PITHAPUR RAJAH'SGOVERNMENT COLLEGE
(AUTONOMOUS)
NAAC A GRADE

KAKINADA

XX–BOARD OF STUDIES

DEPARTMENT OF ZOOLOGY

2019-20

(CHOICE BASED CREDIT SYSTEM)

P.R.GOVT.COLLEGE (AUTONOMOUS) KAKINADA.
2019 -20, XX BOARD OF STUDIES MEETING. Dt.02 .04.2019
DEPARTMENT OF ZOOLOGY

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

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

Resolution II: Resolved to implement of 60% external and 40% internal marks for both theory and practicals from the academic year 2019-20 for III and IV semesters along with I and II semesters.

Resolution III: Resolved to split 40 marks of theory internal as 20 marks for mid exams and 20 marks for co-curricular activities (seminar/assignment/quiz/group discussion).

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

Resolution V: Resolved to follow Adikavi Nanayya University B.Sc Aquaculture UG syllabus for V and VI semesters along with III & IV semesters and B.Voc (professional) syllabus for I&II semesters from 2019-20 onwards

Resolution VI: Resolved to follow the same syllabus and exam pattern for the II & III students (2019-20)

Resolution VII: Resolved to induct apprenticeship programme for final year students in v semester by compressing the syllabus for 2 ½ semesters

Resolution VIII: Resolved to continue an elective paper – ornamental fishery in the VI th semester along with cluster papers- (-1-fishery processing technology and -2 fishery micro biology and fishery byproducts and 3- quality control in processing plants,along with project for final year students at the end of VI semester) `

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

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

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

Resolutuon XIII: Resolved to approve the syllabus with internship programme in the V semester,subjected to the directions of the Commissioner ate of Collegiate Education, AP Vijaywada.

Chairperson
Board of Studies
Dept. of Zoology

P.R. GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
DEPARTMENT OF ZOOLOGY

XIX-BOARD OF STUDIES MEETING 2019-20
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2018-19)

Time: 03.00 PM. **Date: 02.04.2019**

Venue: *Department of Zoology*

The XIX BOARD OF STUDIES Meeting of the Department of Zoology took place 03:OO PM on O2.04.2019 in the Department of Zoology P.R. Govt. College, (A) Kakinada for the year 2019-20. The following members attended.

Sl No	Name and affiliation	Designation	Signature
01	Sri.B.Ahmad Ali Baba Lecturer in-charge Dept of Zoology P R College(Autonomous) KAKINADA.	Chairperson	
02	Dr.K.Ramaneswari Prof. in Zoology Dept. of Zoology Adikavi Nannaya University RAJAHMAHENDRAVARM	Vice-Chancellor's Nominee	
03	Dr.D.Padmavathi Senior Lecturer in Zoology M.S.N. Degree College KAKINADA	Subject Expert	
04	Dr. A.Sreenivasulu Director V.S.Lakshmi Research Centre	Industralist	
05	Dr.M. Vijaya Santhi Lecturer in Zoology IDEAL College KAKINADA	Subject Expert	

DEPARTMENTAL STAFF

6. Dr.N.Sreenivas — Member
Lecturer in Zoology
P.R.Govt College (A)
Kakinada.

7.P.John Kiran — Member
Lecturer in Zoology
P.R.Govt College (A)
Kakinada.

8. L.K.R.V.Prasad — Member
Lecturer in Zoology
P.R.Govt College (A)
Kakinada.

9. T Venkateswara Rao — Member
Lecturer in Zoology (Contract)
P.R.Govt College (A)
Kakinada.

10.Sk. MadinaSaheb — Member
Lecturer in Zoology (Contract)
P.R.Govt College (A)
Kakinada

11. P.Vijaya Chandrika — Member
Lecturer in Zoology (Guest)
P.R.Govt College (A)
Kakinada

12. Y. Gouthami — Member
Lecturer in Zoology (Guest)
P.R.Govt College (A)
Kakinada

132. V. Praveena — Member
Lecturer in Zoology (Guest)
P.R.Govt College(A)
Kakinada

14.Eswar Krupa — Member
Lecturer in Zoology (Guest)
P.R.Govt College(A)
Kakinada

LIST OF EXAMINERS

DEPARTMENT OF ZOOLOGY

S.No	Name of the Examiners	Subject	Name of the College
01	Dr. K. BalaJagannadha Rao	Zoology	AMAL College, Anakapally
02	Dr. M. vijayasanthi	Zoology	Ideal college ,kakinada
03	B.VijayaBhaskara Rao	Zoology	AVN College, Vizag
04	Dr.M.Vijaya Kumar	Zoology	GDC (Men), Palakollu
05	Dr. P.Jaya	Zoology	VSK College, Vizag
06	K.Visweswara Rao	Zoology	C.R.R.College (Men) Eluru
07	P.Ramakrishna Prasad	Zoology	C.R.R.College (Men) Eluru
08	K.K.D.M.Lakshmi	Zoology	C.R.R.College (Womens) Eluru
09	Dr.K.Usha Rani	Zoology	D.N.R.College, Bhimavaram
10	Smt.D.Parvathi	Zoology	G.D.College, Ganapavaram
11	N.Suneetha	Zoology	GDC ,Nidadavolu
12	C.Vara Lakshmi	Zoology	M.R.College (W) Vizianagaram
13	M.Rajeswari	Zoology	M.R.College (W) Vizianagaram
14	B.Narayana Rao	Zoology	M.R.College (A) Vizianagaram
15	G.Mani	Zoology	M.R.College (A) Vizianagaram
16	R.Indira	Zoology	St.Theressa College, Eluru
17	V.SuryaKumari	Zoology	M.R.College (A) Vizianagaram
18	R.Prabakara Rao	Zoology	M.R.College, Peddapuram
19	Dr.V. Sandhya	Zoology	GDC, Ganapavaram
20	PVBKRL.Saibaba	Zoology	SKBR.College, Amalapuram
21	V.V.Padmavathi	Zoology	St.Theressa College, Eluru
22	Dr. P. Padmavathi	Zoology	MSN Degree College, Kakinada

Lecturer in charge- Dept of Zoology

LIST OF QUESTION PAPER SETTERS

DEPARTMENT OF ZOOLOGY

S.N	Name of the Examiners	Subject	Name of the College
01	Dr.K.V.C.S.Appa Rao	Zoology	Y.N.College, Narasapuram
02	Y.V.K.Durgaprasad	Zoology	V.S.K. College , Vizag
03	Dr.k.Narasimhamurthy	Zoology	Pydah fisheries polytechnic college Patavala
04	Dr.K.Usha Rani	Zoology	D.N .R. College, Bhimavaram
05	Mrs, R.KrishnaBharathi	Zoology	S.K.V.T.College, Rajahmundry.
06	A.VenkatapathiRaju	Zoology	S.K.B.R.College, Amalapuram.
07	Dr. Rama Murthy	Zoology	B.V.K.College, Vizag.
08	K.Sathi Reddy	Zoology	Bullayya College, Vizag.
09	K. Chakravarthy	Zoology	DRG Govt. Degree College, Tp.gudem
10	Y.Polinaidu	Zoology	C.R.R.College (A) Eluru
11	K.V.S. Reddy	Zoology	A.N.R. College, Gudivada
12	Dr.V.SuryaKumari	Zoology	M.R.College, Vijayanagaram
13	Dr. K.S.R.Prasada Rao	Zoology	S.N.K.P.&Dr.K.S.Raju College Penugonda
14	Smt.M.Vasanthalakshmi	Zoology	D.R.G.Govt Degree College, Tp.gudem.
15	Dr. P.Jaya	Zoology	VSK College, Vizag
16	Dr.M.Vijaya Kumar	Zoology	GDC (Men), Palakollu
17	N.Suneetha	Zoology	GDC ,Nidadavolu

Lecturer in charge-Dept of Zoology

P R GOVERNMENT COLLEGE (A), KAKINADA
DEPARTMENT OF ZOOLOGY
Compressed syllabus for the embedded courses 2019-2020 (Aquaculture Technology)

Aquaculture Technology Programme

S.No	CORE SUBJECTS			Marks	Credits
	Semester	Paper	Title		
1	**I Semester**	I	Basic principles of aquaculture	100	03
			Practical I	50	02
2	**II Semester**	II	Biology of fin fish & shell fish	100	03
			Practical II	50	02
3	**III Semester**	III	Fish nutrition & feed technology + 1	100	03
			Practical III	50	02
4		IV	Fish Health Management	100	03
			Practical IV	50	02
5	**IV Semester**	V	Fresh water & brackish water aquaculture	100	03
			Practical V	50	02
6		VI	Fisheries Extension, economics and marketing	100	03
			Practical VI	50	02
7	**V Semester**		Apprenticeship (as per the directions of CCE)		
8	**VI semester**	Elective	Ornamental Fishery	100	03
			Practical VII	50	02
9		Cluster 1A	Fishery Processing technology	100	03
			Practical VIII	50	02
10		Cluster 1B	Fishery microbiology and fishery byproducts	100	03
			Practical IX	50	02
11		Cluster 1C	Quality control in processing plants	100	03
			Project	50	02

P .R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

SEMESTER - I – PAPER-1
BASIC PRINCIPLES OF AQUACULTURE

UNIT-I: INTRODUCTION

1-1 Concept of Blue Revolution - History and definition of Aquaculture
1-2 Scope of Aquaculture at global Level, India and Andhra Pradesh
1-3 Fresh water aquaculture, brackish water aquaculture and mariculture
1-4 Different Aquaculture systems – Pond, Cage, Pen, Running water, Extensive, Intensive & Semi-Intensive Systems and their significance. Monoculture, Polyculture and Monosex culture systems
1-5 Aquaculture versus Agriculture; Present day needs with special reference to Andhra Pradesh

UNIT-II: POND ECOSYSTEM

2-1 General Concepts of Ecology, Carrying Capacity and Food Chains
2-2 Lotic and lentic systems, streams and springs
2-2 Nutrient Cycles in Culture Ponds – Phosphorus, Carbon and Nitrogen
2-3 Importance of Plankton and Benthos in culture ponds, nutrient dynamics and algal blooms
2-4 Concepts of Productivity, estimation and improvement of productivity

UNIT-III: TYPES OF FISH PONDS

3-1 Classification of ponds based on water resources – spring, rain water, flood water, well water and water course ponds
3-2 Functional classification of ponds – head pond, hatchery, nursery, rearing, production, stocking and quarantine ponds
3-3 Hatchery design

UNIT- IV: POND PREPARATION

4-1 Important factors in the construction of an ideal fish pond – site selection, topography, nature of the soil, water resources
4-2 Lay out and arrangements of ponds in a fish farm
4-3 Construction of an ideal fish pond – space allocation, structure and components of barrage pond

UNIT-V: POND MANAGEMENT FACTORS

5-1 Need of fertilizer and manure application in culture ponds; Role of nutrients; NPK contents of different fertilizers and manures used in aquaculture; and precautions in their application
5-2 Physico-chemical conditions of soil and water optimum for culture –temperature, depth, turbidity, light, water and shore currents, PH, DOD, CO2 and nutrients; measures to increase oxygen and reduce ammonia & hydrogen sulphide in culture ponds; correction of PH
5-3 Eradication of predators and weed control – advantages and disadvantages of weed, weed plants in culture ponds, aquatic weeds, weed fish, toxins used for weed control and control of predators

PRESCRIBED BOOK(S):

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

REFERENCES:

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

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

SEMESTER - I – PAPER-1
BASIC PRINCIPLES OF AQUACULTURE
PRACTICAL SYLLABUS

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

1. Estimation of Carbonates, Bicarbonates in water samples
2. Estimation of Chlorides in water samples
3. Estimation of dissolved oxygen
4. Estimation of ammonia in water
5. Field visit to nursery, rearing and stocking ponds of aqua farms
6. Field visit to hatchery
7. Study of algal blooms and their control
8. Collection & identification of zooplankton and phytoplankton
9. Study of aeration devices
10. Determination of soil nitrogen and phosphorus
11. Collection and study of aquatic weeds
12. Filed survey of nearby habitat for dietary dependency on and requirement of aqua products

BASIC PRINCIPLES OF AQUACULTURE

PRACTICAL MODEL PAPER

Max Marks 50 Time 2hrs

I. Estimate carbonates/Bicarbonates/chlorides/DO/Ammonia in a given sample and write procedure and principle	10 marks
II. Identify the following spotters A. Phytoplankton B. Phytoplankton C. Zooplankton D. Aquatic Weed	20 marks
III. Record	05 marks
IV. Internal assessment	15 marks
Total	**50 marks**

P .R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)
SEMESTER – II PAPER-1I
TITLE - BIOLOGY OF FIN FISH & SHELL FISH

UNIT-I: GENERAL CHARACTERS & CLASSIFICATION OF CULTIVABLE FIN & SHELL FISH
1-1 General Characters and classification of fishes, crustaceans and molluscs up to the level of Class.
1-2 Fish, Crustaceans and Molluscs of commercial importance
1-3 Sense organs of fishes, crustaceans and molluscs
1-4 Specialized organs in fishes – electric organ, venom and toxins
1-5 Buoyancy in fishes- swim bladder and mechanism of gas secretion

UNIT-II: FOOD, FEEDING AND GROWTH
2-1 Natural fish food, feeding habits, feeding intensity, stimuli for feeding, utilization of food, gut content analysis, structural modifications in relation to feeding habits, forage ratio and food selectivity index
2-2 Principles of Age and growth determination; growth regulation, Growth rate measurement – scale method, otolith method, skeletal parts as age indicators
2-3 Genetic, biotic & ecological factors in determining the longevity of fishes, lengthfrequency method, age composition, age-length keys, absolute and specific growth, back calculation of length and growth, annual survival rate, asymptomatic length, fitting of growth curve
2-4 Length-weight relationship, condition factor/Ponderal index, relative condition factor

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

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

UNIT-V: HORMONES & GROWTH
5-1 Endocrine system in fishes
5-2 Neurosecretary cells, androgenic gland, ovary, Y-organ, chromatophores, pericardial glands and cuticle.
5-3 Molting, molting stages, metamorphosis in crustacean shell fish

PRESCRIBED BOOK(S):

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

REFERENCES:

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

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

SEMESTER – II PAPER-1I
TITLE - BIOLOGY OF FIN FISH & SHELL FISH
PRACTICAL SYLLABUS

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

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

BIOLOGY OF FIN FISH & SHELL FISH
PRACTICAL MODAL PAPER

Max Marks 50 Time 2hrs

I.	Enumerate Length Weight relationship of the given fishes. Write procedure and Draw Graphs as required		10 marks
II.	Identify the following spotters A. Mouth Parts B. Type of Eggs C. Larval Forms D. Larval Forms	4x5=	20 marks
III.	Record		05 marks
IV.	Internal assessment		15 marks
	Total		**50 marks**

P .R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2018-2019 onwards)

SEMESTER III – PAPER-1II

TITLE - FISH NUTRITION & FEED TECHNOLOGY

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

PRESCRIBED BOOK(S):
1. HALVER JE 1989. Fish nutrition. Academic press, San diego
REFERENCES:

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

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

SEMESTER III – PAPER-1II

TITLE - FISH NUTRITION & FEED TECHNOLOGY
PRACTICAL SYLLABUS

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

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

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)
SEMESTER III – PAPER-III
TITLE - FISH NUTRITION & FEED TECHNOLOGY
PRACTICAL MODEL PAPER

Max Marks 50 **Time 2hrs**

I. Estimate Protein content in aquaculture feeds. Write procedure	10 marks
II. Estimate the Ash content in aquaculture feed. Write procedure	10 marks
III. Different Feed formulation identification using charts	05 marks
IV. Record	05 marks
V. Field Note book	05 marks
VI. Internal assessment	15 marks
Total	**50 marks**

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

SEMESTER III– PAPER-IV
FISH HEALTH MANGEMENT

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.

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 diseases, trypanosomiasis. Prevention and therapy

UNIT IV: NUTRITIONAL DISEASES & FISH HEALTH MANAGEMENT

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.

4-3 Diagnostic tools – immune detection- DNA/RNA techniques, General preventive methods and prophylaxis. Application and development of vaccines, Quarantine methods, Zero water exchange, Use of Probiotics in Aquaculture.

Suggested Reading:
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

P.R.GOVERNMENT COLLEGE (A), KAKINADA

II B.Sc., (Fisheries), SEMESTER-III

TITLE: FISH HEALTH MANGEMENT

(WITH EFFECTIVE FROM 2017-2018)

COURSE CODE:

MODEL QUESTION PAPER

Time: 2 ½ hrs. Max Marks: 60

PART – 1

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

3x10 = 30M

SECTION- A

1. Define disease? Explain the about the categories of Fish diseases.
2. Write an essay on Bacterial diseases in Carps.
3. Write an account of Viral diseases in shrimp and prophylaxis methods.

SECTION- B

4. Write an essay on the Bacterial diseases in shrimps and preventive methods.
5. Describe the nutritional diseases in the fishes.
6. Explain about the Use of probiotics in Aquaculture.

Part – II

Answer any **Six** question **6x5=30M**

7. Cell metabolism
8. Atrophy and hypertrophy
9. Lagenidium diseases
10. CCVD
11. Ichthyophthiriasis
12. Whirling diseases in shrimp
13. Preventive methods of prawn protozoan diseases
14. Vaccines
15. Vitamic C
16. Quarantine methods

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BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTED TO THE UNIT
MODULE – I	01	02	20
MODULE – II	01	02	20
MODULE – III	02	03	35
MODULE – IV	02	03	35
Total no.of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 marks including choice Of which 60 marks to be answered

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

QUESTION BANK

10 marks

1. Define disease? Explain the about the categories of Fish diseases.
2. What is Cell? Explain the types of degenerations of cell.
3. Write an essay on Bacterial diseases in Carps.
4. Explain about the Fungal diseases in Fishes.
5. Describe the vial diseases in Fishes.
6. Write an account of Viral diseases in shrimp and prophylaxis methods.
7. Write an essay on the Bacterial diseases in shrimps and preventive methods.
8. Explain the different types of proteozoan diseases in shimp.
9. Explain about the best preventive methods shrimp diseases management.
10. Describe the nutritional diseases in the fishes.
11. Explain about the Use of probiotics in Aquaculture.
12. Describe the environmentally induced diseases and management practices.

5 Marks

1. Cell metabolism
2. Atrophy and hypertrophy
3. Necosis
4. Cell death
5. Lagenidium diseases
6. CCVD
7. Fusarium
8. Brachiomycosis
9. Ichthyophthiriasis
10. Whirling diseases in shrimp
11. WSSV
12. Costiasis
13. YHV
14. MBV
15. Preventive methods of prawn protozoan diseases
16. Vaccines
17. Vitamic C
18. Quarantine methods
19. DNA/RNA technic
20. Zero water Exchange
21. Aflotoxins
22. Disease causing dinoflagellates

SEMESTER III– PAPER-IV
FISH HEALTH MANGEMENT

PRACTICALS:

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

II **B.Sc., (Fisheries), SEMESTER-III**
PRACTICAL MODEL PAPER

Max marks: 50
Time : 2Hrs

1. Dissect and display the external lesions of fish/prawn. Draw a neat labelled diagram 10M

2. Identification of spotters 4X5=20M

A)----------

B)----------

C)----------

D)----------

E)----------

3. Record 05M

4. Continuous Internal Assessment 15M

Total **50M**

P .R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

SEMESTER IV – PAPER-V

TITLE - FRESH WATER & BRACKISHWATER AQUACULTURE

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, morphotypes 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

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

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

SEMESTER IV – PAPER-1V

TITLE - FRESH WATER & BRACKISHWATER AQUACULTURE

PRACTICALS SYLLABUS

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

1. Identification of important cultivable carps
2. Identification of important cultivable air-breathing fishes
3. Identification of important cultivable fresh water prawns
4. Identification of different life history stages of fish
5. Identification of different life history stages of fresh water prawn
6. Collection and study of weed fish
7. Identification of commercially viable crabs – Scylla cerrata, Portunus pelagicus, P.sanguinolentus, Neptunus pelagicus, N. Sanguinolentus
8. Identification of lobsters – Panulirus polyphagus, P.ornatus, P.homarus, P.sewelli, *P.penicillatus*
9. Identification of oysters of nutritional significance – Crossostrea madrasensis, C.gryphoides, C. cucullata, C.rivularis , 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.

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

TITLE - FRESH WATER & BRACKISHWATER AQUACULTURE
SEMESTER IV – PAPER-1V
PRACTICALS MODEL PAPER

Max Marks 50 **Time 2hrs**

I.	Identify the following specimens and write a short notes on their commercial importance a. Carp b. Freshwater prawn c. Stages of prawn d. Crab e. Oyesters f. Mussel/clam	6x5=30M
II.	Record	05 marks
III.	Internal assessment	15 marks
	Total	**50 marks**

P .R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

SEMESTER IV – PAPER-VI
FISHERIES EXTENSION, ECONOMICS & MARKETING

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 ECONOMICS

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 & TRANSFER OF TECHNOLOGY

4-1 Fisheries extension – scope and objectives, principles and features of fisheries extension Education; Fisheries extension methods and rural development
4-2 Adoption and diffusion of innovations; ICAR programs – salient features of ORP, NDS, LLP, IRDP, ITDA, KVK, FFDA, FCS, FTI, TRYSEM
4-3 Training – meaning, training vs. education and teaching
4-4 DAATT centres and their role in tot programs, video conferencing, education of farmers through print and electronic media

PRACTICAL:

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.

P.R.GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc., (Fisheries), SEMESTER-V

TITLE: FISHERIES EXTENSION, ECONOMICS & MARKETING

(WITH EFFECTIVE FROM 2017-2018)

COURSE CODE:

MODEL QUESTION PAPER

Time: 2 ½ hrs. Max Marks: 60

PART – 1

Note:Answer any THREE questions choosing at least one question from each section.
Draw the diagrams where ever necessary **3x10 = 30M**

SECTION- A

1. Explain about the scope of fisheries economics in India.
2. Explain the methods of economic analysis of fishery marketing.
3. How to preparation of project and their appraisals.

SECTION- B

4. Explain the Role of NABARD in fishermen cooperatives.
5. Write an account on the economic principles to Aquaculture.
6. Give an account on the ICAR programs.

Part – II

Answer any **Six** question **6x5=30M**

7. Goods and services
8. Law of diminishing
9. Types of economics
10. Market functions
11. Price determination
12. NABARD
13. Fishermen cooperative
14. Fisheries rural development
15. DAATT Centres
16. ORP and NDS

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BLUE PRINT

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTED TO THE UNIT
MODULE – I	01	03	25
MODULE – II	02	02	30
MODULE – III	02	02	30
MODULE – IV	01	03	25
Total no.of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 marks including choice Of which 60 marks to be answered

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

Question Bank

10 Marks

1. Explain about the scope of fisheries economics in India.
2. Describe the various factors influencing the fishery products.
3. Explain the basic marketing functions and demand.
4. Give an account on the price determination of fishes.
5. Explain the methods of economic analysis of fishery marketing.
6. How to preparation of project and their appraisals.
7. Explain the Role of NABARD in fishermen cooperatives.
8. Write an account on the economic principles to Aquaculture.
9. Explain the various cost and earning of Aquaculture systems.
10. Explain about the various inputs and production functions.
11. Give an account on the ICAR programs.
12. Describe the fisheries extensions, objectives and their scope.

5 Marks

1. Goods and services
2. Law of diminishing
3. Types of economics
4. Micro economics
5. Macro economics
6. Market functions
7. Price determination
8. Economic analysis
9. Project appraisal
10. Primary producer fishermen
11. Aquaculture economics
12. Aquaculture economic principles
13. Role of Matsyafed
14. NABARD
15. Fishermen cooperative
16. Fisheries National economy
17. Fisheries Extension
18. Fisheries rural development
19. DAATT Centres
20. ORP and NDS
21. FFDA and TRYSEM
22. LLP and IRDP
23. Fisheries Transfer of Technology

P .R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

SEMESTER VI – ELECTIVE PAPER
ORNAMENTAL FISHERY

UNIT I: INTRODUCTION AND FRESH WATER ORNAMENTAL FISHES

1-1 Aquarium and ornamental fishes – introduction; Present status of Aquarium trade in the world and India
1-2 Aquarium accessories – aerators, filters, lighters and heaters; Water quality needs and different kinds of feeds
1-3 Live bearers, gold fish, koi, gourami, barbs abd tetras, angel fish and cichlid fish
1-4 Brood stock development, breeding, larval rearing and grow out
1-5 Larval feeds and feeding

UNIT II: MARINE ORNAMENTAL FISHES

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

UNIT III: AQUARIUM MANAGEMENT

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

UNIT IV: COMMERCIAL PRODUCTION OF AQUARIUM FISH AND PLANTS

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

PRACTICALS:

1. Study of aerators – types and structures
2. Water circulation methods in aquarium and filtration
3. Collection and identification of aquarium plants
4. Identification of common marine aquarium fishes
5. Identification of common fresh water aquarium fishes
6. Breeding of egg layers

7. Breeding of live bearers
8. Evaluation of significance of aquaria for commercial and domestic use

PRESCRIBED BOOK(S):

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

REFERENCES:

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

P.R.GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc., (Fisheries), SEMESTER-VI

TITLE: ORNAMENTAL FISHERY

(WITH EFFECTIVE FROM 2017-2018)

COURSE CODE:

MODEL QUESTION PAPER

Time: 2 ½ hrs. Max Marks: 60

PART – 1

Note: Answer any <u>THREE</u> questions choosing at least one question from each section. Draw diagrams where ever necessary.

<u>SECTION- A</u>

1. Write an essay on Present status of Aquarium trade in the world and India.
2. Describe the Freshwater brood stock development and their grow out techncology.
3. Explain about the major marine ornamental fish resources of India.

<u>SECTION- B</u>

4. Describe the transportation of marine ornamental live fish and which techniques were used.
5. Describe the different types of aquarium plants.
6. Define Aquarium? Explain about setting up Aquaium.

Part – II

Answer any **Six** question **6x5=30M**

7. Live bearers
8. Freshwater ornamental fishes
9. Collection of marine ornamental fishes
10. Breeding of marine ornamental fishes
11. Gouramies
12. Aquarium plants
13. Retail marketing of ornamental fishes
14. Marine other ornamental animals
15. Acclimatization
16. Reef Aquarium

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MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	02	02	30
MODULE – III	01	03	25
MODULE – IV	01	03	25
Total no.of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 marks including choice Of which 60 marks to be answered

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

Question Bank

ORNAMENTAL FISHERY

10 Marks

4. Write an essay on Present status of Aquarium trade in the world and India.
5. Describe the Freshwater brood stock development and their grow out techncology.
6. Explain about the larval food and feeding in Freshwater ornamental fishes.
7. Give an account on the Aquarium accessories.
8. Explain about the major marine ornamental fish resources of India.
9. Describe the transportation of marine ornamental live fish and which techniques were used.
10. Explain the different types of marine ornamental fishes.
11. Describe the common diseases of Aquarium fishes and diagnosis methods.
12. Define Aquarium? Explain about setting up Aquaium.
13. Explain about the water quality management in Aquarium.
14. Explain about the export of ornamental fishes.
15. Describe the different types of aquarium plants.

5 Marks

1. Live bearers
2. Freshwater ornamental fishes
3. Aquarium feeds
4. Angel fish
5. Brood stock development
6. Collection of marine ornamental fishes
7. Breeding of marine ornamental fishes
8. Marine other ornamental animals
9. Acclimatization
10. Reef Aquarium
11. Fungal diseases of Aquarium fishes
12. Bacterial diseases of Aquarium fishes
13. Production of gold fish
14. Gouramies
15. Aquarium plants
16. Retail marketing of ornamental fishes

SEMESTER-VI
PRACTICAL MODEL PAPER

Max marks: 50
Time : 2Hrs

1. Dissect and display the fish. Draw a neat labelled diagram 10M

2. Identification of spotters 4X5=20M

A)----------

B)----------

C)----------

D)----------

E)----------

3. Record 05M

4. Continuous Internal Assessment 15M

Total **50M**

P .R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

SEMESTER VI – CLUSTER ELECTIVE I A
FISH PROCESSING TECHNOLOGY

Unit 1: Introduction:
1-1 Principles of fish preservation. Importance of hygiene and sanitation in fish handling.
1-2 Quality of water and ice in fish handling and processing. Preparation of ice.
1-3 Different types of ice used in the seafood industry and their merits.
1-4 Preservation by refrigerated seawater and chilled sea water

Unit 2: Freezing and Canning:
2-1 Fundamental principles involved in chilling and freezing of fish and fishery products.
2-2 Various freezing methods. Freezing of shrimps and fishes.
2-3 Changes during the cold storage of fish and fishery products. Principles involved in canning of fish.
2-4 Different types of containers. Different stages of canning of Tuna. Retortable pouch processing.

Unit 3: Drying, Smoking and Freeze-drying:
3-1 Principles of smoking, drying and salting of fish, factors affecting drying. Traditional drying / curing methods. Different types of drying.
3-2 Drying of fish and prawns. Packing and storage of dried products. Spoilage of dried products.
3-3 Preventive measures. Standards for dry fish products. Cold smoking. Principles of freeze drying.
3-4 Accelerated freeze drying and packing of freeze dried products. Modern methods of preservation by irradiation and modified atmospheric storage.

Unit 4: Packing, Cold Storage and Export of Fishery Products:
4-1 Functions of packing. Different types of packing materials and its quality evaluation.
4-2 Packing requirements for frozen and cured products. Statutory requirements for packing. Labeling requirements.
4-3 Different types of cold storages. Insulated and refrigerated vehicles.
4-4 Export of fishery products from India - major countries, important products, export documents and procedures.
4-5 Prospects and constraints in export including tariff and non- tariff barriers, marine insurance, export incentives, registered exporters

Text books:

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

Reference Books:

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

P.R.GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc., (Fisheries), SEMESTER-VI
TITLE: FISH PROCESSING TECHNOLOGY
(WITH EFFECTIVE FROM 2017-2018)
COURSE CODE:
MODEL QUESTION PAPER

Time: 2 ½ hrs. Max Marks: 60

PART – 1

Note:Answer any THREE questions choosing at least one question from each section. Draw diagrams where ever necessary

SECTION- A

1. Give an account on Principles of fish preservation methods.
2. Describe the various freezing methods.
3. Explain the Modified Atmospheric Storage methods for preservation.

SECTION- B

4. Explain the different types of dying methods.
5. Write an essay on export of fishery products from India.
6. Explain about the constraints in export including tariff and non-tariff barriers.

Part – II

Answer any **Six** question **6x5=30M**

7. Principles of fish preservation
8. Preparation of Ice
9. Types of ice used in the seafood industry
10. Freezing methods
11. Canning
12. Labeling requirements.
13. Fisheries export products
14. Marine insurance
15. Standards for dry fish products
16. Types of cold storage

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MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTED TO THE UNIT
MODULE – I	01	03	25
MODULE – II	01	02	20
MODULE – III	02	02	30
MODULE – IV	02	03	35
Total no.of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 marks including choice Of which 60 marks to be answered

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

Question Bank

10 Marks

1. Give an account on Principles of fish preservation methods.
2. How to Preservation by refrigerated seawater and chilled sea water.
3. Explain about the fundamental principles involved in chilling and freezing of fish and fishery products.
4. Describe the various freezing methods.
5. Give an account on the accelerated freeze drying and packing dried products.
6. Explain the Modified Atmospheric Storage methods for preservation.
7. Explain the different types of dying methods.
8. Give an account on the spoilage of dried products.
9. Describe the different types of packing materials and its quality measurements.
10. Explain about the different types of cold storages.
11. Write an essay on export of fishery products from India.
12. Explain about the constraints in export including tariff and non-tariff barriers.

5 Marks

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

P .R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM

AQUACULTURE TECHNOLOGY COURSE SYLLABUS (Effective from 2017-2018 onwards)

SEMESTER VI – CLUSTER ELECTIVE IB
FISHERY MICROBIOLOGY AND FISHERY BYPRODUCTS

Unit 1: Introduction:
1-1 History and development of microbiology –Different members of the microbial community – General characteristics of bacteria, fungi, viruses, algae and protozoans.
1-2 Ultrastructure of prokaryotic cell – structure and function of bacterial cell wall, plasma membrane, capsule, flagella and endospore. Structure of fungi and yeast cell.
1-3 Ultrastructure of virus – classification of viruses, Llfe cycle bacteriophages – lytic and lysogenic cycle.

Unit 2: Aquatic Microbiology:
2-1 Microflora of aquatic environment, Different culture techniques.
2-2 Nutrition and growth of bacteria – different types of media for isolation of bacteria and fungi. Isolation, enumeration, preservation and maintenance of cultures.
2-3 Routine tests for indentification of bacteria – morphological, cultural bioehemical and serological. Basics of mycological and virologial techniques.

Unit 3: Fish Microbiology:
3-1 Perishability of seafood – Fish as an excellent medium for growth of microorganisms.
3-2 Spoilage microflora of fish and shellfish.
3-3 Intrinsic and extrinsic factors affecting spoilage.

Unit 4: Fishery By-Products and Value Added Products
4-1 Fish meal, fish protein concentrate, shark fin rays, fish maws, isinglass, fish liver oil, fish body oil, fish hydrolysates, chitin, chitosan, glucosamine hydrochloride, squalene, pearl essence, ambergris, gelatin, beche-de-mer, fish silage, fish ensilage and seaweed products like agar, alginic acid and carragenan.
4-2 Advantages of value addition. Fish mince and Surimi. Analog and fabricated products.
Preparation of coated fishery products.
4-3 Preparation of products viz. fish / prawn pickle, fish wafers, prawn chutney powder, fish soup powder, fish protein hydrolysate, fish stacks, fillets, fish curry, mussel products, marinated products.

Text Books:

1. Pelzar, Reid & Chan – Microbiology
2. Prescolt, Harley & Klein – Microbiology
3. Adelogerg, Ingra & Wheates – Introduction to Microbial World
4. Windsor and Barlow. Introduction to Fishery Byproducts.
5. CIFT. Proceedings on Summer Institute on Non-traditional Diversified Fish Products &Byproducts.

6. Anon. Productivity in Aquatic Bodies.
7. Chincheste,C.O. and Graham,H.D. Microbial Safety of Fishery Products.
8. Amerine,M.A. and Pangborm,R.M. Principles of Sensory Evaluation of Foods.
9. Connell,J.J. Control of Fish Quality
10. Bigh,E.G. Seafood Science and Technology
11. Gopakumar.K Tropical Fishery Products

Reference Books

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

P.R.GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc., (Fisheries), SEMESTER-VI

TITLE: FISHERY MICROBIOLOGY AND FISHERY BY-PRODUCTS

(WITH EFFECTIVE FROM 2017-2018)

COURSE CODE:

MODEL QUESTION PAPER

Time: 2 ½ hrs. Max Marks: 60

PART – 1

Note:Answer any THREE questions choosing at least one question from each section. Draw diagrams where ever necessary. 3x10 = 30M

SECTION- A

1. Explain about the Ultrastructure of prokaryotic cell.
2. Explain the microflora of aquatic environment.
3. Give an account on different types of media preparation for bacteria culture.

SECTION- B

4. Give an account on the preparation of coated fishery products.
5. How to spoilage fish? Explain the spoilage of micoflora of fish and shellfish.
6. Explain about the Fishery By-poducts.

Part – II

Answer any **Six** question **6x5=30M**

7. General characters of Algae
8. Prokaryotics
9. Ultra structure of virus
10. Aquatic environment
11. Identification of Bacteria
12. By-Products
13. Advantages of value addition
14. Pearl essence
15. Fish liver oil
16. Fish fillets

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MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTED TO THE UNIT
MODULE – I	01	03	25
MODULE – II	02	02	30
MODULE – III	02	02	30
MODULE – IV	01	03	25
Total no.of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 marks including choice Of which 60 marks to be answered

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

Question Bank

10 marks

1. Explain about the Ultrastructure of prokaryotic cell.
2. Define microbes? Explain about the different types of microbes.
3. Explain the microflora of aquatic environment.
4. Give an account on different types of media preparation for bacteria culture.
5. How to explain the basics of mycological and virological techniques.
6. Explain about the different types of culture techniques in microbiology.
7. Describe the Fish as an excellent medium for growth of microorganisms.
8. How to spoilage fish? Explain the spoilage of micoflora of fish and shellfish.
9. Explain about the Fishery By-poducts.
10. Describe the fishery value added products.
11. Explain the fish mince and surimi products.
12. Give an account on the preparation of coated fishery products.

5 Marks

1. General characters of Algae
2. Prokaryotics
3. Ultra structure of virus
4. Life cycle of bacteriophages
5. Structure of fungi
6. Aquatic environment
7. Identification of Bacteria
8. Perishability of seafood
9. Intrinsic factors
10. Extrinsic factors
11. By-Products
12. Advantages of value addition
13. Seaweed products
14. Chitin and chitosan
15. Pearl essence
16. Fish liver oil
17. Fish fillets

P .R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM

QUALITY CONTROL IN PROCESSING PLANTS (Effective from 2017-2018 onwards)
SEMESTER VI - CLUSTER IC

Unit I:

1-1 Quality management, total quality concept and application in fish trade.
1-2 Quality assessment of fish and fishery products - physical, chemical, organoleptic and microbiological.
1-3 Quality standards. Quality Assurance. Inspection and quality assurance:
1-4 Fish inspection in India, process; water quality in fishery industry, product quality, water analysis, treatments, chlorination, ozonisation, UV radiation, reverse osmosis, techniques to remove pesticides and heavy metals.

Unit 2:
2-1 Sensory evaluation of fish and fish products, basic aspects, different methods of evaluation, taste panel selection & constitution,
2-1 Statistical analysis Quality problem in fishery products: good manufacturing practices.
2-3 HACCP and ISO 9000 series of quality assurance system, validation and audit. national and international standards, EU regulation for fish export trade,

Unit 3:

3-1 IDP and SAT formations in certification of export worthiness of fish processing units, regulations for fishing vessels pre-processing and processing plants, eu regulations.
3-2 Factory sanitation and hygiene: National and international requirements, SSOP.

Unit 4:
4-1 Hazards in sea foods: Sea food toxins, biogenic amines, heavy metals and industrial pollutants.
4-2 Infection and immunity, Microbial food poisoning, bacteria of public health significance in fish /fishery products / environments - Salmonella, Clostridia, Staphylococcus, E. coli, Streptococcus, Vibrio, Aeromonas, Listeria, Yersinia, Bacillus.
4-3 Laboratory techniques for detection and identification of food poisoning bacteria. Mycotoxins in cured fish, bacterial associated with fish disease.

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

Practical I

Title : Fish Processing Technology and Quality Control

Experiments:

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

Filed visit:

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

SEMESTER-VI
PRACTICAL MODEL PAPER

Max marks: 50
Time : 2Hrs

1. Determination of moisture content in fish and fishery products. Draw a neat labelled diagram10M

2. Identification of spotters 4X5=20M

A)----------

B)----------

C)----------

D)----------

E)----------

3. Record 05M

4. Continuous Internal Assessment 15M

Total **50M**

Practical II

Title : Fishery Microbiology and Quality Control

Experiments/Activities 1. Sterilization technique- dry heating, autoclaving
2. Media preparation
3. Isolation and maintenance of bacteria from fishes and water.
4. Gram staining of bacteria
5.Enumeration of bacteria by TPC method
6. Enumeration of total coli forms.
7. Evaluation of fish/fishery products for organoleptic, chemical and microbial quality

Collection:
1. Collection of fishery by-products

SEMESTER-VI
PRACTICAL MODEL PAPER

Max marks: 50
Time : 2Hrs

1. Determination of Enumeration of bacteria by TPC method. Draw a neat labelled diagram10M

2. Identification of spotters 4X5=20M

A)----------

B)----------

C)----------

D)----------

E)----------

3. Record 05M

4. Continuous Internal Assessment 15M

Total **50M**

Practical III –

PROJECT WORK

P.R.GOVERNMENT COLLEGE (A), KAKINADA
III B.Sc., (Fisheries), SEMESTER-VI
TITLE: QUALITY CONTROL IN PROCESSING PLANTS
(WITH EFFECTIVE FROM 2017-2018)
COURSE CODE:
MODEL QUESTION PAPER

Time: 2 ½ hrs. Max Marks: 60

PART – 1

Note:Answer any THREE questions choosing at least one question from each section. Draw diagrams wherever necessary **3x10 = 30M**

SECTION- A

1. Give an account on water quality in fishery industry.
2. Write an essay on quality management application in fish trade.
3. Explain about the sensory evaluation of fish and fish products.

SECTION- B

4. Give an account on SSOP.
5. Explain the infection and immunity processes of sea foods.
6. Give an account on Laboratory techniques for detection and identification of bacteria.

Part – II

Answer any **Six** question **6x5=30M**

7. Quality assurance
8. Quality standards
9. Quality assessment of fish products
10. UV radiation
11. Sensory evaluation
12. Aeromonas
13. Listeria
14. Bacillus
15. Industrial pollutants
16. Microbial food poisoning

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MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTED TO THE UNIT
MODULE – I	02	03	35
MODULE – II	01	02	20
MODULE – III	01	02	20
MODULE – IV	02	03	35
Total no.of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 marks including choice Of which 60 marks to be answered

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

Question Bank

10 Marks

1. Explain the Quality assessment of fish and fishery products.
2. Give an account on water quality in fishery industry.
3. Write an essay on quality management application in fish trade.
1. Explain the quality standards of fishery products.
2. Explain the fish inspection in India.
3. Explain about the sensory evaluation of fish and fish products.
4. Describe the Statistical analysis Quality problem in fishery products.
5. Describe the concept of HACCP.
6. Explain about the IDP and SAT formations in certification for Export.
7. Give an account on SSOP.
8. Describe the hazards in sea foods.
9. Explain the infection and immunity processes of sea foods.
10. Give an account on Laboratory techniques for detection and identification of bacteria.

5 Marks

1. Quality assurance
2. Quality standards
3. Quality assessment of fish products
4. Chlorination
5. UV radiation
6. Sensory evaluation
7. Different methods of evaluation
8. HACCP
9. Validation and audit
10. EU regulation
11. Fish export trade
12. IDP and SAT
13. SSOP
14. Sea food toxins
15. Industrial pollutants
16. Microbial food poisoning
17. Staphylococcus
18. E. coli
19. Aeromonas
20. Listeria
21. Bacillus

DEPARTMENT OF ZOOLOGY
BACHELOR OF VOCATIONAL COURSE
(COMMERCIAL AQUACULTURE)
LIST OF EXAMINERS

S.NO.	NAME OF THE EXAMINER	SUBJECT	NAME OF THE COLLEGE/INSTITUTION
01.	Dr. D. Padmavathi	Zoology	MSN Degree College, Kakinada
02.	P.V.B.K.R.L. Saibaba	Zoology	SKBR College, Amalapuram
03.	R. Indira	Zoology	St. Theresa College, Eluru
	K. Madhavi Rani	Zoology	St. Theresa College, Eluru
04.	Dr. P. Ram Mohan Rao	FDO	SIFT, Jaganaikpur, Kakinada
05.	Dr. Ramatheerdham	FDO	SIFT, Jaganaikpur, Kakinada
06.	Dr. Chandra Sekhar Reddy	FDO	SIFT, Jaganaikpur, Kakinada
07.	Murali Mohan	Senior Technical Officer	CIFE, Kakinda
08.	Dr. P. Rami Reddy	Senior Technical Officer	CIFE, Kakinda
09.	Dr. K.V.C.S Appa Rao	Zoology	Y.N. College, Narsapur
10.	Dr. P.Jaya	Zoology	Dr. V.S.K. College (A), Visakhapatnam
11.	Dr. K. Usharani	Zoology	D.N.R. College, Bheemavaram
12.	Smt. M. Vasanthalakshmi	Zoology	D.R.G.Govt. Degree College, Tadepalligudam
13.	Dr. K.S.R. Prakasa Rao	Zoology	S.N.K.P. & Dr. K.S. Raju Arts & Science College, Penugonda, W.G.
14.	B. Vijayabhaskara Rao	Zoology	A.V.N. College, Visakhapatnam
15.	V. Surya Kumari	Zoology	M.R. College (A), Vizianagaram

Lecturer in Incharge
Dept. of Zoology

P.R. GOVT. COLLEGE (A)
DEPT. OF ZOOLOGY
BACHELOR OF VOCATIONAL COURSE
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QUESTION PAPER SETTERS

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01.	Dr. D. Padmavathi	Zoology	MSN Degree College, Kakinada
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05.	Dr. Ramatheerdham	FDO	SIFT, Jaganaikpur, Kakinada
06.	Dr. Chandra Sekhar Reddy	FDO	SIFT, Jaganaikpur, Kakinada
07.	Murali Mohan	Senior Technical Officer	CIFE, Kakinda
08.	Dr. P. Rami Reddy	Senior Technical Officer	CIFE, Kakinda
09.	Dr. K.V.C.S Appa Rao	Zoology	Y.N. College, Narsapur
10.	Dr. P.Jaya	Zoology	Dr. V.S.K. College (A), Visakhapatnam
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