Resolved to approve certificate course in vermicomposting.

26. Resolved to **delete** the following topics

a. Paper-I-Animal Diversity – Biology of Non Chordates
Unit-IV, Evolution of Coelom and Coelomoducts
b. Paper-II-Animal Diversity – Biology of Chordates
Unit-III, Skull in reptiles

27. Resolved to include the following **<u>Additional Inputs</u>** -

a. Paper-I-Animal Diversity – Biology of Non Chordates
Unit-I, 8 Deadly Diseases in Human History (Corona, Ebola, Dengue, Hantavirus, Meningitis, SARS, Influenza, Bird Flu)
Unit-IV, Apiculture
b. Paper-II-Animal Diversity – Biology of Chordates
Unit-III, Ecological importance of reptiles and amphibians
Unit-V, Structural and Functional Adaptations of mammals
c. Paper-III-Cytology, genetics and Evolution
Unit-III, Multiple Alleles- Blood groups in man
d. Paper-V-Animal Biotechnology
Unit-V, Prebiotics and Probiotics
e. Paper-VI-Animal Husbandry
Unit-V, Piggery

PROGRAMME: B.Sc. B.Z.C

(Zoology)

(With effect from 2020-21 Academic Year)

Programme Educational Objectives (PEOs):

- **PEO1Higher Education**: Empower students to pursue higher studies in various fields of Biology and Chemistry.
- **PEO2Career**: Enable students to pursue careers in Chemical, Biological and related fields as demonstrated by professional success at positions within industry, government, or academia.
- **PEO3Social responsibility**: Enable students to exhibit professionalism, ethical attitude, communication skills and team work in their profession.

Program Outcomes (POs):

The Learning Outcomes of the programme could be in consonance with the Bloom's Taxonomy, which includes –

1. Remember (Lower order)
2. Understand (Lower Order)
3. Apply (Lower Order)
4. Analyze (Higher Order)
5. Evaluate& Problem Solving (Higher Order)
6. Create (Higher Order)

PO1Critical thinking: Able to understand and utilize the principles of scientific enquiry, think analytically, clearly and evaluate critically while solving problems and making decisions during biological study.

PO2Effective communication: Able to formally communicate Scientific ideas and investigations of the biology discipline to others using both oral and written communication skills.

PO3Social interaction: Able to develop individual behavior and influence society and social structure.

PO4Effective citizenship: Able to work with a sense of responsibility towards social awareness and follow the ethical standards in the society.

PO5Ethics: Ability to demonstrate and discuss ethical conduct in scientific activities.

PO6Environment and Sustainability: Able to understand the impact of biological science in societal and environmental contexts and demonstrate the knowledge for sustainable development.

PO7Self-directed and life-long learning: Able to recognize the need of life-long learning and engage in research and self-education

GENERAL CURRICULAR ACTIVITIES

- **Lecturer-based**:

1) **Class-room activities**: Organization of Group discussions, question-answer sessions, scientific observations, use of audio-visual aids, guidance programmes, examination and evaluation work (scheduled and surprise tests), quizzes, preparation of question banks, student study material, material for PG entrance examinations etc.
2) **Library activities**: Reading books and magazines taking notes from prescribed and reference books and preparation of notes on lessons as per the syllabus; Reading journals and periodicals pertaining to different subjects of study; Making files of news-paper cuttings etc.
3) **Lab activities**: Organization of practical's, maintenance of lab attendance registers/log registers, maintenance of glassware and chemicals
4) **Activities in the Seminars, workshops and conferences**: Organization of at least one seminar/workshop/conference per academic year either on academic/research aspects and inculcate research spirit among students
5) **Research activities**: Student study projects (General / RBPT model), Minor or Major research projects, Research guidance to research scholars, Publication of research articles/papers (at least one in 2 years) in UGC-recognized journals, Registration in Vidwan/Orcid/Scopus/Web of Science
6) **Smart Classroom Activities**: Organization of Departmental WhatApp groups, Ed Modo groups/Google Class Rooms/Adobe Spark groups for quick delivery of the subject; Preparation of Moocs content & presentation tube lessons by trained lecturers; Using smart/digital/e- class rooms (mandarory) wherever present; Utilization of youtube videos (subject to copy rights) etc.

- **Student-based**:

1) **Class-room activities**: Power point presentations, seminars, assignments
2) **Library activities**: Visit to library during library hour and preparation of notes
3) **Lab activities**: Maintenance of observation note book and record, keeping lab clean and tidy
4) **Activities in the Seminars, workshops and conferences**: Participation/presentation in seminar/workshop/conference

CO-CURRICULAR ACTIVITES

OBJECTIVES:

The co-curricular activities are aimed at strengthening the theoretical knowledge with an activity related to the content taught in the class room. For aesthetic development, character building, spiritual growth, physical growth, moral values, creativity of the student.

The different types of co-curricular activities relevant to Zoology domain are listed below:

- **Academic - based**

- Preparation of Charts/Clay or Thermocol Models
- Debates, Essay Writing Competitions
- Group Discussions
- Departmental (Zoology) magazine
- Formation of Book clubs
- Animal album-making
- Viva-Voce

- **Lab/Research –based**

- Digital dissections
- Field Visit/Excursions/Zoological Tours and submission of report
- Training at research centers (aquaculture/apiculture/sericulture etc.)
- Exposure to scientific instruments and hands-on experience

- **Value - based**

- Organization of first-aid camp, swachbharat, cleanliness week, girl-child importance, Nutrition and health awareness etc.

- **Observation of Days of National/International Importance**

World Cancer Day (February 4th)	International Biological Diversity Day (May 22nd)
Darwin Day (February 12th)	World Turtle Day (May 23rd)
National Science Day (Feb 28th)	World blood Donor Day (June 14th)
World Wildlife day (March 3rd)	World Zoonoses Day (July 6th)
National Vaccination Day (March 16th)	World Mosquito Day (August 20th)
World Health Day (April 7th)	World Turtle Day (May 23rd)
Earth Day (April 22nd)	World Mosquito Day (August 20th)
Malaria Day (April 25th)	World Animal day (October 4th)
World Hepatitis Day (May 19th)	World Immunization Day (November 10th)

Structure of ZOOLOGY Syllabus with credits

(Under CBCS for B.Sc. Programme)

YEAR	SEM	PAPER	TITLE	MARKS (100)		CREDITS
				MID SEMESTER	END SEMESTER	
I	I	I	Animal Diversity – I- Biology of Non-Chordates	40	60	04
			Practical – I	25	25	01
	II	II	Animal Diversity – II- Biology of Chordates	40	60	04
			Practical – II	25	25	01

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

I B.Sc BZC

ZOOLOGY SYLLABUS

(w.e.f. 2020-21)

SEMESTER I

PAPER – I: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES

HOURS: 60 **Max. Marks: 100**

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

CO1: Describe general taxonomic rules on animal classification

CO2: Classify Protozoa to Coelenterata with taxonomic keys

CO3: Classify Phylum Platyhelminthes to Annelida phylum using examples from parasitic adaptation and vermin composting

CO4: Describe Phylum Arthropoda to Mollusca using examples and importance of insects and Molluscans

CO5: Describe Echinodermata to Hemichordata with suitable examples and larval stages in relation to the phylogeny

Learning objectives:

1. To understand the taxonomic position of protozoa to helminthes.
2. To understand the general characteristics of animals belonging to protozoa to hemichordata.
3. To understand the structural organization of animals phylum from protozoa to hemichordata.
4. To understand the origin and evolutionary relationship of different phyla from protozoa to hemichordata.
5. To understand the origin and evolutionary relationship of different phylum from annelids to hemichordates.

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

I B.Sc BZC

ZOOLOGY SYLLABUS

(w.e.f. 2020-21)

SEMESTER I

PAPER – I: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES

HOURS: 60 **Max. Marks: 100**

UNIT I

1.1 Principles of Taxonomy – Binomial nomenclature – Rules of nomenclature

1.2 Whittaker's five kingdom concept and classification of Animal Kingdom.

Phylum Protozoa

1.3 General Characters and classification of protozoa up to classes with suitable examples

1.4 Locomotion, nutrition and reproduction in Protozoans

1.5 *Elphidium* (type study)

- **Additional Input:** 8 Deadly Diseases in Human History (Corona, Ebola, Dengue, Hantavirus, Meningitis, SARS, Influenza, Bird Flu)

UNIT –II

Phylum Porifera

2.1 General characters and classification up to classes with suitable examples

2.2 Skeleton in Sponges

2.3 Canal system in sponges

Phylum Coelenterata

2.4 General characters and classification up to classes with suitable examples

2.5 Metagenesisin *Obelia*

2.6 Polymorphism in coelenterates

2.7 Corals and coral reefs

Phylum Ctenophora :

2.8 General Characters and Evolutionary significance (affinities)

Unit – III

Phylum Platyhelminthes

3.1 General characters and classification up to classes with suitable examples

3.2 Life cycle and pathogenecity of *Fasciola hepatica*

3.3 Parasitic Adaptations in helminthes

Phylum Nemathelminthes

3.4 General characters and classification up to classes with suitable examples

3.5 Life cycle and pathogenecity of *Ascarislumbricoides*

Unit – IV

Phylum Annelida

4.1 General characters and classification up to classes with suitable examples

4.2 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

Phylum Arthropoda

4.4 General characters and classification up to classes with suitable examples

4.5 Vision and respiration in Arthropoda

4.6 Metamorphosis in Insects

4.7 *Peripatus* - Structure and affinities

4.8 Social Life in Bees and Termites

- **Additional Input:** Apiculture

Unit – V

Phylum Mollusca

5.1 General characters and classification up to classes with suitable examples

5.2 Pearl formation in Pelecypoda

5.3 Sense organs in Mollusca

Phylum Echinodermata

5.4 General characters and classification up to classes with suitable examples

5.5 Water vascular system in star fish

5.6 Larval forms of Echinodermata

Phylum Hemichordata

5.7 General characters and classification up to classes with suitable examples

5.8 *Balanoglossus* - Structure and affinities

Co-curricular activities (suggested)

- Preparation of chart/model of phylogenic tree of life, 5-kingdom classification, *Elphidium* life cycle etc.
- Visit to Zoology museum or Coral island as part of Zoological tour
- Charts on life cycle of *Obelia*, polymorphism, sponge spicules
- Clay models of canal system in sponges
- Preparation of charts on life cycles of *Fasciola* and *Ascaris*
- Visit to adopted village and conducting awareness campaign on diseases, to people as part of Social Responsibility.
- Plaster-of-paris or Thermocol model of *Peripatus*
- Construction of a vermicompost in each college, manufacture of manure by students and donating to local farmers
- Models of compound eye, bee hive and terminarium (termitaria) by students
- Visit to apiculture centre and short-term training as part of apprenticeship programme of the govt. Of Andhra Pradesh
- Chart on pearl forming layers using clay or Thermocol
- Visit to a pearl culture rearing industry/institute
- Live model of water vascular system
- Phylogeny chart on echinoderm larvae and their evolutionary significance
- Preparation of charts depicting the feeding mechanism, 3 coeloms, tornaria larva etc., of *Balanoglossus*

REFERENCE BOOKS

1. **L.H. Hyman** '*The Invertebrates' Vol I, II and V.* – M.C. Graw Hill Company Ltd.
2. **Kotpal, R.L. 1988 - 1992** Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
3. **E.L. Jordan and P.S**. Verma '*Invertebrate Zoology'* S. Chand and Company.
4. **R.D. Barnes** '*Invertebrate Zoology'* by: W.B. Saunders CO., 1986.
5. **Barrington. E.J.W**., '*Invertebrate structure and Function'* by ELBS.
6. **P.S. Dhami and J.K. Dhami.** Invertebrate Zoology. S. Chand and Co. New Delhi.
7. **Parker, T.J. and Haswell**'*A text book of Zoology'* by, W.A., Mac Millan Co. London.
8. **Barnes, R.D. (1982).** *Invertebrate Zoology*, V Edition"

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

I B.Sc BZC

ZOOLOGY PRACTICAL SYLLABUS

SEMESTER-I

PAPER – I

ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

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

Learning Outcomes:

1. To understand the importance of preservation of museum specimens
2. To identify animals based on special identifying characters
3. To understand different organ systems through demo or virtual dissections
4. To maintain a neat, labeled record of identified museum specimens

Syllabus :

1. **Study of museum slides / specimens / models (Classification of animals up to orders)**
   Protozoa: Amoeba, *Paramoecium, Paramoecium Binary fission and Conjugation, Vorticella, Entamoebahistolytica, Plasmodium vivax*
   Porifera: *Sycon, Spongilla, Euspongia, Sycon*- T.S & L.S, Spicules, Gemmule
   Coelenterata: *Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatula*v.
   Platyhelminthes: *Planaria, Fasciola hepatica, Fasciola*larval forms – Miracidium, Redia, Cercaria, *Echinococcusgranulosus, Taeniasolium, Schistosomahaematobium*vii.
   Nemathelminthes: *Ascaris(Male & Female), Drancunculus, Ancylostoma, Wuchereria*
   Annelida: *Nereis, Aphrodite, Chaetopteurs, Hirudinaria,* Trochophore larva
   Arthropoda: Cancer, Palaemon**,** Scorpion, *Scolopendra, Sacculina, Limulus, Peripatus,* Larvae - Nauplius, Mysis, Zoea, Mouth parts of male &female *Anopheles* and *Culex,* Mouthparts of Housefly and Butterfly. xiii.
   Mollusca: *Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus,* Glochidium larva
   Echinodermata: *Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon,* Bipinnaria larva
   Hemichordata: *Balanoglossus,* Tornaria larva
2. **Dissections:**
   1 Prawn: Appendages, Digestive system, Nervous system, Mounting of Statocyst
   2 Insect Mouth Parts
   3 Laboratory Record work shall be submitted at the time of practical examination
   4 An **"Animal album**" containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose
   5 Computer - aided techniques should be adopted or show virtual dissections

RFERENCE MANUALS:

1. Practical Zoology- Invertebrates S.S. Lal
2. Practical Zoology - Invertebrates P.S. Verma
3. Practical Zoology - Invertebrates K.P. Kurl
4. Ruppert and Barnes (2006) Invertebrate Zoology,8th Edition, Holt Saunders International Edition

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

I B.Sc (B.Z.C) ZOOLOGY THEORY

INTERNAL MARKS ALLOTMENT

SEMESTER-I

PAPER – I

ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

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

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

I B.Sc (B.Z.C) ZOOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

SEMESTER-I

PAPER – I

ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

Time: 3 Hours **Total Marks: 60**

Zoology Theory- External

Section –A

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

Section –B

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

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

I B.Sc (B.Z.C) ZOOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-I

PAPER – I

ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

Zoology Practical's - External

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

1. Major dissection demonstration only (Identification-2M; Diagram-3M; Labelling-3M)	:	8 marks
2. Mounting (2)/Minor dissection (1)	:	4 marks (2+2)
3. Identification (2)	:	5 marks (2x2 1/2)
4. Record	:	5 marks
5. Viva voce	:	3 marks

Zoology 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 (B.Z.C) ZOOLOGY THEORY

SEMESTER-I

PAPER – I

ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

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: Short Questions : 5 x 4 = 20

Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

Section-B: Essay Questions : 5 x 8 = 40

Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc (B.Z.C) ZOOLOGY (w.e.f -2017-18)
SEMESTER-I
PAPER – I
ANIMAL DIVERSITY - BIOLOGY OF NONCHORDATES

Time: 3Hrs **Max Marks: 60**

SECTION-A

I. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x4=20**
ఈ కొందరి ప్రశ్నలలో నుండి ఐదు ప్రశ్నలకు సమాధానలు వ్రయుండి అవసరమగు చోట పటము సహాయింతో
వివరింప్ుము.

1. Binomial nomenclature
2. Nutrition in Protozoa
3. General characters of ctenophore
4. Fringing Reef
5. Parasitic adaptations in Helminthes
6. General characters of Nematyhelminthes
7. Oligocheata
8. Vision in Arthropoda
9. Bipinnaria
10. Structure of Balanoglossus

SECTION-B

II. Answer any FIVE of the following
Draw labeled diagram wherever necessary **5x8=40**
ఈ కొందరి ప్రశ్నలలో నుండి ఐదు ప్రశ్నలకు సమాధానలు వ్రయుండి అవసరమగు చోట పటము సహాయింతో
వివరింప్ుము.

11. (a) Write an essay on Whittaker's five kingdom concept .

(OR)

(b). Describe the Lifecycle of Elphidium

12. (a) Explain the Canal system in Sponges.

(OR)

(b).Write an essay on Polymorphism in coelenterate.

13. (a) Describe the Lifecycle of Fasciola hepatica

(OR)

(b) Describe the Lifecycle of Enterobius vermicularis

14. (a) Write an essay on Vermiculture

(OR)

(b). Explain the structure and affinities of Peripatus

15. (a) Explain the process ofpearl formation in Pelycepoda

(OR)

(b) Describe the water vascular system in starfish.

****

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

I B.Sc BZC

ZOOLOGY SYLLABUS

(w.e.f. 2020-21)

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

HOURS :60 **Max. Marks:100**

Course Outcomes:

By the completion of the course the graduate should able to -

CO1: Describe general taxonomic rules on animal classification of chordates

CO2: Classify Protochordata to Mammalia with taxonomic keys

CO3: Understand Mammals with specific structural adaptaions

CO4: Understand the significance of dentition and evolutionary significance

CO5: Understand the origin and evolutionary relationship of different phyla from Prochordata to mammalia.

Learning objectives:

1. To understand the animal kingdom .
2. To understand the taxonomic position of Protochordata to Mammalia.
3. To understand the general characteristics of animals belonging to Fishes to Reptilians.
4. To understand the body organization of Chordata.
5. To understand the taxonomic position of Protherian mammals.

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

I B.Sc BZC

SEMESTER-II

PAPER – II: ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

HOURS: 60 **Max. Marks: 100**

Unit - I

1.1 General characters and classification of Chordata upto classes
1.2 Protochordata- Salient features of Cephalochordata , Affinities of Cephalochordata.
1.3 Salient features of Urochordata
1.4 Structure and life history of *Herdmania*
1.5 Retrogressive metamorphosis –Process and Significance

Unit - II

2.1 Cyclostomata, General characters, Comparison of*Petromyzon* and *Myxine*
2.2 Pisces : General characters of Fishes
2.3 *Scoliodon*: External features, Digestive system, Respiratory system, Structure and function of Heart, Structure and functions of the Brain.
2.4 Migration in Fishes
2.5 Types of Scales
2.6 Dipnoi

Unit - III

3.1 General characters of Amphibia
3.2 Classification of Amphibiaup to orders with examples.
3.3 *Ranahexadactyla*: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and functions of the Brain
3.4 Reptilia: General characters of Reptilia, Classification of Reptilia upto orders withexamples
3.5 *Calotes*:External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain
3.6 Identification of Poisonous snakes

- **Additional Inputs:** Ecological importance of reptiles and amphibians

Unit - IV

4.1 Aves General characters of Aves
4.2 *Columba livia*: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain
4.3 Migration in Birds
4.4 Flight adaptation in birds

Unit - V

5.1 General characters of Mammalia
5.2 Classification of Mammalia upto sub - classes with examples
5.3 Comparision of Prototherians, Metatherians and Eutherians
5.4 Dentition in mammals

- **Additional Inputs:** Structural and Functional Adaptations of Mammals

Co-curricular activities (suggested)

- Preparation of charts on Chordate classification (with representative animal photos) and retrogressive metamorphosis
- Thermocol or Clay models of Herdmania and Amphioxus
- Visit to local fish market and identification of local cartilaginous and bony fishes
- Maintaining of aquarium by students
- Thermocol model of fish heart and brain
- Preparation of slides of scales of fishes
- Visit to local/nearby river to identify migratory fishes and prepare study notes
- Preparation of Charts on above topics by students (Eg: comparative account of vertebrate heart/brain/lungs, identification of snakes etc.)
- Collecting and preparation of Museum specimens with dead frogs/snakes/lizards etc., and/or their skeletons
- Additional input on types of snake poisons and their antidotes (student activity).
- Collection of bird feathers and submission of report on Plumology
- Taxidermic preparation of dead birds for Zoology museum
- Map pointing of prototherian and metatherian mammals
- Chart preparation for dentition in mammals

REFERENCE BOOKS

1. J.Z. Young, 2006. The life of vertebrates. (The Oxford University Press, New Delhi). 646 pages. Reprinted
2. Arumugam, N. Chordate Zoology, Vol. 2. SarasPlublication. 278 pages. 200 figs.
3. A.J. Marshall, 1995. Textbook of zoology, Vertebrates. (The McMillan Press Ltd., UK). 852 pages. (Revised edition of Parker &Haswell, 1961).
4. M. EkambaranathaAyyar, 1973. A manual of zoology. Part II. (S. ViswanathanPvt. Ltd., Madras).
5. P.S. Dhami& J.K. Dhami, 1981. Chordate zoology. (R. Chand & Co.). 550 pages.
6. Gurdarshan Singh & H. Bhaskar, 2002. Advanced Chordate Zoology. Campus Books, 6 Vols., 1573 pp., tables, figs.
7. A.K. Sinha, S. Adhikari& B.B. Ganguly, 1978. Biology of animals. Vol. II. Chordates. (New Central Book Agency, Calcutta). 560 pages.
8. R.L.Kotpal, 2000. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut). 632 pages.
9. E.L. Jordan & P.S. Verma, 1998. Chordate zoology. (S. Chand & Co.). 1092 pages.
10. G.S. Sandhu, 2005. Objective Chordate Zoology. Campus Books, vii, 169 pp.
11. Sandhu, G.S. & H. Bhaskar, H. 2004. Textbook of Chordate Zoology. Campus Books, 2 vols., xx, 964 p., figs.
12. Veena, 2008. Lower Chordata. (Sonali Publ.), 374 p., tables, 117 figs.

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

I B.Sc BZC

ZOOLOGY PRACTICAL SYLLABUS

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY - BIOLOGY OF CHORDATES

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

Learning Outcomes:

- To understand the taxidermic and other methods of preservation of chordates
- To identify chordates based on special identifying characters
- To understand internal anatomy of animals through demo or virtual dissections, thus directing the student for "empathy towards the fellow living beings"
- To maintain a neat, labeled record of identified museum specimens

OBSERVATION OF THE FOLLOWING SLIDES / SPOTTERS / MODELS

1. Protochordata :*Herdmania, Amphioxus, Amphioxus* T.S through pharynx.
2. Cyclostomata :*Petromyzon and Myxine.*
3. Pisces : *Pristis, Torpedo, Hippocoampus ,Exocoetus, Echeneis, Labeo, Catla, Clarius,Channa, Anguilla*.
4. Amphibia :*Ichthyophis, Amblystoma, Axolotl larva, Hyla,*
5. Reptilia: *Draco, Chamaeleon, Uromastix,,Testudo, Trionyx, Russels viper, Naja,* Krait, *Hydrophis, Crocodile.*
6. Aves : *Psittacula, Eudynamis, Bubo, Alcedo.*
7. Mammalia: *Ornithorhynchus,Pteropus,Funambulus.*

Dissections-

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

Note:

1. Dissections are to be demonstrated only by the faculty or virtual.
2.Laboratory Record work shall be submitted at the time of practical examination.

REFERENCE BOOKS:

1. S.S.Lal, Practical Zoology – Vertebrata
2. P.S.Verma, A manual of Practical Zoology – Chordata

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

I B.Sc (B.Z.C) ZOOLOGY THEORY

INTERNAL MARKS ALLOTMENT

SEMESTER-II
PAPER – II
ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

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

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

I B.Sc (B.Z.C) ZOOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

Time: 3 Hours **Total Marks: 60**

Zoology Theory- External

Section –A

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

Section –B

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

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

I B.Sc (B.Z.C) ZOOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY - BIOLOGY OF CHORDATES

Zoology Practical's - External

Time: 3 hrs.		**Total Marks: 25**
1. Major dissection demonstration only (Identification-2M; Diagram-3M; Labelling-3M)	:	8 marks
2. Mounting (2)/Minor dissection (1)	:	4 marks (2+2)
3. Identification (2)	:	5 marks (2x2 1/2)
4. Record	:	5 marks
5. Viva voce	:	3 marks

Zoology 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 (B.Z.C) ZOOLOGY THEORY

SEMESTER-II

PAPER – II

ANIMAL DIVERSITY - BIOLOGY OF CHORDATES

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: Short Questions : 5 x 4 = 20

Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

Section-B: Essay Questions : 5 x 8 = 40

Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
I B.Sc (B.Z.C) ZOOLOGY
SEMESTER-II
PAPER – II
ANIMAL DIVERSITY- BIOLOGY OF CHORDATES

Time:3 Hrs **Max Marks: 60**

SECTION-A

I. Answer any FIVE of the following **5x4=20**
Draw labeled diagrams wherever necessary
ఈ క్రింది ప్రశ్నలలో నుండి ఐదు ప్రశ్నలకు సమాధానలు వ్రయుండి అవసరమగు చోట పటము సహాయింతో
వివరింపుము.

1. Structure of *Amphioxus*
2. General charters of prochordata
3. Placoid scale
4. Dipnoi
5. Apoda
6. Anapsida
7. Quill feather
8. Ratitae
9. Prototheria
10. General characters of mammals

II. Answer any FIVE of the following: **5x8=40**
Draw labeled diagrams wherever necessary
ఈ క దిి ప్రశ్నలలో నుండి ఐదు ప్రశ్నలకు సమాధానలు వ్రయుండి అవసరమగు చోట పటము సహాయింతో
వివరింపుము.

11. a. Explain the life history of Herdmania

OR

b. Explain the general characters of chordata

12. a. Compare the characters of *Petromyzon* and *Myxine*

OR

b. Describe the structure of heart of *Scoliodon*

13. a. Describe the digestive system of *Rana hexadactyla*

OR

b. Describe the identifications of poisonous snakes

14. a. Write an essay on flight adaptations in birds

OR

b. Explain the respiratory system of *Columba livia*

15. a. Compare the characters of Metatheria and Eutheria

OR

b. Write an essay on dentition in mammals

****

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

SKILL DEVELOPMENT COURSE
ZOOLOGY STREAM
SEMESTER-II
PAPER: 2SDS3
DAIRY TECHNOLOGY
SYLLABUS
B.A/B.Com/B.Sc

(As part of skill development courses under CBCS framework with effect from 2020-2021)

Total Hours: 30 (02h/wk)
Credits: 02
Max Marks: 50 Marks

LEARNING OUTCOMES:

After successful completion of the course, students will be able to;

1. Understand the pre-requisites for starting a Dairy farm
2. Recognize different breeds of Cows & buffaloes following safety precautions.
3. Prepare and give recommended feed and water for livestock
4. Maintain health of livestock along with productivity
5. Vaccination of cattle, nutrients requirements
6. Entrepreneurship i.e., effectively market dairy products
7. Ensure safe and clean dairy farm and Standard safety measures to be taken in establishing am industry
8. Efficiently start and manage to establish or develop a Dairy Industry

SYLLABUS

UNIT No	TOPIC	No. of Hours
UNIT-I	**Introduction and Establishment of a Dairy Farm** 1.1 Dairy development in India – Dairy Cooperatives (NDRI, NDDB, TCMPF)(1hr) 1.2 Constraints of Present Dairy Farming and Future Scope of Dairy Farmer.(1 hr) 1.3 Selection of site for dairy farm; Systems of housing – Loose housing system, Conventional Dairy Farm; Records to be maintained in a dairy farm. (2 hrs)	**05**

UNIT-II	**Livestock Identification and Management** 2.1 Breeds of Dairy Cattle and Buffaloes – Identification of Indian cattle and buffalo breeds and Exotic breeds; Methods of selection of Dairy animals. (5 hrs) 2.2 Systems of inbreeding and crossbreeding. (2 hrs) 2.3 Weaning of calf, Castration, Dehorning, Deworming and Vaccination programme (3 hrs) 2.4 Care and management of calf, heifer, milk animal, dry and pregnant animal, bulls and bullocks. (3 hrs)	**13**
UNIT-III	**Feed Management, Dairy Management, Cleaning and Sanitation** 3.1 Basic Principles of Feed, Important Feed Ingredients, Feed formulation and Feed Mixing(2 hrs) 3.2 Operation Flood –Definition of Milk and Nutritive value of milk and ICMR recommendation of nutrients –Per Capita Milk production and availability in India and Andhra Pradesh -Methods of Collection and Storage of Milk–Labelling and Storage of milk products (4 hrs) 3.3 Cleaning and sanitation of dairy farm – Safety precautions to prevent accidents in an industry. (2 hrs)	**8**
Co-curricular Activities suggested	1. Group discussion & SWOT analysis 2. Visit to a Dairy Farm 3. Visit to Milk Cooperative Societies 4. Visit to Feed Milling Plants 5. Market Study and Identification of Government Schemes, Insurance and Bank Loans in relation to dairy farming	**4**

Reference books:

1. Dairy Science: Petersen (W.E.) Publisher – Lippincott & Company
2. Principles and practices of Dairy Farm –Jagdish Prasad
3. Text book of Animal Husbandry - G C Benarjee
4. Hand book of Animal Husbandry - ICAR Edition
5. Outlines of Dairy Technology – Sukumar (De) – Oxford University press
6. Indian Dairy Products – Rangappa (K.S.) & Acharya (KT) – Asia Publishing House.
7. The technology of milk Proceesing – Ananthakrishnan, C.P., Khan, A.Q. and Padmanabhan, P.N. – Shri Lakshmi Publications.
8. Dairy India 2007, Sixth edititon
9. Economics of Milk Production – Bharati Pratima Acharya Publishers.
10. http://www.asci-india.com/BooksPDF/Dairy%20Farmer%20or%20Entrepreneur.pdf
11. https://labour.gov.in/industrial-safety-health

Question Paper Blue Print

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

SKILL DEVELOPMENT COURSE
ZOOLOGY STREAM
SEMESTER-II
PAPER-2SDS3
DAIRY TECHNOLOGY
B.A/B.Com/B.Sc
(As part of skill development courses under CBCS framework with effect from 2020-2021)

Total Hours: 30 (02h/wk)
Credits: 02
Max Marks: 50 Marks

BLUE PRINT MODEL FOR EXTERNAL EXAMINATIONS

	Essay Questions		
	No of questions	**Marks allotted**	**Total marks**
UNIT-I	02	10	20
UNIT-II	05	10	50
UNIT-III	03	10	30

Essay Questions: Questions numbers 1 to 10,

Out of 10 Questions 5 has to be answered: 5 x 10 = 50

Total Max Marks : 50 Marks

Model Question Paper

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

SKILL DEVELOPMENT COURSE
ZOOLOGY STREAM
SEMESTER-II
PAPER-2SDS3
DAIRY TECHNOLOGY
B.A/B.Com/B.Sc

Time:1½ Hrs **Max Marks: 50**

SECTION-B

5**X10 =50 Marks**

Answer any FIVE Questions. Each answer carries 10 marks

1. Explain two methods of systems of housing of dairy animals.

2. Write about NDRI and NDDB

3. Explain the methods of selection of Dairy animals

4. Explain about Inbreeding and Crossbreeding in cattle

5. Write about Deworming and Vaccination programmes followed in dairy farms

పాడి క్షేత్రాలలో అనుసరించే డ్రైవర్మింగ్ మరియు టీకా కార్యక్రమాల గురించి వ్రాయండి.

6. Write about care and management of Calf and milk animals .

దూడ మరియు పాలు ఇచ్చే జంతువుల సంరక్షణ మరియు నిర్వహణ గురించి వ్రాయండి.

7. Write about care and management taken for bulls and bullocks

8. Explain different methods of collection of milk.

9. Give an account of feed ingredients and feed management required for dairy animals.

10. Write about cleaning and sanitation following in dairy farms

******

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)
ZOOLOGY SYLLABUS
SEMESTER-III
PAPER – III
EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

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

Unit - I

1.1 Developmenal Biology and Embryology

1.1.1 Gametogenesis
1.1.2 Fertilisation
1.1.3 Types of eggs
1.1.4 Types of cleavages

1.2 Development of Frog upto formation of primary germ layers

1.3 Formation and functions of Foetal membrane in chick embryo

1.4 Development, types and functions of Placenta in mammals

Unit - II

2.1 Physiology - I

2.1.1 Elementary study of process of digestion
2.1.2 Absorption of digested food
2.1.3 Respiration - Pulmonary ventilation, transport of oxygen and carbondioxide
2.1.4 Circulation - Structure and functioning of heart, Cardiac cycle
2.1.5 Excretion - Structure of nephron, urine formation, counter current mechanism

Unit - III

3.1 Physiology - II

3.1.1 Nerve impulse transmission - Resting membrane potential, origin and propogation of action potentials along myelinated and non myelinated nerve fibres
3.1.2 Muscle contraction - Ultra structure of muscle fibre, molecular and chemical basis of muscle contraction
3.1.3 Endocrine glands - Structure, secretions and the functions (of hormones) of pituitary, thyroid, parathyroid, adrenal glands and pancreas
3.1.4 Hormonal control of reproduction in a mammal

Unit - IV

4.1 Ecology - I

4.1.1 Meaning and scope of Ecology
4.1.2 Important abitic factors of Ecosystem - Temperature, light, water, oxygen and CO2
4.1.3 Nutrient cycles - Nitrogen, carbon and phosphurus
4.1.4 Components of Ecosystem (Example : lake), food chains and food web, energy flow in ecosystem

Unit - V

5.1 Ecology - II

5.1.1 Habitat and ecological niche
5.1.2 Community interactions - Mutualism, commensalism, paratisism, competition, predation
5.1.3 Ecological succession
5.1.4 Population studies

5.2 Zoogeography

5.2.1 Zoogeographical regions
5.2.2 Study of physical and faunal peculiarities of Oriental, Australian and Ethiopian regions

□□□□□□

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)

ZOOLOGY PRACTICAL SYLLABUS
SEMESTER-III
PAPER – III
EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

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

I. Embryology

1. Study of T.S. of testis, ovary of a mammal
2. Study of different stages of cleavages (2, 4, 8 cell stages)
3. Study of chick embryos of 18 hours, 24 hours, 33 hours and 48 hours of incubation

II. Physiology

1. Qualitative tests for identification of carbohydrates, proteins and fats
2. Qualitative tests for identification of ammonia, urea and uric acid
3. Study of activity of salivary amylase under optimum conditions
4. Study of prepared slides of T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage

III. Ecology

1. Determination of pH of given sample
2. Estimation of dissolved oxygen of given sample
3. Estimation of total alkalinity of given sample
4. Estimation of salinity of given sample

REFERENCE BOOKS:

1. Fundamentals of Ecology by Eugene Odum, Gary W. Barrett, Brooks Cole.
2. Concepts of Ecology N. Arumugam, Saras Publications
3. Embrology-Rastogi publishers
4. A Text book of Human Physiology- A.K.Berry

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

II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)

ZOOLOGY THEORY

INTERNAL MARKS ALLOTMENT

SEMESTER-III

PAPER – III

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

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.

II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)

ZOOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

SEMESTER-III

PAPER – III

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

Zoology Theory- External	**Total Marks: 60**
Section –A	
Short Answer questions 1 to 10 (Any 5 from given 10)	: 5x4=20
Section –B	
Essay Questions 11 to 15 (With internal choice)	: 5x8=40

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

II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)

ZOOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-III

PAPER – III

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

Zoology Practical's - External

Time: 3 hrs.		**Total Marks : 25**
1. Major Experiment	:	8 marks
2. Minor Experiment	:	4 marks
3. Identification	:	8 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.

II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)

ZOOLOGY THEORY

SEMESTER-III

PAPER – III

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY
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: Short Questions : 5 x 4 = 20
Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

Section-B: Essay Questions : 5 x 8 = 40
Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)

ZOOLOGY
SEMESTER-III
PAPER – III
EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

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

SECTION-A

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

1. Types of eggs
2. Blastula
3. Proteins digestion
4. Chloride shift
5. Action potential
6. Pancreas
7. Carbon cycle
8. Food chains
9. Growth curves
10. Ecological niche

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

11. a) Describe the process of spermatogenesis and draw the structure of sperm.

(Or)

b) What is placenta? Describe the different types of placenta.

12. a) Describe the structure and working of heart.

(Or)

b) Explain the formation of urine in mammals.

13. a) Describe the mechanism of muscle contraction.

(Or)

b) Describe the structure and hormones of pituitary gland

.

14. a) Explain the importance of light as an abiotic factor in ecosystem.

(Or)

b) Describe the components in Lake Ecosystem?

15. a) Describe the different types of community interactions?

(Or)

b). Give an account of physical and faunal features of oriental region.

****

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)
ZOOLOGY SYLLABUS
SEMESTER-IV
PAPER - IV
ANIMAL BIOTECHNOLOGY& ANIMAL HUSBANDRY

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

Unit-I

1.1 Scope of Biotechnology
1.2 Biotechnology in India
1.3.Cloning vectors - Plasmids, Cosmids, Phagemids, Lambda bacteriophage, M13 and expression vectors (characteristics)
1.4 Restriction enzymes - Nomenclature, study of type II
1.5 Transformation techniques - Calcium chloride method and electroporation

Unit - II
Molecular techniques in gene manipulation
2.1 Construction of genomic and cDNA libraries
2.2 Southern and Western blotting, DNA sequencing - Sanger method
2.3 Polymerase chain reaction
2.4 DNA finger printing and DNA micro array

Unit – III
3.1 Animal cell culture
3..2 Culture media
3.3 Primary culture
3.4 Cell lines and cloning

UNIT – IV
4. 1General introduction to poultry farming.
4.2 Principles of Poultry housing. Poultry houses.
4.3 Systems of poultry farming.
4.4 Management of chicks, growers and layers. Management of Broilers.

UNIT – V
5.1 Poultry feed management – Prinicples of feeding.
5.2 Nutrient requirements for different stages of layers and broilers.
5.3 Methods of feeding.
5.4 Poultry diseases – viral, bacterial, fungal and parasitic (two each); symptoms, control and management.

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)
ZOOLOGY PRACTICAL SYLLABUS
SEMESTER-IV
PAPER - IV
ANIMAL BIOTECHNOLOGY& ANIMAL HUSBANDRY

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

1. Genomic DNA isolation from *E. coli*

2. Plasmid DNA isolation (pUC 18/19) from *E. coli*

3. PCR (demonstration)

4. Project report on animal cell culture

5. Study of various breeds of layers and broilers (photographs)

6. Identification of disease causing organisms in poultry birds (as per theory)

7. Study of the anatomy of a poultry bird by way of dissecting a bird. (Demonstration)

8. Study of various activities in a poultry farm (layers and broilers) and submission of a report.

Reference Books :

1. P.K. Gupta: Biotechnology and Genomics, Rastogi publishers (2003).
2. B.D. Singh: Biotechnology, Kalyani publishers, 1998 (Reprint 2001).
3. A Text book of Animal Husbandry G.C.Benerji Original publication-1964
4. Handbook of Animal Husbandry by ICAR

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

II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)

ZOOLOGY THEORY

INTERNAL MARKS ALLOTMENT

SEMESTER-IV
PAPER - IV
ANIMAL BIOTECHNOLOGY& ANIMAL HUSBANDRY

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.

II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)

ZOOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

SEMESTER-III

PAPER – III

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

Zoology Theory- External	**Total Marks: 60**
Section –A	
Short Answer questions 1 to 10 (Any 5 from given 10)	5x4=20
Section –B	
Essay Questions 11 to 15 (With internal choice)	5x8=40

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

II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)

ZOOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-IV
PAPER - IV
ANIMAL BIOTECHNOLOGY& ANIMAL HUSBANDRY

Zoology Practical's - External

Time: 3 hrs.		**Total Marks : 25**
1. Major Experiment	:	8 marks
2. Minor Experiment	:	4 marks
3 .Identifications	:	8 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.

II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)

ZOOLOGY THEORY

SEMESTER-IV
PAPER - IV
ANIMAL BIOTECHNOLOGY& ANIMAL HUSBANDRY

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: Short Questions : 5 x 4 = 20
Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

Section-B: Essay Questions : 5 x 8 = 40
Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)
ZOOLOGY
SEMESTER-IV
PAPER – IV
ANIMAL BIOTECHNOLOGY& ANIMAL HUSBANDRY

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

SECTION-A

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

1. Cosmids
2. Electrophoration.
3. PCR
4. DNA finger printing.
5. MRCamd Hela Cell lines
6. Cryopreservation
7. Deep litter system
8. Management of layers
9. Poultry Feed management
10. Marek's disease

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

11. (a) Explain different types of restriction enzymes used in genetic engineering.

(Or)

(b) Write an essay on cloning vectors.

12. (a) Explain the preparation of genomic and c-DNA libraries.

(Or)

(b) Write an essay on Sanger's methods of DNA sequencing.

13. (a) Write an account on Artificial media used in animal cell culture.

(Or)

(b) Describe the protocol for primary cell culture.

14. (a) Explain the different types of sheds in Poultry

(Or)

b) Describe different methods of management of chicks

15. a) Describe Nutrient requirement for Layers and Broilers

(Or)

b) Write an essay on symptoms, control and management of any two viral and two bacterial diseases.

****

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

II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)
AQUACULTURE TECHNOLOGY SYLLABUS
SEMESTER-III
PAPER – III
FISH NUTRITION & FEED TECHNOLOGY

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

Course Outcomes:

After learning this course, the students will get thorough knowledge of

1. Different type of feeds and feeding methods in fin and shell fish.
2. Feed preparation and feed storage
3. Feed manufacture and storage
4. Feed additives & non-nutrient ingredients in aquaculture
5. Different nutritional deficiency in cultivable fish and their prevention methods.
6. Feed quality and nutritional value analysis.

Learning Objectives:

1 To understand the different type feeds and feeding methods in fin and shell fish.

2 To improve the knowledge in feed preparation and feed storage.

3 To gain knowledge feed manufacture and storage.

4 To understand the feed additives & non-nutrient ingredients in aquaculture.

5 To know the different nutritional deficiency in cultivable fish and their prevention methods.

6 To improve the technical knowledge of feed quality and nutritional value analysis.

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)
AQUACULTURE TECHNOLOGY SYLLABUS
SEMESTER-III
PAPER – III
FISH NUTRITION & FEED TECHNOLOGY

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

UNIT-I: NUTRITIONAL REQUIREMENTS OF CULTIVABLE FISH

1-1 Requirements for energy, proteins, carbohydrates, lipids, fiber, micronutrients for different stages of cultivable fish and prawns
1-2 Essential aminoacids and fatty acids, protein t0 energy ratio, nutrient interactions and protein sparing effect
1-3 Dietary sources of energy, effect of ration on growth, determination of feeding rate, check tray
1-4 Factors affecting energy partitioning and feeding

UNIT-II: FORMS OF FEEDS & FEEDING METHODS

2-1 Fed conversion efficiency, feed conversion ratio and protein efficiency ratio
2-2 Wet feeds, moist feeds, dry feeds, mashes, pelleted feeds, floating and sinking pellets, advantages of pelletization
2-3 Manual feeding, demand feeders, automatic feeders, surface spraying, bag feeding & tray feeding
2-4 Frequency of feeding

UNIT-III: FEED MANUFACTURE & STORAGE

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

UNIT-IV: FEED ADDITIVES & NON-NUTRIENT INGREDIENTS

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

UNIT-V: NUTRITIONAL DEFICIENCY IN CULTIVABLE FISH

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

Reference Books:

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

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

II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)

AQUACULTURE TECHNOLOGY

PRACTICAL SYLLABUS

SEMESTER-III

PAPER - III

FISH NUTRITION & FEED TECHNOLOGY

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

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

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II B.Sc EATZC (EMBEDDED COURSE IN AQUACULTURE TECHNOLOGY)
AQUACULTURE TECHNOLOGY
SEMESTER-III
PAPER – III
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

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

Section –B

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

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

II B.Sc (EATZC) EMBEDDED AQUACULTURE TECHNOLOGY

PRACTICAL MARKS ALLOTMENT

AQUACULTURE TECHNOLOGY

SEMESTER-III

PAPER – III

FISH NUTRITION & FEED TECHNOLOGY

Practical's - External

Time: 3 hrs.		**Total Marks: 25**
1. Identification of given sample	:	6 marks
2. Identification of given sample	:	6 marks
3.Identification	:	8 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.

II B.Sc (EATZC) EMBEDDED AQUACULTURE TECHNOLOGY
AQUACULTURE TECHNOLOGY
SEMESTER-III
PAPER – III
FISH NUTRITION & FEED 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: Short Questions : 5 x 4 = 20
Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

Section-B: Essay Questions : 5 x 8 = 40
Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

Total : 60 Marks

MODEL QUESTION PAPER

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II B.Sc EATZC (EMBEDDED AQUACULTURE TECHNOLOGY)
AQUACULTURE TECHNOLOGY (w.e.f -2019-20)
SEMESTER-III
PAPER – III
FISH NUTRITION & FEED TECHNOLOGY

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

Section -A

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

1. Lipids
2. Check tray
3. Feed conversion efficiency
4. Bag feeding
5. Extrusion processing
6. Micro-coated feeds
7. Anti-oxidants
8. Afflatoxins

Section -B

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

9. a. Explain essential amino acids required for cultivable fish

(or)

b. Describe various carbohydrates and micronutrients for different stages of cultivable fish

10. a. Explain various feeds

(or)

b. Describe different feeding methods.

11 a. Explain nutrient composition and nutrient availability of feed ingredients..

(or)

b. Describe feed storage methods

12. a. Explain Probiotics role in fishes

(or)

b. Describe Enzymes and growth promoters

13. a. Explain Protein and Vitamin deficiency symptoms.

(or)

b. Describe natural and supplementary feed importance.

******

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II.B.Sc EATZC EMBEDDED AQUACULTURE TECHNOLOGY
AQUACULTURE TECHNOLOGY SYLLABUS
SEMESTER-IV
PAPER – IV
FRESH WATER & BRACKISHWATER AQUACULTURE

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

Course Outcomes

After learning this course, the students will get thorough knowledge of

1. The present status of freshwater aquaculture and their role in world economy and food production
2. Carp and prawn culture and composite fish culture systems.
3. Prawn hatchery technology and culture practices.
4. Mixed culture of fish and prawns
5. Technical skills to identification of cultivable fin fish and shell fish.

Learning Objectives:

1. To know the present status of freshwater aquaculture and their role in world economy and food production.
2. To gain knowledge in carp and prawn culture and composite fish culture systems.
3. To improve the technical knowledge prawn hatchery technology and culture practices.
4. To gain knowledge mixed culture of fish and prawns.
5. To improve the knowledge and technical skills to identification of cultivable fin fish and shell fish.

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II.B.Sc ATZC EMBEDDED AQUACULTURE TECHNOLOGY
SYLLABUS
SEMESTER-IV
PAPER – IV
FRESH WATER & BRACKISHWATER AQUACULTURE

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

UNIT-1: INTRODUCTION TO FRESHWATER AQUACULTURE

1-1.1 Status, scope and prospects of fresh water aquaculture in the world, India and AP

1-1.2 Different fresh water aquaculture systems

UNIT-II: CARP CULTURE

2-1 Major cultivable Indian carps – Labeo, Catla and Cirrhinus & Minor carps

2-2 Exotic fish species introduced to India – Tilapia, Pangassius and Clarius sp.

2-3 Composite fish culture system of Indian and exotic carps

2-4 Impact of exotic fish, Compatibility of Indian and exotic carps and competition among Them

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, re-circulatory systems, cages and pens, sewage-fed fish culture

UNIT-IV: CULTURE OF PRAWN

4-1 Fresh water prawns of India - commercial value

4-2 *Macrobrachium rosenbergii* and *M. Malcomsonii* – biology, seed production, pond preparation, stocking, management of nursery and grow-out ponds, feeding, mprphotypes and Harvesting

UNIT-V: CULTURE OF BRACKISHWATER SPECIES

5-1 Culture of P.mondon – Hatchery technology and Culture practices including feed and disease management

5-2 Culture of L. vannamei – hatchery technology and culture practices including feed and disease management.

5-3 Mixed culture of fish and prawns

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II.B.Sc ATZC EMBEDDED AQUACULTURE TECHNOLOGY
AQUACULTURE TECHNOLOGY PRACTICAL SYLLABUS
SEMESTER-IV
PAPER – IV
FRESH WATER & BRACKISHWATER AQUACULTURE

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

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 , Picnodanta*
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.

PRESCRIBED BOOK(S):

1. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi

REFERENCES:

1. Santharam R, N Sukumaran and P Natarajan 1987. A manual of aquaculture, Oxford-IBH, New Delhi
2. Srivatsava 1993. Fresh water aquaculture in India, Oxford-IBH, New Delhi
3. Marcel H 1972. Text book of fish culture.Oxford fishing news books

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

II B.Sc (AT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY

AQUACULTURE TECHNOLOGY THEORY
INTERNAL MARKS ALLOTMENT

SEMESTER-IV

PAPER – IV

FRESH WATER & BRACKISHWATER AQUACULTURE

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.

II B.Sc (AT.Z.C) EMBEDDED AQUACULTURE TECHNOLOGY

AQUACULTURE TECHNOLOGY THEORY
EXTERNAL MARKS ALLOTMENT

SEMESTER-IV

PAPER – IV

FRESH WATER & BRACKISHWATER AQUACULTURE

Theory- External

Time: 3 Hours **Total Marks: 60**

Section –A

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

Section –B

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

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

II B.Sc (EATZC) EMBEDDED AQUACULTURE TECHNOLOGY

AQUACULTURE TECHNOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-IV

PAPER – IV

FRESH WATER & BRACKISHWATER AQUACULTURE

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	:	8 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.

II B.Sc (EATZC) EMBEDDED AQUACULTURE TECHNOLOGY

AQUACULTURE TECHNOLOGY THEORY
SEMESTER-IV

PAPER – IV

FRESH WATER & BRACKISHWATER AQUACULTURE

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: Short Questions : 5 x 4 = 20
Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

Section-B: Essay Questions : 5 x 8 = 40
Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

Total : 60 Marks

Model Question Paper

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
II B.Sc (EATZC) EMBEDDED AQUACULTURE TECHNOLOGY
AQUACULTURE TECHNOLOGY
SEMESTER-IV
PAPER – IV
FRESH WATER & BRACKISHWATER AQUACULTURE

Time: 3 hrs **Max Marks: 100**

SECTION-A

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

1. .Fresh water aquaculture system
2. Aquaculture status in India
3. Exotic fishes
4. Minor carps
5. re-circulatory system
6. Sewage-fed fish culture
7. Seed production
8. grow-out ponds
9. *P.Monodon*
10. Mixed culture.

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

11. a. Describe status and prospects of fresh water aquaculture in A.P.
(or)
b. Explain fresh water aquaculture system.

12. a. Write an essay on major cultivable Indian carps
(or)
b. Describe composite fish culture system of Indian and exotic carps.

13. a. Explain recent culture trends in murrels
(**or)**
b. Explain advantages in the culture of air-breathing and cold water fishes
.

14. a. Write an essay commercial value of Indian fresh water prawn.
(or)
b. Explain *Macrobrachium rosenbergii* culture .

15. a. Explain feed and disease management in *P.monodon* culture.
(or)
b. Describe hatchery technology and culture practice in *L. vannamei*.

****

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

II B.Sc BZC

ZOOLOGY SYLLABUS

SEMESTER-III

PAPER – III

CYTOLOGY, GENETICS AND EVOLUTION

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

Unit - I

Cytology: Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma

Electron microscopic structure of eukaryotic cell.

Plasma membrane –Different models of plasma membrane.

Unit – II

Cell organelles: Structure and functions of Endoplasmic Reticulum

Structure and functions of Golgi apparatus

Structure and functions of Lysosomes

Structure and functions of Ribosomes

Structure and functions of Mitochondria

Nucleus, Chromatin - Structure and significance, Chromosomes - Structure, types, functions

Unit – III- Genetics-I

Mendel's work on transmission on traits

Principles of inheritance, Incomplete dominance and codominance

Lethal alleles, Epistasis, Pleiotropy

Unit – IV- Genetics-II

Sex determination, Sex linked inheritance, Linkage and crossing over

Extra chromosomal inheritance, Human karyotyping

- **Addition Input:** Multiple Alleles- Blood groups in man

Unit – V- Evolution

Origin of life, Lamarckism, Darwinism, Neo – Darwinism

Hardy-Weinberg Equilibrium, Variations, Isolating mechanisms,

Natural selection, Types of natural selection (directional, stabilizing, disruptive)

Artificial selection and forces of evolution, Speciation (Allopatric and Sympatric)

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.

II B.Sc BZC

ZOOLOGY PRACTICAL SYLLABUS

SEMESTER-III

PAPER – III

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. Study of Living Fossils and submission of project report.

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

II B.Sc BZC

ZOOLOGY THEORY

INTERNAL MARKS ALLOTMENT

SEMESTER-III

PAPER – III

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.

II B.Sc BZC

ZOOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

SEMESTER-III

PAPER – III

CYTOLOGY, GENETICS AND EVOLUTION

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

Section –A

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

Section –B

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

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

II B.Sc BZC

ZOOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-III

PAPER – III

CYTOLOGY, GENETICS AND EVOLUTION

Zoology Practical's - External

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

1.Major Experiment	:	8 marks
2. Minor experiment	:	4 marks
3. Identification	:	8 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.

II B.Sc BZC

ZOOLOGY THEORY

SEMESTER-III

PAPER – III

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.
II B.Sc BZC
ZOOLOGY
SEMESTER-III
PAPER – III
CYTOLOGY, GENETICS AND EVOLUTION

Time: 3 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
2. Mycoplasma
3. Lysosomes
4. Ribosomes
5. Epistatis
6.
7.
8. Colour Blindness
9. Speciation
10. Hardy Weinberg Law

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

(or)

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

12. a) Describe the structure and functions of Endoplasmic Reticulum .

(or)

b) Give an account of the structure and functions of Nucleus.

13. a) Explain mendals laws of heredity with suitable examples

(or)

b) Explain Incomplete dominance and Co dominance with examples.

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

(or)

b) Explain about Extra chromosomal inheritance in paramecium.

15. a) Write as essay on isolation.

(or)

b) What is macro evolution? Explain it with adaptive radiation in Darwins finches (birds).

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

III B.Sc BZC & ATZC

ZOOLOGY SYLLABUS

SEMESTER-V

PAPER – V

ANIMAL BIOTECHNOLOGY

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

Unit 1: Tools of Recombinant DNA technology - Enzymes and Vectors

Restriction modification systems: Types I, II and III. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering

DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases

Cloning Vectors: Plasmid vectors:pBR and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs,

Unit 2 Techniques of Recombinant DNA technology

Cloning: Use of linkers and adaptors

Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated delivery

PCR: Basics of PCR.

DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing

Hybridization techniques: Southern, Northern and Western blotting,

Genomic and cDNA libraries: Preparation and uses

UNIT 3 Animal Cell Technology

Cell culture media: Natural and Synthetic

Cell cultures: primary culture, secondary culture, continuous cell lines; Protocols for Primary Cell Culture; Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures.

Hybridoma Technology: Cell fusion, Production of Monoclonal antibodies (mAb), Applications of mAb

Stem cells: Types of stem cells, applications

Unit 4 Reproductive Technologies & Transgenic Animals

Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization , super ovulation, Embryo transfer, Embryo cloning

Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish; applications

Unit 5 Applied Biotechnology

Industry: Fermentation: Different types of Fermentation: Short notes on - Submerged & Solid state; batch, Fed batch & Continuous; Stirred tank, Air Lift, Fixed Bed and Fluidized; Downstream processing - Filtration, centrifugation, extraction, chromatography, spray drying and lyophilization

Agriculture: fisheries – monoculture in fishes, polyploidy in fishes; DNA fingerprinting

- **<u>Additional Input</u>:** Prebiotics and Probiotics

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc BZC & ATZC
ZOOLOGY PRACTICAL SYLLABUS
SEMESTER-V
PAPER – V
ANIMAL BIOTECHNOLOGY

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

Any SIX of the following:

1. Maintenance and storage of*E.coli* DH5 alpha cells.
2. Isolation of Plasmid DNA from *E.coli*
3. Preparation of genomic DNA from *E. coli*/animals/ human.
4. DNA quantification using agarose gel electrophoresis (by using lambda DNA as standard).
5. Restriction digestion of lambda (λ) DNA using EcoR1 and Hind III.
6. Preparation for insertion and vector for ligation.
7. Performance of ligation reaction using T4 DNA ligase.
8. Preparation of competent cells
9. Transformation of *E. coli* with plasmid DNA using CaCl2,
10. Selection of transformants on X-gal and IPTG
11. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
12. Interpretation of sequencing gel electropherograms
13. Amplification of DNA by PCR
14. Packing and sterilization of glass and plastic wares for cell culture.
15. Preparation of culture media.

REFERENCE BOOKS

1. Brown TA. (2010). Gene Cloning and DNA Analysis. 6th edition. Blackwell Publishing, Oxford, U.K.
2. Clark DP and Pazdernik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA
3. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.
4. Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press
5. Wiley JM, Sherwood LM and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education
6. Brown TA. (2007). Genomes-3. Garland Science Publishers
7. Primrose SB and Twyman RM. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.
8. Animal Cells Culture and Media, D.C. Darling and S.J. Morgan, 1994.BIOS Scientific Publishers Limited.
9. Methods in Cell Biology, Volume 57, Jennie P. Mathur and David Barnes, 1998. Animal Cell Culture Methods Academic Press.
10. P.K. Gupta: Biotechnology and Genomics, Rastogi publishers (2003).
11. B.D. Singh: Biotechnology, Kalyani publishers, 1998 (Reprint 2001)

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

III B.Sc BZC & ATZC
ZOOLOGY THEORY

INTERNAL MARKS ALLOTMENT

SEMESTER-V

PAPER- V

ANIMAL BIOTECHNOLOGY

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.

III B.Sc BZC & ATZC
ZOOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

SEMESTER-V

PAPER – V

ANIMAL BIOTECHNOLOGY

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

Section –A

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

Section –B

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

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

III B.Sc BZC & ATZC
ZOOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-V

PAPER – V

ANIMAL BIOTECHNOLOGY

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.

III B.Sc BZC & ATZC

ZOOLOGY THEORY

SEMESTER-V

PAPER – V

ANIMAL BIOTECHNOLOGY

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: Short Questions : 5 x 4 = 20

Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

Section-B: Essay Questions : 5 x 8 = 40

Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc BZC & ATZC
ZOOLOGY
SEMESTER-V
PAPER – V
ANIMAL BIOTECHNOLOGY

Time: 2½hrs **Max Marks: 60**

SECTION-A

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

1. DNA polymerases. DNA 6□□o□□□
2.
3. Electrophoration. □□s□□□6ª o□□□
4. PCR PCR6□□□□□ o□□a□□□□
5. Organ culture. □□□□□□□□□c
6. Cryopreservation s□□□□□□□□□
7. Super ovulation. □□□□ □□□□ □□□□□ □c
8. Embryo Cloning □□9□□□ s□9□□□
9.
10.

SECTION-B

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

11. (a) Explain different types of restriction enzymes used in genetic engineering.

Or

(b) Write an essay on cloning vectors.

12. (a) Explain the preparation of genomic and c-DNA libraries.

Or

(b) Write an essay on Sanger's methods of DNA sequencing.

13.(a) Give an account on production of MAb's and it's applications.

MAb

Or

(b) Describe the different types of Stemcells and it's applications.

14. (a) What do you understand by (IVF) Invitro Fertilization. How it is done?

IVF

Or

(b) What is transgenesis and explain its application in animals?

15. (a) Explain the steps involved in down stream processing of fermentation.

Or

(b) Explain monoculture and polypoidy in fishes.

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc BZC & ATZC
ZOOLOGY SYLLABUS
SEMESTER-V
PAPER – VI
ANIMALHUSBANDRY

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

UNIT – I :

General introduction to poultry farming. Principles of poultry housing. Poultry houses. Systems of poultry farming. Management of chicks, growers and layers. Management of Broilers.

UNIT – II:

Poultry feed management – Principles of feeding. Nutrient requirements for different stages of layers and broilers. Methods of feeding. Poultry diseases – viral, bacterial, fungal and parasitic (two each); symptoms, control and management.

UNIT – III:

Selection, care and handling of hatching eggs. Egg testing. Methods of hatching. Brooding and rearing. Sexing of chicks.

UNIT- IV:

Breeds of Dairy Cattle and Buffaloes – Definition of breed; Classification of Indian Cattle breeds, exotic breeds and Indian buffalo breeds. Systems of inbreeding and crossbreeding. Housing of dairy animals – Selection of site for dairy farm; systems of housing – loose, housing system. Conventional dairy barn. Cleaning and sanitation of dairy farm. Weaning of calf. Castration and dehorning. Deworming and Vaccination programme. Records to be maintained in a dairy farm.

UNIT - V:

Care and management of dairy animals - Care and management of calf, heifer, milk animal, dry and pregnant animal, bulls and bullocks.

- **Additional input :** Piggery

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc BZC & ATZC
ZOOLOGY PRACTICAL SYLLABUS
SEMESTER-V
PAPER – VI
ANIMAL HUSBANDRY

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

1. Study of various breeds of layers and broilers (photographs)
2. Identification of disease causing organisms in poultry birds (as per theory)
3. Study of the anatomy of a poultry bird by way of dissecting a bird. (Demonstration)
4. Study of various activities in a poultry farm (layers and broilers) and submission of a report.
5. Study of various breeds of cattle (photographs/microfilms)
6. Study of various activities carried out in a dairy farm and submission of a report.

REFERENCE BOOKS

1. TEXTBOOK OF ANIMAL HUSBANDRY by BANERJEE, G.C. Publisher oxford
2. Book on Animal Husbandry Gyan Deep Singh Publisher : Anmol Publishers
3. Paadiparisrama Ch. Ramesh Saritha Veterinary book publishers-Hyderabad, Vijayawada
4. Pasugana yagamanyam Dr. A. Venkata, Ramaiah Rithu nestham Publications
5. Animal Husbandry by Venkateswara Publications, Guntur
6. Kollaprisrama-Telugu Academy.

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

III B.Sc BZC & ATZC
ZOOLOGY THEORY

INTERNAL MARKS ALLOTMENT

SEMESTER-V

PAPER – VI

ANIMAL HUSBANDRY

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.

III B.Sc BZC & ATZC
ZOOLOGY THEORY

EXTERNAL MARKS ALLOTMENT

SEMESTER-V

PAPER – VI

ANIMAL HUSBANDRY

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

Section –A

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

Section –B

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

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

III B.Sc BZC & ATZC

ZOOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-V

PAPER – VI

ANIMAL HUSBANDRY

Zoology Practical's - External

Time: 3 hrs.		**Total Marks : 25**
1.Major	:	8 marks
2.Minor	:	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.

III B.Sc BZC & ATZC

ZOOLOGY THEORY

SEMESTER-V

PAPER – VI

ANIMAL HUSBANDRY

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: Short Questions : 5 x 4 = 20

Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

Section-B: Essay Questions : 5 x 8 = 40

Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc BZC AQUACULTURE TECHNOLOGY
SEMESTER-V
PAPER – VI
ANIMAL HUSBANDRY

Time: 2½ hrs **Max Marks: 60**

SECTION-A

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

1. Deep litter system
2. Management of layers
3. Poultry Feed management
4. Marek's disease
5. Candle test
6. Methods of Hatching
7. Cleaning and Sanitation of Dairy Farms
8. V
9. Care and managementof milk animals
10. Care and Management of Bulls and Bullocks

SECTION-B

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

11. a. Explain the different types of sheds in Poultry

(or)

b. Describe different methods of management of chicks

12. a. Describe Nutrient requirement for Layers and Broilers

(or)

b. Write an essay on symptoms, control and management of any two viral and two bacterial diseases.

13 a. Write an essay on different methods of hatching of eggs

(or)

b. Write an essay on sexing of chicks

14 a. What is animal breeding and explain methods of animal breeding

(or)

b. Describe housing of dairy animals

15 a. Write an essay on care and management of calf and Heifers

(or)

b. Write an essay on management of pregnant animals.

****

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc (AT.Z.C)
AQUACULTURE TECHNOLOGY SYLLABUS
SEMESTER-V
PAPER – V
FISH HEALTH MANGEMENT

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

UNIT I: PATHOLOGY AND PARASITOLOGY

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

UNIT II: DISEASES OF FIN FISH

2-1 Fungal diseases (both of shell and finfish) – Saprolegniosis, brachiomycosis, ichthyophorus diseases – Lagenidium diseases – Fusarium disease, prevention and therapy
2-2 Viral diseases – Emerging viral diseases in fish, haemorrhagic scepticemia, spring viremia of carps, infectious hematopoietic necrosis in trout, infectious pancreatic necrosis in salmonids, swim-bladder inflammation in cyprinids, channel cat fish viral disease, prevention and therapy
2-3 Baterial diseases – Emerging bacterial diseases, aermonas, pseudomonas and vibrio infections, columnaris, furunculosis, epizootic ulcerative syndrome, infectious abdominal dropsy, bacterial gill disease, enteric red mouth, bacterial kidney disease, proliferative kidney disease, prevention and therapy

UNIT III: DISEASES OF SHELL FISH

3-1 Major shrimp viral diseases – Bacculovirus penaeii, Monodon Bacculovirus, Bacculoviral midgut necrosis, Infectious hypodermal and haematopoietic necrosis virus, Hepatopancreatic parvo like virus, Yellow head bacculovirus, white spot bacculovirus.
3-2 Bacterial diseases of shell fish – aeromonas, pseudomonas and vibrio infections, luminous bacterial disease, filamentous bacterial disease. Prevention and therapy
3-3 Protozoan diseases- Ichthyophthiriasis, Costiasis, whirling disea/ses, trypanosomiasis. Prevention and therapy

UNIT IV: NUTRITIONAL DISEASES

4-1 Nutritional pathology – lipid liver degeneration, Vitamin and mineral deficiency diseases. Aflatoxin and dinoflagellates.
4-2 Antibiotic and chemotherapeutics. Nutritional cataract. Genetically and environmentally induced diseases.

UNIT V: FISH HEALTH MANAGEMENT

5-1 Diagnostic tools – immune detection- DNA/RNA techniques, General preventive methods and prophylaxis. Application and development of vaccines.
5-2 Quarantine – Significance, methods and regulations for transplants.
5-3 Production of disease-free seeds. Evaluation criteria of healthy seeds.
5-4 Good Feed management for healthy organisms, Zero water exchange, Probiotics in health management, Issues of biosecurity.

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc (AT.Z.C)
AQUACULTURE TECHNOLOGY PRACTICAL SYLLABUS
SEMESTER-V
PAPER – V
FISH HEALTH MANGEMENT

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

---

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, hepatopncreas, lymphoid organ, muscles and nerves of prawn and shrimp
6. Collection, processing and analysis of data for epedemeiological investigations of viral diseases
7. Bacterial pathogens – isolation, culture and characterization
8. Identification of parasites in fishes: Protozoan, Helmiths, Crustaceans
9. Antibiograms – 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

PRESCRIBED BOOK(S):

1. Shaperclaus W. 1991 Fish Diseases- Vol.I & II. Oxonian Press Pvt.ltd
2. Roberts RJ 1989. Fish pathology. Bailliere Tindall, New York
3. Lydia Brown 1993. Aquaculture for veterinarians- fish husbandray and medicine. Pergamon Press. Oxford

REFERENCES:

1. Shankar KM & Mohan CV. 2002. Fish and Shellfish Health Management. UNESCO Publ. Sindermann CJ. 1990
2. Walker P & Subasinghe RP. (Eds.). 2005 Principal Diseases of Marine Fish and Shellfish. Vols. I, II. 2nd Ed. Academic Press
3. DNA Based Molecular Diagnostic Techniques: Research Needs for Standardization and Validation of the Detection of Aquatic Animal Pathogens and Diseases. FAO Publ. Wedmeyer G, Meyer FP & Smith L. 1999.
4. Bullock G et.al., 1972 Bacterial diseases of fishes. TFH publications, New Jersey
5. Post G 1987. Text book of Fish Health. TFH publications, New Jersey
6. Johnson SK 1995. Handbook of shrimp diseases. Texas A & M University, Texas

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

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

INTERNAL MARKS ALLOTMENT

SEMESTER-V

PAPER – V

FISH HEALTH MANGEMENT

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

SEMESTER-V

PAPER – V

FISH HEALTH MANGEMENT

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 (AT.Z.C) AQUACULTURE TECHNOLOGY

PRACTICAL MARKS ALLOTMENT

SEMESTER-V

PAPER – V

FISH HEALTH MANGEMENT

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-V
PAPER – V
FISH HEALTH MANGEMENT
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: Short Questions : 5 x 4 = 20

Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

Section-B: Essay Questions : 5 x 8 = 40

Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY
SEMESTER-V
PAPER – V
FISH HEALTH MANAGEMENT

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

SECTION-A

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

1. Necrosis
2. Inflammation
3. Aermonas in Fin fish
4. Fusarium in Fin fish
5. Costiasis in shell fish
6. Yellow head bacculovirus in shell fish
7. Aflatoxin
8. Zero water exchange
9. Mineral deficiency
10. Probiotics

SECTION-B

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

11. a. Explain progesssive and retrogressive tissue changes in fish.
(or)
b. Describe cell death and causes in fish

12. a. Explain any three fungal diseases in fin fish with preventive and therapeutic measures.
(or)
b. Describe spring viremia of carps and infectious pancreatic necrosis in Salmonids.

13. a. Explain any three viral diseases in shell fish.
(or)
b. Explain preventive and therapaeutic measeures of protozoan diseases in shell fish.

14. a. Describe vitamin deficiency diseases in Fin fish.
(or)
b. Explain genetically induced diseases in Fin fish

15. a. Describe immune detection techniques used in shell fish
(or)
b. Write an account on Probiotics in health management of shell fish.

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

AQUACULTURE TECHNOLOGY SYLLABUS
SEMESTER-V
PAPER – VI
FISHERIES EXTENSION, ECONOMICS & MARKETING

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

UNIT – 1 INTRODUCTION

1-1 Meaning and scope of economics with reference to fisheries

1-2 Basic concepts of economics – goods, services, wants and utility, demand and supply, value price, market demand and individual demand, elasticity of demand**,** law of diminishing marginal utility

1-3 Theory of production, production function in fisheries

1-4 Various factors influencing the fishery product's price

UNIT – I1 FISHERIES MARKETING

2-1 Basic marketing functions, consumer behaviour and demand, fishery market survey and test marketing a product

2-2 Fish marketing – prices and price determination of fishes

2-3 Marketing institutions- primary(producer fishermen, fishermen cooperatives, and fisheries corporations) and secondary (merchant/agent/speculative middlemen)

2-4 Methods of economic analysis of business organizations

2-5 Preparation of project and project appraisal

UNIT-III FISHERIES CONOMICS

3-1 Aquaculture economics- application of economics principles to aquaculture operations

3-2 Various inputs and production function. Assumptions of production function in aquaculture analysis, least cost combination of inputs, laws of variable proportions

3-3 Cost and earnings of aquaculture systems – carp culture, shrimp farming systems, hatcheries, Cost and earnings of fishing units and freezing plants

3-4 Socio-economic conditions of fishermen in Andhra Pradesh, Role of Matsyafed and NABARD in uplifting fishermen's conditions, fishermen cooperatives

3-5 Contribution of fisheries to the national economy

UNIT-IV FISHERIES EXTENSION

4-1 Fisheries extension – scope and objectives, principles and features of fisheries extension education

4-1.1 Fisheries extension methods and rural development

4-3 Adoption and diffusion of innovations

UNIT-V TRANSFER OF TECHNOLOGY

5-1 ICAR programs – salient features of ORP, NDS, LLP, IRDP, ITDA, KVK, FFDA, FCS, FTI, TRYSEM

5-2 Training – meaning, training vs. education and teaching

5-3 DAATT centres and their role in tot programs, video conferencing, education of farmers through print and electronic media

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
AQUACULTURE TECHNOLOGY PRACTICAL SYLLABUS
SEMESTER-V
PAPER – VI
FISHERIES EXTENSION, ECONOMICS & MARKETING

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

Project work/on-job training at industry

******

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

REFERENCES:

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

*****

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

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

INTERNAL MARKS ALLOTMENT

SEMESTER-V

PAPER – VI

FISHERIES EXTENSION, ECONOMICS & MARKETING

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

SEMESTER-V

PAPER – V

FISHERIES EXTENSION, ECONOMICS & MARKETING

Theory- External **Total Marks: 60**

Section –A

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

Section –B

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

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

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

PRACTICAL MARKS ALLOTMENT

SEMESTER-V

PAPER – VI

FISHERIES EXTENSION, ECONOMICS & MARKETING

Practical's - External **Total Marks : 25**

Project work/on-job training at industry-

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

1 .Assessment	:	10 marks
2.Record	:	10 marks
3.Vivo Voce	:	5 marks

Question Paper Blue Print

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

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

SEMESTER-V

PAPER – V

FISHERIES EXTENSION, ECONOMICS & MARKETING

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: Short Questions : 5 x 4 = 20

Questions numbers 1 to 10, Out of 10 Questions 5 has to be answered.

Section-B: Essay Questions : 5 x 8 = 40

Questions numbers 11 to 15, Internal Choice (either / or) and 5 Questions has to be answered.

Total : 60 Marks

Model Question Paper

SRR&CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.
III B.Sc (AT.Z.C) AQUACULTURE TECHNOLOGY
SEMESTER-V
PAPER – VI
FISHERIES EXTENSION, ECONOMICS AND MARKETING

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

SECTION-A

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

1. Value price
2. Market demand and individual demand
3. Fishery market survey
4. Fishermen cooperatives
5. Role of NABARD in fisheries
6. Contribution of fisheries to the national economy
7. Scope and objectives of fisheries extension education
8. Adoption of innovation
9. Education of farmers through electronic media
10. LLP –Lab to Land Programme

SECTION-B

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

11. a. Explain various factors influencing the fishery products price.
(or)
b. Describe the theory of production in relation to fisheries

12. a. Describe price determination of fishes in market.
(or)
b. Explain basic marketing functions of fish.

13. a. Explain cost and earning of shrimp farming systems.
(or)
b. Explain the role of Matsyafed in uplifting fishermen's condition.

14. a. Explain scope and objectives of fisheries extension education.
(or)
b. Explain fisheries extension methods

15. a. Describe the salient features of FFDA
(or)
b. Explain the role DAATT centers and their role in tot programs.

Signatures of the Members in BOS

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)**
   Principal,
   SGK Government Degree College,
   Vinukonda,
   Guntur.AP

4. **Dr.N.SREENIVAS** **(Subject Expert)**
   Associate Professor, Dept of Zoology
   PR Govt.(A) College,
   Kakinada.AP

5. **Sri.A. RAGHURAM REDDY** **(Industrial Expert)**
   Proprietor,
   M/s Neelagri Foundation
   Atmakur,
   Guntur

6. **Sri. B.APPALA NAIDU** **(Special Member)**
   Assistant Project Manager-Tilapia Fish Project
   Rajiv Gandhi centre for Aquaculture (RGCA)
   Manikonda

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

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

9. **Sk.Parveen** **(Faculty Member)**
   Lecturer in Zoology
   SRR & CVR GDC (A),
   Vijayawada