



**Dr. V. S. Krishna Govt. Degree College (A)  
Visakhapatnam**

**Dr. V. S. Krishna Govt. Degree & PG College (A)**

**Add-on Course**

**2021-22**

**Subject: AQUA FEED**



**DEPARTMENT OF ZOOLOGY**





## Dr. V. S. KRISHNA GOVT. DEGREE COLLEGE

(AUTONOMOUS)

NODAL RESOURCE CENTRE & AU CENTRE FOR RESEARCH

Maddilapalem, Visakhapatnam – 530013, Andhra Pradesh.

0891-2553262, <https://www.drsvkrishnagdc.edu.in>



### PERMISSION LETTER TO START ADD-ON COURSE

From  
The Head of The Department,  
Department Of Zoology  
Dr. V. S. Krishna Govt. Degree College (A)

To  
Principal,  
Dr. V. S. Krishna Govt. Degree College (A)

Sir,

SUB: Permission to start an Add-on course for 2021-22 and permission to nominate the Zoology faculty to teach classes for the add on course - regarding

Ref: Resolution copy of the department of Zoology Dated 14-10-2021

As per the resolution of the department of Zoology, we are very much glad to start add-on course with a title “Aqua Feed” for the B.Sc (CBZ) students. Hence, we are requesting you to give permission to start the Add on course and also permission to teach theory and practical classes for the said add on course.

Thanking you sir

Course Coordinator

HOD

Department of Zoology

PRINCIPAL



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### **DEPARTMENT OF ZOOLOGY**

#### **Add-on Course for 2021-22**

### **AQUA FEED**

#### **Introduction:**

Like all other living things, aquatic animals need certain nutrients or substances for growth, tissue upkeep, metabolic control, and overall health. Fish farming depends increasingly on planned feeds and less on natural food sources as it gets more intensive. A well-balanced meal and sufficient feeding are essential components. Maximizing the profitability and productivity of fish. Farm fish suffer from excessive mortality, poor development, and insufficient food. It has been discovered that high-quality feed, when paired with appropriate feeding management, can increase feed conversion efficiency, reduce production costs, and lessen environmental harm.

The essential concepts of proper nutrition and feeding should be taken into consideration in an efficient feeding regime. This calls for knowledge of the dietary needs, eating habits, and behavior of various species, as well as fish's ability to absorb and utilize essential nutrients. The protein and essential amino acid needs of cultured species, along with lipids and essential fatty acids, energy, vitamins, and minerals, must all be provided via aqua feeds. The quantity of nutrients that fish can access will ultimately determine the meal's quality. As a result of fish eating to maintain their efficiency.

A particular fish species' nutritional requirements for cultivation should be understood. Carnivores like grouper, sea bass, and snapper have higher protein requirements than omnivores like milkfish and herbivores like tilapia. Varying fish species have varying requirements for vital amino acids. While tiger prawns and Asian seabass need both omega-3 and omega-6 fatty acids, milkfish only need omega-3 fatty acids. Conversely, tilapia needs N-6 fatty acids. Therefore, feed compositions ought to be determined by the optimal nutrient requirements and levels for the farmed species. Feed development should continuously investigate methods to raise the quality of raw materials, reduce feed prices, and enhance farm feeding management.

The fish need to use the nutrients in the feed effectively. A plethora of new products, such as growth boosters, binders, and feed attractants, have entered the market. However, feed additives must be utilized cautiously in aqua feeds since new ones are constantly being launched without enough study on their effectiveness. Feed manufacturing ought to ensure that anti-nutrient components are eliminated and that the nutritional content is maintained. The control of feed quality in fish farms must start with the selection of materials and continue through feed processing, storage, and use. If a high-quality, nutritionally balanced diet is not properly implemented, it may be ineffective. Prioritizing improved feed performance and good feeding management is also necessary. Effective feeding management necessitates having answers to the questions of what, how much, when, how often, and where to feed the fish. The feeding schedule that is used must coincide with the fish's eating schedule and digestive cycle in order to maximize feed usage. Fish production costs and the quality of the cultural environment will be significantly impacted by any decrease in food waste.

#### **Goals and Objectives:**

- To determine the significant foods that aquatic species consume on a daily basis.
- Encouragement of Aquafeeds' preparation and manufacturing.
- To create methods for preparing feed using various ingredients.
- To lower disease rates with wholesome diets.
- Being aware of the kind of feeding ingredients used for fish and shrimp.
- Acquire practical knowledge

#### **Course objectives:**

- The student will recognize the ingredients in the food.
- The student will be familiar with manufacturing processes.
- Students will take action to fix their own fish meals.
- The students manufacture and sell fish meals for small-scale farmers.
- Methods for understanding how to lessen and treat fish illnesses.
- Employment prospects in the feed and aqua farming sectors.



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### **Department of Zoology Add-on-course (w.e.f.2021-22)**

**Course Title: AQUAFEED**

**Hours: 60**

**Max. Marks: 100**

#### **AIM OF THE COURSE**

To become knowledgeable about the feed equipment and nutritional needs of the main cultivable species in order to create innovative and new feeds for commercial aquaculture

#### **LEARNING OBJECTIVES**

- To comprehend the idea of feeds, feed ingredients, and feed preparation;
- To recognize the significance of ingredient selection, formulation, processing, and manufacturing;
- To give students hands-on experience with feed processing technology;
- To familiarize students with various nutritional leaching in feeds, feed quality determination, and feed making;
- To help students comprehend the equipment used in feed manufacturing.

#### **COURSEOUTCOMES:**

The overall course outcome is that the student shall develop deeper understanding of feed quality and feed ingredients. This course will provide students with a deep knowledge in aqua culture feeds. By the completion of the course the graduate shall able to –

- **CO1-Understandthebasicconceptsfeedmaking,whichcreatesscientifictemper**

among students

- **CO2**– Acquire knowledge on different types of feed ingredients for feed making.
- **CO3**– Get hands-on experience of various instruments.
- **CO4**– Analyzesamplesbyusingvariousscientifictechniquesandexposureto protocol-based research analysis.
- **CO5**– Knowledge on types of feeds for aqua industry.

**CO–PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	✓				✓		✓		✓
CO2	✓		✓			✓	✓	✓	✓
CO3		✓				✓		✓	✓
CO4	✓				✓		✓	✓	
CO5				✓	✓		✓	✓	✓



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### **SYLLABUS**

#### **Unit I**

Introduction: Types of fishes habitation, Need for studying the nutritional requirements of cultivable fishes, Natural Feed and Artificial Feed, feed formulation, Feed ingredients and Feed preparation: Commonly used feed ingredients in aqua feeds, Novel feed ingredients, estimation of quality of feed ingredients, Qualities of feed ingredients, Floating fish feed processing and manufacturing. Fish feed preparation method.

#### **Unit II**

Larval feeds and Live feeds: Shrimp larval feeds, artificial diets for larvae

Forms of feeds: Floating, semi-floating, sinking and stable feeds for aquaculture, Feed making methods for different feeds, Nutrient leeching in feeds, feed quality determination and feed making, Evaluation of feeds, Simulated system evaluation, lab analysis.

#### **Unit III**

Feed processing technology: Common processes in feed manufacture; Grinding, Dosing, Homogenization; Extrusion cooking; Complimentary processes; Drying, crumbling, coating; Use of binders; Feed manufacture productions with high energy diets vacuum coating with lipid. Equipments used in feed manufacture; Pulverizer, grinder, mixer, pelletizer, crumbler, drier, Extruder/Expander, Vacuum coater, fat sprayer

#### **UNIT VI. Practicals**

Nutritional requirements determination for different species

Collection and analysis of different feed ingredients

Feed formulation with different feeding gradients

Visit to feed mills and feed making process

#### **Suggested Reading**

1. Dr. Karri. Rama Rao, P. Ayodhya Reddy, Dr. Dasari Prasanna. Recent Trends in

- Aquaculture: (2021), JTS Publications, Delhi, ISBN 978-93-90143-69-6.
2. ADCP (Aquaculture Development and Co-ordination Programme), 1980. Fish Feed Technology. ADCP/REP/80/11. FAO.
  3. Ali SA. 2018. Nutritional feeding of fish and shrimps in India. MJPPubl.
  4. Cyrino EP and Bureau D and Kapoor BG. 2008. Feeding and Digestive Functions in Fishes. Science Publ.
  5. D Abramo LR, Conklin DE and Akiyama DM. 1977. Crustacean Nutrition: Advances in Aquaculture. Vol. VI. World Aquaculture Society, Baton Rouge.
  6. De Silva SS and Anderson TA. 1995. Fish Nutrition in Aquaculture. Chapman and Hall Aquaculture Series.
  7. Elena M. 2003. Nutrition, Physiology and Metabolism in Crustaceans. Science Publishers.
  8. Ganguly S. 2014. Potential and recommended feed additives for sustainable aquaculture, livestock and poultry farming practices. Narendra Publ.
  9. Guillame J, Kaushik S, Bergot P and Metallier R. 2001. Nutrition and Feeding of Fish and Crustaceans. Springer Praxis Publ.
  10. Halver J and Hardy RW. 2002. Fish Nutrition. Academic Press.
  11. Halver JE and Tiews KT. 1979. Finfish Nutrition and Fish Feed Technology. Vols. I, II Heenemann, Berlin.
  12. Hertrampf JW and Pascual FP. 2000. Hand book on Ingredients for Aquaculture Feeds. Kluwer.
  13. Houlihan D, Boujard T and Jobling M. 2001. Food Intake in Fish. Blackwell.
  14. Lavens P and Sorgeloos P. 1996. Manual on the Production and Use of Live Food for Aquaculture. FAO Fisheries Tech. Paper 361, FAO.
  15. Lovell RT. 1998. Nutrition and Feeding of Fishes. Chapman and Hall.
  16. Lovell T. 2014. Nutrition and feeding of fish. Springer Publ.
  17. Merrifield D and Ringo E. 2014. Aquaculture Nutrition: gut health, probiotics and prebiotics.
  18. Nates SF, 2016. Aquafeed formulation. Academic Press
  19. New MB. 1987. Feed and Feeding of Fish and Shrimp. A Manual on the Preparation and Preservation of Compound Feeds for Shrimp and Fish in Aquaculture. FAO – ADCP/REP/87/26. • Strasbourg LK. 2013. Fish feeding in integrated fish farming. Random Exports.
  20. Wiley Blackwell. Ninawe AS and Khedkar GD. 2009. Nutrition in aquaculture. Narendra Publications.



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### BLUEPRINT FOR SEMESTER END EXAMINATIONS PAPERSETTING

Learning Level-wise Weightage				
Bloom's Taxonomy level	Weightage	marks	Essay type	Short answer type
Knowledge/ Remember	33%	24	1	1 (1 out of 2)
Understanding/ Comprehension	27%	20	1	1 (1 out of 2)
Application/	20%	24	1	1 (1 out of 2)
Analysis	13%	16		2 (2 out of 4)
Synthesis/Evaluate	7%	16		1 (1 out of 2)
<b>Total</b>	100	100	3 questions	6 questions

S. No.	Module/ Chapter	Name of the chapter	50 Marks (MCQs)
1	Module-I	Unit-I	25 marks
2	Module-II	Unit-II	20 marks
3	Module-III	Unit-I	25 marks
4	Module-IV	Unit-II	30 marks

**Note:** The questions with internal choice should be of same Bloom's level.



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**Department of Zoology**  
**Add-on course**  
**Course Title: Aqua Feed**

**Time: 3 Hours**

**70 M**

**MODEL PAPER**

- I. *Answer any FOUR of the following:* **54x5= 25**  
*Draw labeled diagrams wherever necessary*

1. Feed ingredients
2. Feed quality determination
3. Evaluation of feeds
4. Extrusion cooking
5. Pelletizer
6. Binders

**.SECTION-B**

- II. *Answer any THREE of the following:* **3x15 = 45**  
*Draw labeled diagrams wherever necessary*

1. Describe the method and needs of study the nutritional requirements  
OR  
Explain the estimation of quality of feed ingredients
2. Describe the various types of feeds?  
OR  
Write a detail note on feed quality and feed making
3. Explain the Feed processing technology?  
OR  
Describe the Feed manufacture productions with high energy diets



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**Department of Zoology**  
**Add-on course**  
**Course Title: Aqua Feed Practical**

**Time: 1 <sup>1/2</sup> Hours**

**30 M**

**MODEL PAPER**

- I. Prepare Fish Feed using different feed ingredients - 20M
  
- II. Field trip Record ----5M
  
- III. Viva-Voce---- 5M

**External Examiner**

**Internal Examiner**









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MADDILAPALEM, VISAKHAPATNAM-530013. ANDHRA PRADESH



### Value Added Course Certificate

202.1. to 202.2.

This is to certify that Mr./Miss B. CHANDRIKA of  
III B.Sc. EM has successfully completed the Value Added Course in AQUA FEED  
with Regd No. E20203005 Organized by the Department of ZOLOGY in  
collaboration with..... during year 2021. to 2022 He/She has passed the course with  
A grade.

  
Academic  
Coordinator

  
IQAC  
Coordinator

  
Course  
Coordinator



  
PRINCIPAL

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MADDILAPALEM, VISAKHAPATNAM-530013. ANDHRA PRADESH



### Value Added Course Certificate

202.1. to 202.2.

This is to certify that Mr./Miss T. ANUSHA of  
III CBZ EM has successfully completed the Value Added Course in AQUA FEED  
with Regd No. E20203002 Organized by the Department of ZOLOGY in  
collaboration with..... during year 2021. to 2022 He/She has passed the course with  
A grade.

  
Academic  
Coordinator

  
IQAC  
Coordinator

  
Course  
Coordinator



  
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## Value Added Course Certificate

2021. to 2022.

This is to certify that Mr./Miss Y. BHAVANA of  
III CBZ EM has successfully completed the Value Added Course in AQUA FEED  
with Regd No. E20203004 Organized by the Department of ZOOLOGY in  
collaboration with \_\_\_\_\_ during year 2021. to 2022. He/She has passed the course with  
'A' grade.

  
Academic  
Coordinator

  
IQAC  
Coordinator

  
Course  
Coordinator



  
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