IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS NAAC ACCREDITED B)

DR. P.V.N. RAJU VIDYAPRANGANAM

KAKINADA

BOARD OF STUDIES
2022-2023

COURSE: B.VOC., INDUSTRIAL AQUACULTURE AND FISHERIES

Second & Third Year (III, IV & V Semester)

DEPARTMENT OF FISHERIES AND AQUACULTURE

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS , NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM
KAKINADA

Date: 13/12/2O22

Board of Studies of B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

A meeting of Board of studies of the Department of Fisheries and Aquaculture will be held on **13.12.2022 at 12.30 P.M** in Ideal College of Arts and Sciences (Autonomous), Vidyutnagar, Kakinada, to consider the following Agenda.

You are cordially invited to attend the meeting and make it a success.

Agenda:

1. To ratify the syllabus for the First year & Second year and Third year (I, II, III & IV&Vth Semesters).
2. To prepare and ratify scheme of Examinations for both internal and external examinations.
3. Model Question paper for First year & Second year and Third Year).
4. To fix Panel of paper setters and Examiners.
5. Additional inputs into the curriculum and up gradation of syllabus incorporate the Apprenticeship.
6. Other academic activities of Department.

PRINCIPAL

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DEPARTMENT OF FISHERIES AND AQUACULTURE
Board of Studies of B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

The Board of Studies for the Department of Fisheries and Aquaculture for the year 2022-2023 is constituted with the following Members.

SI.No.Members Present

1.	P.V.Lovaraju	Chairman
2.	Dr.S.Jagan mohan	Member
3.	K. Sharon	Student Member
4.	R. Jnana prasanna	Student Member

Adikavi Nannaya University Nominee

1.Dr. K. Ramaneswari
Dept. of Zoology
HOD, Adikavi Nannaya University
Rajamahendravaram
Cell No: 8074112754

Members from other Colleges

1. Dr. Muralidhar P. Ande
Senior Scientist & Office In-Charge, CIFE, Kakinada
Cell No: 7396182790

2. Dr.P.V.V.Satish
HOD of Fisheries,P.V.R.T.DegreeCollege. Kakinada
CellNo: 8074194098

Industry/Scientific Organization

1. T. Madhu Mohan
Technical Director,SGS Aqua Solutions, Kakinada.
Cell No: 9849744984

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IDEAL COLLEGE OF ARTS AND SCIENCES
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The syllabus and model question papers in INDUSTRIAL AQUACULTURE AND FISHERIES subject for B.Vocation course for Second Year (III & IV Semesters) in the academic year 2022-2023, list of Examiners and paper setter, Department activities is approved in the Board of Studies meeting held in the Department of Fisheries and Aquaculture at 12:30 PM on 13/12/22.

Sl.No.	Members Present	Signatures of Members
1.	P.V.Lovaraju	Chairman
2.	Dr. K. Ramaneswari	University Nominee
3.	Dr. Muralidhar P. Ande	Expert
4.	Dr. P. V.V.Satish	Expert
5.	T. Mohan Mohan	Representative from Industry
6.	Dr.S.Jagan mohan	Member
7.	K. Sharon	Student Member
8.	R. Jnana prasanna	Student Member

IDEAL COLLEGE OF ARTS AND SCIENCES
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KAKINADA
A.Y.2022-2023
DEPARMENT OF FISHERIES AND AQUACULTURE
B.VOC., INDUSTRIAL AQUACULTURE AND FISHERIES

Resolutions:

1. Resolved to follow the following pattern for Examinations.
   a) The syllabus is divided in to two semesters each paper 30%internal and 70% external for III & IVand Vth semester (second year & third Year).
   b) During each semester two internal Examinations for each paper will be conducted as per schedule in descriptive mode.
   c) No internal examination/semester examination will be conducted separately for the absentees.
   d) Average of the two internal Examinations will be considered. Absentee will be awarded zero marks.
   e) The minimum pass mark for external examination is 35%, Candidate should get a total of 40 marks in internal and external examination put together.
   f) The pattern of semester examinations and practical III , IV ,V is herewith appended.
   g) Practical examination will be conducted at each Semester end.
2. Resolved to approve the model question papers for, III , IV&V semesters are here with appended.
3. Resolved to approve the panel of paper setter and examiners as appended herewith.
4. Additional inputs into the curriculum and up gradation of syllabus will be incorporated the OJT (On Job Training) and Project Work.
5. It Resolved to fishing methods is introduced in the place of Fish Seed Production in second semester.

6.It resolved to fish seed production is introduced in the place of fishing methods in third semester.

7.Resolved to introduce elective paper livestock management in v semester zoology

8.Third semester followed as per university syllabus in the year of 2022-2023.

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KAKINADA
Bachelor of Vocation: INDUSTRIAL AQUACULTURE AND FISHERIES Course structure and syllabus: 2022-2023 Admitted Batch II Year, Semester III

S.No	Course	Teaching hours	credits	Mid Sem	semend	Total marks
	General Education					
1.	English	4	3	30	70	100
2.	Second language-Telugu	4	3	30	70	100
3.	Life Skill Course-1	2	2	-	50	50
4.	LifeSkill Course-II	2	2	-	50	50
5.	Skill Development Course	2	2	-	50	50
	Skill Education					
1	Zoology (Cell biology, Genetics, Molecular Biology & Evolution	4	4	30	70	100
2	Lab Practical	2	1	-	50	50
3	Capture fisheries	4	4	30	70	100
4	Lab Practical	2	1	-	50	50
5	Aquaculture nutrition	4	4	30	70	100
6	Lab Practical	2	1	-	50	50
7	Fish Seed Production (nopractical	4	4	30	70	100
8.	OJT	2	1	-	50	50
9.	Yoga	-	1	-	-	-
	Total	38	33			**950**

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Bachelor of Vocation: INDUSTRIAL AQUACULTURE AND FISHERIES
II Year, Semester III
Cell biology, Genetics, Molecular Biology & Evolution

HOURS:04 **SYLLABUS** **CREDITS:04**

UNIT - I Cell Biology

1.1 Definition , history , prokaryotic and eukaryotic cells , anus , viroids , mycoplasma

1.2 Electron microscopic structure of animal cell

1.3 Plasma membrane - Models and transport functions of plasma membrane

1.4 Structure and functions of Golgi complex . Endoplasmic Reticulum and Lysosomes

1.5 Structure and fanctions of Rabosomes , Mitochondna . Nucleus , Chromosomes
(Note : 1. General pattern of study of each cell organelle - Discovery , Occurrence , Number , Origin Structure and Functions with suitable diagrams) 2. Need not study cellular respiration under mitochondrial functions

UNIT-II GENETICS-I

2.1 Genetics - I Mendel's work on transmission of traits

2.2 Gene Interaction - Incomplete Dommence , Codominance , Lethal Genes

2.3 Polygenes (General Characteristics & examples) Multiple Alleles (General Characteristics and Blood gromp inheritance

2.4 Sex determination (Chromosomal , Genic Balance , Hormonal . Environmental and Haplo - diploidy types of sex determination)

2.5 Sex linked inheritance (X - linked Y - linked & XY - linked inheritance)

UNIT - III GENETICS-II

3.1 Genetics II Mutations & Mutagenesis

3.2 Chromosomal Disorders (Autosomal and Allosomal)

3.3 Human Genetics - Karyotyping , Pedigree Analysis (basic)

3.4 Basics on Genomics and Proteomics

UNIT-IV Molecular Biology

4.1 Central Dogma of Molecular Biology

4.2 Basic concepts of

a . DNA replication - Overview (Senti - conservative mechanism . Semi discontinuous mode , Origin & Propagation of replication fork)

b Transcription in prokaryotes - Initiation , Elongation and Termination , Post transcriptional modifications (basics)

c Translation - Initiation , Elongation and Termination

UNIT –V EVOLUTION

5.1 Origin of life

. 5.2 Theories of Evolution : Lamarckism , Darwinism , Germ PlasmTheroy , Mutation Theory

5.3 Neo - Darwinism : Modern Synthetic Theory of Evolution . Hardy - Weinberg Equilibrum

5.4 Forces of Evolution : Isolating mechanisms , Genetic Drift , Natural Selection , Speciation

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B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES
II Year, III semester 2022-2023
Cell biology, Genetics, Molecular Biology & Evolution
MODEL PAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any FOUR of the following: 4 x 5 = 20 Marks
Draw labeled diagram wherever necessary

1. Prokaryotic cell
2. Golgi complex
3. Polygenes
4. Multiple alleles
5. Mutations
6. Karyotyping
7. Lac operon concept
8. Genetic drift

PART - B

Answer any FIVE of the following: 5 x 10 = 50 Marks
Draw labeled diagram wherever necessary

9. a) Describe the ultra structure of animal cell
   OR
   b) Explain the structure of mitochondria. Add a note on its functions.

10. a) Write an essay on gene interactions
    OR
    b) Discuss sex linked inheritance.

11. a) What are chromosomal disorders? Explain various types of autosomal and allosomal disorders
    OR
    b) Explain About Human Karyotyping ?

12. a) Give an account of DNA replication
    OR
    b) Explain the mechanism of Prokaryotic transcription

13. a) An essay on modern synthetic theory of evolution
    OR
    b) Define isolation. Discuss various isolating mechanisms.

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B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

II Year, III semester 2022-2023

Cell biology, Genetics, Molecular Biology & Evolution

PRACTICAL SYLLABUS

HOURS:02 **CREDITS:01**

I. Cell Biology

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 and problems.
2. Problems on blood group inheritance and sex linked inheritance.
3. Study of human Karyo types (Down's syndrome, Edwards, syndrome, Patausyndrome, Turner's syndrome and Klinefelter syndrome).

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. Study of Genetic Drift by using examples of Darwin's finches(pictures).
5. Visit to Natural History Museum and submission of report.

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II Year, III semester 2022-2023
Cell biology, Genetics, Molecular Biology & Evolution
PRACTICAL MODEL PAPER

MAX.MARKS-50

1.Prepare temporary slideof----------. Write the procedure, Precautions, Identify the stage ,write with characters 1x15=15M
(Procedure–6M,Precautions–3M,Identification–2M,Characters–4M)

2. Solve the following two genetic problems. 1x5=5M
(Eachproblem–5M)

3.Identify and write notes on the following evolution spotters A,B,C 3x5=15M
(Identification–1M,Characters–3M,Diagram-1M)

4.Record+viva 5+5=10M

5. Fieldvisit report 5M

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II Year, Semester III
CAPTURE FISHERIES

HOURS-4 **CREDITS-4**

Unit 1: Riverine and Estuarine Fisheries

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

Unit 2: Reservoir and Lakesterine Fisheries
2.1. Reservoir fisheries- Major reservoirs in India- important characteristic features of reservoirs.
2.2. Lakesterine fisheries- definition, Types of lakes based on circulation, nutrients and surface temperature.

Unit 3: Coastal fisheries

3.1. Coastal fisheries – Elasmobranch fishery; Teleost fishery- Sardines, Anchovies, Mackerel, Mumbai duck, Catfishes, Eels, Ribbon fish, Perches, Mullets, Polnemids, Pomfrets, Scianids, Seer fishes, Flying fishes

Unit 4: Marine Pelagic, Demersal and Deep Sea Resources
4.1. Pelagic resources and Major demersal resource groups- elasmobranchs, cephalopods, silver bellies, flat fishes, crabs, sciaenids, pomfrets, bombay duck, prawns, lobsters, molluscan resources.
4.2. Introduction-Fisheries potential, Major Deep sea resources and scope of their exploitation**,** Present fishing pattern and deep sea fishing in India
4.3. Regulations-Conservation and regulation of fishing pressure - closed season, mesh size regulations, sanctuaries., Deep Sea Fishing Policy

Unit 5: Fisheries institutes

5.1. Different organizations and institutes involved in fisheries and aquaculture research and development – FAO, NACA, SEAFDEC, INFOFISH, MPEDA,World Fish Centre, Bay of Bengal Programme.

5.2. Institutes under ICAR, CSIR; NABARD, Ministry of Agriculture and Ministry of Commerce, Aquaculture Authority of India, NRSA, INCOIS etc.

5.3. State organizations like Matsyafed, FFDA, BFFDA, ADAK, FIRMA and State Fisheries Department.

Suggested Reading:

Core reading

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

Supplementary Reading

1. S.S. Khanna. An introduction to fishes
2. Kurian, C.V. and Sebastian, V.O. 1986. Prawns and prawn fishery of India. Hindustan Publishing Corporation (India), New Delhi.
3. Yadav, B.N. Fish and Fisheries. Daya Publishing House

Advanced Reading

1. Blake, D.J.H. 2006. *The Songkhram River wetlands – a critical floodplain ecosystem of the lower Mekong Basin*. International River Symposium 06, Brisbane, Australia. pp. 1-25.
2. Boonkumjad, S. 2004. *Analysis on fisheries cooperation between Thailand and Union of Myanma*r. Technical paper No. 6/2004. Fisheries Foreign Affairs Division, Department of Fisheries. 66 pp. [in Thai]
3. Coates, D. 2002. *Inland capture fishery statistics in Southeast Asia: current status and information needs*. Asia-Pacific Fishery Commission, Bangkok, Thailand. RAP Publication No. 2002/11. 114 pp.
4. Pawaputanon Na Mahasarakarm O. 2007. *An Introduction to the Mekong fisheries of Thailand*. Mekong Development Series No. 5. Vientiane, Lao PDR, Fisheries Programme, Mekong River Commission. 49 pp.
5. Royal Irrigation Department 2004. *Data cited in* Country review paper on inland capture fisheries information – Thailand. FAO. FI:TCP/RAS/3013, Field Document 11, 31 pp.
6. SAS Institute Services. *JMP statistics andgraphic guide version 4*. 2000. SAS Institute Inc. United State of America. 613 pp.

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B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES
I Year, II semester 2022-2023
CAPTURE FISHERIES

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Biota of Estuary
2. Reservoir fisheries
3. Costal fishery
4. Pelagic resources
5. FAO & NABARD
6. Sanctuaries
7. Lakesterine fisheries
8. Capture fisheries

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Define Estuary? Explain about the Ecological significance of estuary?

OR

b) Write an essay on Major river systems in India?

10. a) Define Reservoir? Major reservoirs in India

OR

b) Write an essay on Types of lakes and based on circulation?

11. a) Write about the general characters of teleost fishes?

OR

b) Write about the general characters of Eels and Mullets?

12. a) Explain the pelagic fish resources?

OR

b) Write an essay on deep sea fishing policy?

13. a) Explain about the FAO and MPEDA?

OR

b) Write a short notes on 1. ICAR 2. INCOIS

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B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

II Year, III semester 2022-2023

CAPTURE FISHERIES

PRACTICAL SYLLABUS

HOURS:02 CREDITS :01

I. Identification of Reservoir Fisheries
   1. *Labeo rohita, L. calbasu,*
   2. *Cirrhinus mrigala*
   3. *Catla catla*

II. Identification of Estuarine Fisheries
   1. Chanos
   2. Lates
   3. Mullets

III. Identification of Marine Fisheries
   a. Pelagic Fisheries (3 to 5 species)
   b. Demersal Fisheries (3 to 5 species)
   c. Deep sea Fisheries (3 to 5 species)

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II Year, III semester 2022-2023
CAPTURE FISHERIES
PRACTICAL MODEL PAPER

MAX..MARKS-50

1. Identification of marine species 5x5=25M

Identification–1M,Labelleddiagram-1M
Identifyingcharacters–3M.

2 Identification of reservoir/ estuarine species 3x5=15M

Identification–1M,Labelleddiagram-1M
Identifyingcharacters–3

3. Certified Record +Viva 5+5=10M

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Bachelor of Vocation: INDUSTRIAL AQUACULTURE AND FISHERIES

II Year, Semester III

AQUACULTURE NUTRITUTION

HOURS :04 **CREDITS :04**

Unit 1: Nutritional Requirements of Fish

1.1. Principles of fish nutrition (Proteins, Carbohydrates and lipids)
1.2. Vitamin and mineral requirements, vitamin C for fish and shell fishes.
1.3. Feeds and feed additives

Unit 2: Feed ingredients & quality

1.1. Different feed ingredients
1.2. Types of feeds, Compounded feeds, pellets, crumbles and microencapsulated feed. Storage, quality standards, proximate composition.
1.3. Digestibility studies and methods.

Unit 3: Feed & Feed Manufacturing

3.1. Feed formulation - methods, square method.
3.2. Feed manufacturing processes, Extrusion, Pelletization.

Unit 4: Feed Management

4.1. Feed schedule in finfish and shellfish, calculations and daily ration.
4.2. Artificial feed formulations of different cultural species.
4.3. Feed Check tray observations and management.

Unit 5: Feed Quality

5.1. Feed energetic, Feed Conversion Efficiency(FCE), Protein Efficiency Ratio (PER),
5.2. Feed Conversion Ratio (FCR), Net Protein Utilization NPU, leaching,
5.3. Water stability. Quality standards

Suggested reading

Core reading

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

Supplementary Reading

1. Halver J.E. Fish Nutrition
2. Hepher Nutrition of pond fishes

Advanced Reading

1) Muir,J.F. and Donald,R. Recent Advances in Aquaculture

Other Reference Books :

1. Prosser & Brown. Comparative Physiology
2. Hoar. Comparative Physiology
3. Hoar & Randall. Fish Physiology
4. Lockwood. Physiology of Crustacea
5. Watermann. Physiology of Crustacea
6. Leninger. Principles of Biochemistry
7. Harper. Physiological Chemistry
8. Bell Patterson & Smith. Textbook of Physiology & Biochemistry
9. Wilson. Textbook of animal Physiology.

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B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES
I Year, II semester 2022-2023
AQUACULTURE NUTRITUTION

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Ascorbic acid
2. Pellet feed
3. Extrusion
4. Artificial feeds
5. FCR
6. Feed additives
7. Types of Feeds
8. PER

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Write an essay on the Principles of fish nutrition?

OR

b) Write about the Feeds and feed additives?

10. a) Explain the different types of feed ingredients?

OR

b) Write an essay on proximate feed composition?

11. a) Write about the fish Feed formulations?

OR

b) Write about the fish Feed manufacturing processes?

12. a) Describe the feeding schedule in shrimp farming?

OR

b) Write an essay on Artificial feed formulations of different cultural species?

13. a) Explain about the Feed energetic and Protein efficiency ratio?

OR

b) Write a short notes on 1. FCE 2. Water stability of feeds

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B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

II Year, III semester 2022-2023

AQUACULTURE NUTRITUTION

PRACTICAL SYLLABUS

HOURS :02 **CREDITS :01**

I. Feed management (Proximate Analysis)

1. Estimation of Crude proteins in fish feed.
2. Estimation of carbohydrates
3. Estimation of Fats
4. Estimation of Ash content
5. Estimation fiber

II. Preparation of supplementary feeds with locally available ingredients,

III. Determination of water stability of pellet feeds.

V. Feed calculation and daily ration

VI. Check-trays in shrimp farming ponds.

VIII. Estimation of FCR.

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B.Voc., Industrial aquaculture and fisheries

II Year, III semester 2022-2023

AQUACULTURE NUTRITION

PRACTICAL MODEL PAPER

MAX.MARKS-50

1. MAJOR EXPERIMENT	1X20=20M
2. MINOR EXPERIMENT S	2X10=10M
A.	
B.	
3.CERTIFIED RECORD+VIVA	5+5 = 10

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Bachelor of Vocation: INDUSTRIAL AQUACULTURE AND FISHERIES

II Year, Semester III

FISH SEED PRODUCTION

HOURS :04 **CREDITS :04**

Unit1: Carp Hatchery and Seed production

1.1. Types of hatcheries

1.2. Cap brood management; Recruitment, pond management, management of spent broods

1.3. Induced breeding technology and Synthetic hormones.

Unit 2: Carp Seed procurement-Bundh Breeding

2.1. Carp seed resources in major rivers India.

2.2. Bundh breeding, types of bundh breeding techniques.

Unit 3: Seed Production of Crustaceans

3.1. Seed production shrimp and prawn

3.2. Operation and management of maturation section.

Unit 4: Seed Production of Molluscs

4.1.Hatchery operations of pearl oysters

4.2.Hatchery operations of Edible oysters

Unit 5: Transportation seed

5.1. Transportation of brooders (Fin fish/shrimp/prawn)

5.2. Transportation of fish seed

Suggested Reading

Core reading

1. Chodar SL Hypophysation in Indian Major Carps
2. CMFRI Spl. Bul. Hatchery Operation of Penaied Shrimps
3. Venkataraman GS The Cultivation of Algae
4. MPEDA Sea Fishes
5. CMFRI sp Bul Artificial Reefs and Sea Farming Techniques

Supplementary Reading

1. Jhingran VG Fish and Fisheries of India
2. Raymond EG Plankton and Productivity of Oceans
3. Boney AD Phytoplankton

Advanced Reading

1. Pillay, TVR and Kutty MN, Principles and Practices of Aquaculture
2. Harvey BJ and Hoar WS, Principle and Practice of Induced Fish Breeding
3. Woyanarovich E and Horrath L., The Artificial Propagation of Warm, Water Fishes-Manual for Extension.

Other Reference Books:

1. Pillay, T.V.R. & M.A. Dill. Advances in Aquaculture. Fishing News (Books) Ltd., England,
1979.
2. Stickney, R.R. Principles of Warm water Aquaculture. John Wiley & Sons Inc.,1979.
3. Hepher, B. & Y. Prugim. Commercial Fish Farming. John Wiley & Sons Inc.,1981.
4. Boyd, C.E. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing
Company, 1982.
5. Jhingran, V.G. Fish and Fisheries of India. Hindustan Publishing Corporation India, 1982
6. Turcker, C.S. (ed.). Channel Catfish Culture. Elsevier, 1985.
7. Bose, A.N. et. Al. Coastal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt.
Ltd., 1991.

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I Year, II semester 2022-2023
FISH SEED PRODUCTION

SECTION -A **4 X 5 = 20 MARKS**

Answer any **FOUR** of the following:
Draw labeled diagram wherever necessary

1. Synthetic hormones
2. Fish Pituitary gland
3. Bundh breeding
4. Eye stalk ablation
5. Hatchery
6. Edible oysters
7. Open seed transport method
8. Characters of finfish brooders

SECTION –B **5 X 10 = 50 MARKS**

Draw labeled diagram wherever necessary

9.a) Write the types of hatcheries

OR

b) Explain Carp brood management.

10. a) Carp seed resources in major rivers India

OR

b) Write about Bundh breeding and its types

11. a) Write an essay on seed production of shirmp.

OR

b) Write an essay on Operation and management of maturation section

12. a) Describe the Hatchery operations of pearl oysters

OR

b) Describe the Hatchery operations of Edible oysters.

13. a) Write in detail manner the Transportation of brooders

OR

b) Write the notes on Transportation of fish seed

***

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

Bachelor of Vocation: INDUSTRIAL AQUACULTURE AND FISHERIES

Course structure and syllabi: 2022-2023Admitted Batch

Semester- III

OJT (ON JOB TRAINING)

CONTENT	EVALUATION	MARKS
FIELD TRIPS	3X5	15
PROJECT REPOT/ INDUSTRIAL OR INSTITUTE TRAINING& SEMINAR	15+5	20
FIELD COMPONENTS	10X1	10
VIVA VOCE	-	05
TOTAL		50

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DR. P.V.N. RAJU VIDYAPRANGANAM,

KAKINADA

B.V0C., INDUSTRIAL AQUACULTURE AND FISHERIES

II Year, IV semester 2022-2023

Course	**Teaching hours**	**credits**	**Mid Sem**	**semend**	**Total marks**
COREPAPERS					
Zoology(Physiology, Cellular Metabolism & Embryology)	4	4	30	70	100
LAB	2	1	-	70	50
Zoology(Immunology &Animal Biotechnology)	4	4	30	50	100
LAB	2	1	-	50	50
Fish Genetics and aquaculture Biotechnology	4	4	30	50	100
LAB	2	1	-	50	50
Fish Pathology and Fish Immunology	4	4	30		100
LAB	2	1	-	70	50
Ornamental fish culture	4	4	30	50	100
LAB	2	1	-	50	50
Larval Nutrition&culture of fish food organisms.(nopractical)	4	4	30	70	100
OJT	2	1	-	50	50
NCC/NSS/Sports/Extra Curricular	-	2	-	-	-
Yoga	-	1	-	-	-
Apprenticeship	-	4	-	100	100
Total	36	37			**1000**

Second spell between First year and Second Year Apprenticeship

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Bachelor of Vocation: INDUSTRIAL AQUACULTURE AND FISHERIES
II Year, Semester IV
SYLLABUS

HOURS :04 **CREDITS :04**

UNIT-I ANIMAL PHYSIOLOGY-I

1.1 Process of digestion and assimilation

1.2 Respiration-Pilmonary ventilation,transport of oxygen and Co_2

(note : Need not to study cellular respiration here)

1.3Circulation- Structure and functioning oh heart, cardiac cycle

1.4 Excretion-structre and functions of kidney urine formation,counter current mechanism

UNIT II Animal Physiology II

2.1 Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non myelinated nerve fibers

2.2. Muscle contractions- Ultra structure of muscle, molecular and chemical basis pf muscle contractions

2.3 Hormonal control of reproduction in a mamal

UNIT III CELLULAR METABOLISM-I (BIOMOLECULAR)

3.1 Carbohydrates –Classification of Carbohydrtes structure of glucose

3.2 proteins – classification pof protein- general properties of amina acids

3.3 Lipids – classification of lipids

3.4 Enzymes – classification and mechanism of action

UNIT IV CELLULAR METABOLISM – II

4.1 Carbodydrates metabolism – glycosis ,krebs cycle Electron transport chain,glycogen metabolism,gluconeogensis

4.2 Lipid Metabolism - β oxidation of palmatic acid

4.3 protein metabolism – Transamination,deamination and urea cycle

UNIT V EMBRYOLOGY

5.1 Gametogenesis

5.2 Fertilization

5.3 Types of eggs

5.4 Development of Frog uptoformation of primary germ layer

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II B.Voc. Department of Fisheries and Aquaculture
Semester IV 2022-2023
B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES
Title :ANIMAL PHYSIOLOGY,CELLULAR METABOLISM AND EMBRYOLOGY
MODEL PAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Assimilation
2. Cardiac cycle
3. Ultra structure of muscle
4. Pancreas
5. Structure of glucose
6. Lipids
7. Gluconeogenesis
8. Types of eggs

PART - B

Answer any FIVE of the following: 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Explain the process of digestion.

OR

b) Describe the structure and function of heart

10. a) Give an account of nerve impulse transmission.

OR

b) Write an essay on the hormonal control of reproduction in mammals

11. a) Write an essay on the classification of carbohydrates

OR

b) Classify the enzymes. Discuss the mechanism of enzyme action

12. a) Write an account on Kreb's cycle.

OR

b) Explain B- oxidation of palmitic acid

13. a) Discuss the process of fertilization

OR

b) Write an essay on gametogenesis.

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Semester IV 2022-2023
B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES
Title :ANIMAL PHYSIOLOGY,CELLULAR METABOLISM AND EMBRYOLOGY
PRACTICAL SYLLABUS

HOURS :02 **CREDITS :01**

Practical Syllabus:

I. Animal physiology

1. Qualitative tests for identification of carbohydrates, proteins and fats
2. Study of activity of salivary amylase under optimum conditions
3. T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage
4. Differential count of human blood

II. Cellular metabolism 1. Estimation of total proteins in given solutions by Lowry's method.
2. Estimation of total carbohydrate by Anthrone method.
3. Qualitative tests for identification of ammonia, urea and uric acid
4. Protocol for Isolation of DNA in animal cells

III. 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. Construction of fate map of frog blastula

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., Commercial aquaculture

Title :ANIMAL PHYSIOLOGY,CELLULAR METABOLISM AND EMBRYOLOGY

PRACTICAL MODEL PAPER

MAX.MARKS-50

1.Identify draw a labelled diagram and write notes on A,B,C. 3x5=15M

2.Esimate the total amount in the givensample(1X15=15M

3.Identify the given samples. 1x10=10

4.Record+Vivavoce 5+5=10

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DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
Bachelor of Vocation: INDUSTRIAL AQUACULTURE AND FISHERIESII Year, Semester IV
IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

HOURS:04 **CREDITS:04**

UNIT - I Immunology - 1 (Overview of Immune system)

1.1 Introduction to basic concepts in immunology

1.2 Innate and adaptive immunity , Vaccines and Immunization programme

1,3 Cells of immune system

1.4 Organs of immune system

UNIT – II Immunology - II (Antigens , Antibodies , MHC and Hypersensitivity)

2.1 Introduction to basic concepts in Immunology
Antigens : Basic properties of antigens , B and T cell epitopes , haptens and adjuvants ; Factors influencing inumunogenicity

2.2 Antibodies : Structure of antibody , Classes and functions of antibodies

2.3 Structure and functions of major lusto compatibility complexes

2.4 Exogenous and Endogenous pathways of antigen presentation and processing

2.5 Hypersensitivity - Classification and Types

UNIT-III Techniques

3.1 Animal Cell Tissue and Organ culture media : Natural and Synthetic media

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

3.3 Stem cells : Types of stem cells and applications

3.4 Hybridoma Technology : Production & applications of Monoclonal antibodies (mAb) O

UNIT - IV Applications of Animal Biotechnology

4.1 Genetic engineering basic concepts vectors ,restriction endonucleases and recombinant DNA technology

4.2 Gene delivery:micro injection , electroporation,biolistic method (gene gun), liposome and viral mediated gene delivery

4.3 transgenic animals :strategies of gene transfer , Transgenic sheep ,fishapplications

4.4 Manipulation of reproduction in animals :Artificial insemination,invitrofertilization,super ovulation,Embryo transfer,Embryo cloning

UNIT-V

5.1 **PCR:**Basics of PCR

5.2 DNA sequencing; Sangers method of DNA sequencing – traditional and automated sequencing- traditional and automated sequencing

5.3 Hybridization techniques:Southern,Northern and western blotting

5.4 DNA finger printing: Procedur and applications

5.5 Applications in industry and agriculture: Fermentation different types of fermentation and Downstream processing: Agriculture:Monoculture in fishes polyploidy in fishes

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II B.Voc. Department of Fisheries and Aquaculture
Semester IV 2022-2023
B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES
Title :IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY
MODELPAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Vaccines
2. Primary lymphoid organs
3. Hapten
4. Hypersensitivity
5. Natural media
6. Cell lines
7. Endo nucleases
8. Polyploidy in fishes

PART - B

Answer any FIVE of the following: 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9. a) Define immunity. Write in detail about innate immunity.

OR

b) Explain various cells of immune system

10. a) Describe the structure of antibody. Add a note on their functions.

OR

b) Describe the structure of MHC molecules. Discuss their role in the mechanism of exogeneous and endogeneous pathway of antigen processing and presentation

11. a) Write an essay on different types of stem cells and their applications

OR

b) Explain the production and applications of monoclonal antibodies.

12. a) Write an account on recombinant DNA technology

OR

b) Write an essay on transgenic animals

13. a) Explain hybridization techniques.

OR

b) Write an essay on PCR

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

Title :IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

PRACTICAL SYLLABUS

HOURS :02 **CREDITS :01**

I. Immunology

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination 4. Demonstration of

a. ELISA

b. Immune electrophoresis .

II. Animal biotechnology

1. DNA quantification using DPA Method.
2. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
3. Separation, Purification of biological compounds by paper, Thin-layer and Column chromatography
4. Cleaning and sterilization of glass and plastic wares for cell culture.
5. Preparation of culture media.

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

Title :IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

PRACTICAL MODEL PAPER MAX.MARKS-50

I. **MAJOR EXPERIMENT**
(Principle-5M ,Procedure-15M,Result-5)

1x25=25M

II. **Identify the following and write characters**? 2x2½=5M

(Identification-1M,Labelleddiagram-1/2M,Characters-2M

III. **Write procedure for preparation of culture media?**
(Procedure-10M) **1X10=10**

IV **. Record+vivavoce 5+5=10**

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II B.Voc. Department of Fisheries and Aquaculture
Semester IV 2022-2023
B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES
Title : FISH GENETICS AND AQUACULTURE BIOTECHNOLOGY
Syllabus

HOURS :04 **CREDITS :04**

Unit 1: Basic Genetics and Biotechnology
1.1. Introduction- Genetics, Mendel's law of inheritance, interaction of gene.
1.2. Supplementary and complementary genes.
1.3. Introduction to Biotechnology in Aquaculture.

Unit 2: Selection and Hybridization
2.1. Introduction-Hybridization of fish-Indian studies; Objectives of fish hybridization
2.2. Interspecific hybrids, Intergeneric hybrids among Indian carps.
2.3. Hybrid vigor, Inbreeding, cross-breeding and hybridization

Unit 3: Sex determination & Chromosome manipulation in fish and shell fishes
3.1. Practical application of genetics in aquaculture. Genetics of sex determination in fish.
3.2. Gonochorism, Hermaphroditism, Protandry, Protogyni, Environmental Influence of Sex Determination.
3.3. Induction of Gynogenesis and Androgenesis, Performance of Gynogens and Androgens, Monosex Populations.

Unit 4: Aquaculture Biotechnology
4.1. Recombinant DNA technology, determinants of DNA replication, cloning, vectors, transformation. Gene manipulation in fish, transgenic fish production.
4.2. Use of PCR for the detection of white spot syndrome in shrimp.
4.3. Cryopreservation technique in Aquaculture.

Unit 5: Marine Biotechnology

5.1. Introduction-Scope and the present status of marine biotechnology;
5.2. Industries Based on Marine Biotechnology
5.3. Use of probiotics and antibiotics in aquaculture operations.

Suggested reading

Core reading

1. Karinasagar I, Karunasagar I and Reily A. Aquaculture Biotechnology
2. Varun Mehta. Fisheries and Aquaculture biotechnology
3. Pandian TD, Kumar A and Prasad K. Aquaculture and Biotechnology
4. Lopes L.- Gene transfer in aquatic organisms
5. Singleton – Elementary Genetics
6. Gjedrem T- Genetics in aquaculture
7. Gupta,S.C. and Kapoor,V.K. Fundamentals of Applied Statistics.
8. Snedecor and Cochran,W.G. Statistical Methods.

Supplementary Reading

1. Sandhya Mitra- Genteics
2. Varma and Agarwal- Genetics
3. Rath RK- Freshwater Aquaculture

Advance Reading

1. NBFGR- Training manual for DNA finger printing
2. Gupta PK- Elements of Biotechnology
3. Padhi BR – Genetics and Aquaculture

Reference Text Books :

1. Hepher, B. and Y. Pruginin. Commercial fish farming. John Wiley & Sons Inc., 1981.
2. Jhingran, V.G. Fish and Fisheries of India, 1982.
3. Bhattacharya, S. Hormones in Pisciculture. Biology Education. Vol.9, No.1, pp.31-41, 1992.
4. Subramonium, T. Endocrine regulation of reproduction and molting in crustacean and its importance in shrimp aquaculture development.
5. Summer School Manuals of CIFE. Recent Developments in Biotechnology. CIFE, 1998.
6. Genetics and Biotechnological tools in Aquaculture and Fisheries, CIFE, 1998.
7. I.C.A.R. Biotechnology in Aquaculture – Training Manual. CIKA, Bhubaneswar, 1992.
8. Darnell. Molecular Cell Biology.

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DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES
II Year, IV semester 2022-2023
FISH GENETICS AND AQUACULTURE BIOTECHNOLOGY

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Mendals law of inhritence
2. Complementary genes
3. Inbreeding depresion
4. Vectors
5. Probiotics
6. Cryopreservation
7. Gynogenesis
8. Hermaphroditism

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Explain about the Role of biotechnology in aquaculture

OR

b) Write briefly about supplementary and complimentary genes

10. a)Explain about Hybridization techniques in fishes

OR

b) Write about Intergeneric hybrids in imc

11. a) Describe about Gynogenesis

OR

b) Explain about Genetics of sex determination in aquaculture

12. a) Explain about Gene manipulation in fishes

OR

b) Define PCR? role of PCR in WSSV in shrimp

13. a) Present status of marine biotechnology in aquaculture

OR

b) Explain briefly about industries based on marine biotechnology

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

PRACTICAL PAPER -I
FISH GENETICS AND AQUACULTURE BIOTECHNOLOGY
(Credits :1, Hours: 2)

1. Problems on Mendelian inheritance.
2. Mitotic and meiotic chromosomes preparation.
3. Demonstration of protocol of androgenesis, gynogenesis and polyploidy.
4. Cryopreservation protocols, Quality evaluation of fish milt.
5. Isolation and quantification of Fish and Prawn DNA
6. Electrophoresis
7. ELISA
8. Immunofluorescence
9. DNA Hybridisation
10. Bioprocessing of organic wastes
11. Practicals on genebank sequence database.
12. PCR

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II B.Voc. Department of Fisheries and Aquaculture
Semester IV 2022-2023
B.Voc., Industrial Aquaculture and fisheries
FISH GENETICS AND AQUACULTURE BIOTECHNOLOGY

PRACTICAL MODEL PAPER

MAX. MARKS-50

1.MAJOR EXPERIMENT **1X20=25M**

2.MINOR EXPERIMENT **1X15=15M**

3. CERTIFIED RECORD +VIVA **5+5=10M**

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II B.Voc. Department of Fisheries and Aquaculture
Semester IV 2022-2023
B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES
Title : **FISH PATHOLOGY AND FISH IMMUNOLOGY**
Syllabus

HOURS :04 **CREDITS :04**

Unit 1: Pathology and Parasitology

1.1. Introduction, Symptoms of sick/diseased fish, causes of fish diseases.
1.2. Stress as a factor in the occurrence of diseases.
1.3. Types of parasites-Ectoparasites, Endoparasites, Commensalism; Mutualism.

Unit 2: Fungal and Bacterial Diseases

2.1. Fungal diseases in fish: Saprolegniasis, Branchiomycosis and Ichthyophonosis; Fungal diseases in prawns/shrimps: Fusarium, Lagenidium and Prevention and therapy.
2.2. Bacterial diseases of fish caused by Aeromonas, pseudomonas, columnaris, Vibro sps.,Epizootic Ulcerative Syndrome Identification, epidemiology, preventive and therapeutic methods. Bacterial diseases in prawns/shrimps: caused by Vibrio sps, luminous bacterial disease, Aeromonas, pseudomonas, filamentous bacterial disease.
2.3. Viral Diseases in shrimp: Monodon Baculo Virus (MBV), White Spot Syndrome (WSSV), Yellow Head Virus (YHV), Infectious Hypodermal and Haematopoietic Necrosis Virus (IHHNV). Prevention and therapeutic methods.

Unit 3: Protozoan and Metazoan Diseases.

3.1. Protozoan diseases- Ichthyophthiriasis, Costiasis, whirling diseases, trypanosomiasis.
3.2. Metazoan Diseases- diseases caused by annelids, helminthes, crustaceans and molluscs.

Unit 4: Fish Microbiology and Nutritional diseases

4.1. Spoilage microflora of fish and shell fish
4.2. Intrinsic and extrinsic factors affecting spoilage of fish and shell fish.
4.3. Nutritional deficiency diseases in fish and shell fishes.

Unit 5: Immunology and Fish Health Management

5.1. Application and development of vaccines.
5.2. Diagnostic tools – immune detection- DNA/RNA techniques (PCR). Evaluation criteria of healthy seeds.
5.3. Best Management Practices in Aquaculture. Quarantine management.

Suggested reading

Core reading

1. R. Ramachandran Nair Encyclopedia of fish disease –
2. K.P. Biswas Prevention and control of fish and Prawn diseases –
3. B.K. Mishra, P. Swain, P.K.Sahoo, B.K.Das, N.Sarangi. Disease management in FW Pisicultue –

4 Wheaton,F.W. Aquacultural Engineering

5 Bose et al. Coastal Aquacultural Engineering

Supplementary Reading

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

Advanced Reading

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

Other Reference Text Books :

1. Cheng, T.C. The Biology of Animal Parasites. Saunders, Philadelphia, 1964.
2. Reichenbach, H.H. Fish Pathology. T.F.H. (Great Britain) Ltd., England, 1965.
3. Conroy, D.A. & R.L. Herman. Textbook of Fish Diseases. Ibid, 1968.
4. Ribelin, W.E. & G. Miguki. The Pathology of Fishes. The Univ. of Wisconsin Press Ltd., Great Russel st., London, 1975.
5. Schauperclaus. Fish Diseases. Vol. I & II.
6. Lightner, D.V. Shrimp Disease Diagnosis, 1998.
7. Sinderman. Fish Diseases, Vol. I. Shell Fish Diseases, Vol. II.

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

II Year, IV semester 2022-2023

FISH PATHOLOGY AND FISH IMMUNOLOGY

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Commensalism
2. Causative factors for diseased shrimp
3. IHHNV
4. Ichthyophonosis
5. Microflora
6. Quarantine management
7. Vaccines
8. Trypanosomiasis

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Explain briefly about different types of parasites with examples

OR

b) Explain disease caused by stress as a factor.

10. a) Brief note on Bacterial diseases and its causative organisms with preventive measures

OR

b) Brief note on Viral disease and its causative organisms with preventive measures

11. a) Protozoan disease causative organisms with preventive measures

OR

b) Metazoan disease causative organisms with preventive measures

12. a) Disease caused by deficiency of nutrients both shell and fin fishes

OR

b) What are the factors affecting the spoilage of fin and shell fishes

13. a) Explain briefly about best management practices in quarantine ponds

OR

b) Give briefly about application and development of vaccines

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

Practical syllabus

HOURS-2 **CREDITS-1**

I.Collection preservation , Identification of disease - causing agents .

II . Preparation of media for culture , Familiarisation with techniques of bacterial culture and identification , fungal isolation , characterization

.

III . Preparation of the list of chemicals and drugs used to control the diseases and medicines , visit to fish and shrimp farms and Disease diagnostic centers.

.IV . Collection , preservation and identification of parasites , preparation of case studies of diseased fish and prawns .

V. Study of life - cycle stages . Estimation of dose and administration of various chemicals and drugs .

VI . Visit to fish farms . Shrimp farms and diagnosis of diseases .

VII . PCR Technique Demonstration .

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B.Voc., Commercial aquaculture

II Year, IV semester 2022-2023

FISH PATHOLOGY AND FISH IMMUNOLOGY

PRACTICAL MODEL PAPER

MAX. MARKS-50

1.MAJOR EXPERIMENT **1X20=20M**

2.MINOR EXPERIMENT **1X10=10M**

3.IDENTIFY THE FOLLOWING CHARTS/PHOTOGRAPHS

A.

B. **2X5=10M**

4.FIELD VISIT REPORT+CERTIFIED RECORD **5+5=10M**

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

Title : **ORNAMENTAL FISH CULTURE**

Syllabus

HOURS :04 **CREDITS :04**

Unit 1: Introduction

1.1. Introduction to aquarium, ornamental fishes and Equipment and accessories- Aerators, filters and lighting.

1.2. World aquarium trade and present status. Design and construction of public fresh water and marine aquaria and oceanarium.

1.3. Water quality management in aquarium fishes, Biofilters in aquarium.

Unit 2: Aquarium Management

2.1. Setting up of aquarium – under gravel filter, pebbles, plants, drift wood, ornamental objects and selection of fishes, Quarantine measures.

2.2. Aquarium maintenance and water quality. Control of snail and algal growth.

2.3. Handling, care and transportation of fish. Temperature acclimation, oxygen packing.

2.4. Food and feeding-Source of feed, different types of food for aquarium fish, monitoring and adjusting.

Unit 3: Freshwater Ornamental Fishes

3.1. Species of ornamental fishes; their taxonomy and biology- Live bearers, Gold fish and koi, Gourami, Barbs and Tetras, angel fish, cichlids.

3.2. Setting up the tank-Choosing the tank, lighting and heating, filtration and aeration, choosing plants, preparing the tank.

3.3. Reproduction-General principles, Vitellin sack, Reproduction strategies, Egg-laying.

Unit 4: Marine Ornamental Fishes

4.1. Marine ornamental fishes – varieties and their habitat.

4.2. Setting up the tank-lighting considerations, siting and substrate, heating and filtration, preparing the tank.

4.3. Reproduction and breeding- Breeding of marine ornamental fishes (clown fishes).
4.4. Other ornamental organisms – Sponges, anemones, Crustaceans, mollusks, annelids, Echinoderms.

Unit 5: Nutrition and Disease

5.1. Nutritional requirements of aquarium fishes. Different kinds of feeds. Culture of fish food organisms; Preparation of dry feeds; feeding methods.
5.2. Use of pigments for colour enhancement. Larval feeds and feeding.
5.3. Common parasites infecting ornamental fishes. Bacterial, viral, fungal diseases of ornamental fishes and their control and prophylaxis.

Suggested reading

Core reading

1.Biswas. S.P., J.N.Das, U.K.Sarkar and Lakra W.S. 2007 Ornamental fishes of North East India An Atlas : NBFGR
2.Marine Aquarium keeping : The Sciences, Animals and Art. John Wiley & Sons, New York
3. Ramachandran.A, Breeding, Farming and Management of Fishes, CUSAT
4. Madhusoodanakurup etal – Ornamental Fish - Breeding, Farming and Trade CUSAT.
5. Jhingran,V.G. Fish and Fisheries of India.
6. Bijukumar,A. Rearing of Aquarium Fishes.
7. Rath,A.K. Freshwater Aquaculture,
8. Santhanam, et.al. a Manual of Freshwater Aquaculture.

Supplementary Reading :

1. Murthi.V.S. 2002 Marine ornamental Fishes of Lakshadweep CMFRI, Special publication 72

Advanced Reading

1. Butting.B., Holthus, P.S. Dalding,S. 2003, Marine Aquarium Industry and conservation.
2. Oliver, K 2003. World trade in ornamental species
3. Marine Ornamental species; collection,……. and Conservation
4. Fish Disease and Disorders, CAB international, Oxford.

Other Reference Books:

1. Bardach, et. Al. Aquaculture – The Farming and Husbandry of Freshwater and Marine Organisms. John Wiley & Sons, NY, 1972.
2. Stickney, R.R. Principles of Water Aquaculture. John Wiley & Sons, NY, 1979.
3. Chondar, C.L. Hypophysation of Indian major carps. Satish Book Enterprise, Agra, 1980.
4. Jhingran, V.G. Fish and fisheries of India. Hindustan Publ. Corporation (India), 1982.
5. Santhanam, R. et. Al. A Manual of Freshwater Aquaculture. Oxford & IBH Publishing Co. Pvt. Ltd., 1987.

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

II Year, IV semester 2022-2023

ORNAMENTAL FISH CULTURE

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Aerators
2. Oceanarium
3. Gravel filters
4. Types of food for aquarium
5. Live bearers
6. Clown fishes
7. Prophylaxis
8. Importance of ornamental fishes

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Water quality management in aquarium fishes.

OR

b) Design and construction of public fresh water aquaria

10. a) Set up the aquaria with quarantine measure.

OR

b) Maintenance of Aquaria with control of snail and algal growth.

11. a) Explain briefly taxonomy and biology of ornamental fishes.

OR

b) General principles of reproduction in ornamental fishes.

12. a) Breeding of marine ornamental fishes.

OR

b) Explain habit and habitat of different types of marine ornamental fishes.

13. a) Give notes on bacterial disease and causative organisms and prophylaxis.

OR

b) Importance of pigments in ornamental fishes.

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II B.Voc. Department of Fisheries and Aquaculture
Semester IV 2022-2023
B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

HOURS-2 **ORNAMENTAL FISH CULTURE** **Credits : 1**

1. Identification of common Freewater and marine aquarium fishes (10 No

2. Construction of aquarium

3. Setting up of aquarium (maintained by students can be evaluated after one month)

4. Water quality management in aquariums

5. Aquarium plants and décor materials

6. Air pump and biological filter

7. Breeding of live bearers – Guppy

8. Breeding of egg layers- gold fishes

9. Breeding of bubble nest builder- Gourami

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., Industrial aquaculture&fisheries

ORNAMENTAL FISH CULTURE

PRACTICAL MODEL PAPER

MAX.MARKS- 50

1. Identification of spotters 5x4=20M

Identification–1M,Labelled diagram-1M

Identifying characters–2M.

2. Identify the given spotter/chart write a note on breeding 1x10=10M

3.Aquarium maintenance report 1x10=10

4.Certified record+viva 5+5=10M

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

Title : **LARVAL NUTRITION AND CULTURE OF FISH FOOD ORGANISMS**

Syllabus

HOURS :04 **CREDITS :04**

Unit 1: Live Feeds

1.1. Different live feeds and their nutritional value. Manipulation of pond for natural feed production.

1.2. Candidate species of phytoplankton and zooplankton for fish and shell fish culture – diatoms, micro algae, nano planktons, Artemia, copepods, cladocera and rotifers.

Unit 2: Culture of Phytoplankton

2.1 Methods of collection and preservation; maintenance of pure culture of Phytoplankton.

2.2 Mass culture. Culture of important microalgae, Chaetoceros, Tetraselmis, Skeletonema, Spirulina and Chlorella.

Unit 3: Culture of Zooplankton

1.1. Methods of collection and preservation; maintenance and rearing of Rotifers, Cladocerans, Copepods, and insect larvae. Mass culture of zooplankton.

1.2. Harvest, storage and feeding.

Unit 4: Artemia culture

4.1 Different strains of Artemia. Artemia culture. Cyst production. Enrichment of Artemia cyst and larvae.

4.2 Decapsulation of Artemia cysts. Hatching, storage and feeding.

Unit 5: Alternative live feeds and Periphyton culture

5.1. Culture methods of Infusoria, Chironomids, polychaetes.

5.2. Nutritional qualities of alternative live feeds.

5.3. Applications Importance of periphyton in aquaculture.

Reference Books:

1. Fundamentals of mathematical statistics – Gupta and Kapoor.
2. Fundamentals of Statistics – S.P. Gupta
3. Elementary Statistics – Yule and Kendall
4. Introduction to Biostatistics – Sokal & Rohlf
5. Fundamentals of Biostatistics – By Khan and Khanum

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B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES
II Year, IV semester 2022-2023
LARVAL NUTRITION AND CULTURE OF FISH FOOD ORGANISMS

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Artemia salina
2. Phytoplankton
3. Rotifers
4. Mysis larva
5. Periphyton
6. Feed additives
7. Micro Algae
8. Polychaete culture

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Write an essay on Different live feeds and their nutritional value

OR

b) Write about the important species of plankton in fish culture?

10. a) Explain the Methods of collection and preservation of phytoplankton?

OR

b) Write an essay on Culture of important microalgae?

11. a) Write about the Methods of collection and preservation of zooplankton?

OR

b) Write about the Mass culture of zooplankton?

12. a) Describe the culture of Artemia?

OR

b) Write an essay on Decapsulation of Artemia cysts?

13. a) Explain about the Applications Importance of periphyton in aquaculture?

OR

b) Describe the Nutritional qualities of alternative live feeds.

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IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

Bachelor of Vocation: INDUSTRIAL AQUACULTURE AND FISHERIES

Course structure and syllabi: 2022-2023Admitted Batch

Semester IV

OJT(ON JOB TRAINING)

HOURS-2 **CREDITS-1**

CONTENT	EVALUATION	MARKS
FIELD TRIPS	3X5	15
PROJECT REPOT/ INDUSTRIAL OR INSTITUTE TRAINING& SEMINAR	15+5	20
FIELD COMPONENTS	10X1	10
VIVA VOCE	-	05
TOTAL		50

IDEAL COLLEGE OF ARTS AND SCIENCES(A)
Bachelor of Vocational: INDUSTRIAL AQUACULTURE AND FISHERIES
Course structure and syllabi: w.e from 2022-2023 Admitted Batch
B.Voc. INDUSTRIAL AQUACULTURE AND FISHERIES
Semester V, from 2022-23
(Syllabus-Curriculum)

III Year; Semester V								
Sem	Course no	Course name	Course type (T/L/P)	Hrs/Week (Sciences 4+2)	Credits (Science 4+1)	Each course Evaluation		
						MID	SEM	Total
V	1	Zoology (live stock management I) *	T	4	4	30	70	100
	2	Zoology (practical) *	L	2	1	0	50	50
	3	Zoology (live stock management II) *	T	4	4	30	70	100
	4	Zoology (practical) *	L	2	1	0	50	50
	5	Fishery By-Products	T	4	4	30	70	100
	6	Fishery By-Products Practical	L	2	1	0	50	50
	7	Fish Processing Technology and Quality Control	T	4	4	30	70	100
	8	Fish Processing Technology and Quality Control Practical	L	2	1	0	50	50
	9	Aquaculture Engineering	T	4	4	30	70	100
	10	Aquaculture Engineering Practical	L	2	1	0	50	50
	11	Fisheries management, economics and marketing (No Practical)	T	4	4	30	70	100
	12	On Job Training	L	2	1	0	50	50
		Total		**36**	**30**			**900**

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Max. Marks 100

Course6 B: LIVE STOCK MANAGEMENT-I (BIOLOGY OF DAIRY ANIMALS)

HOURS -04 (Skill Enhancement Course (Elective) CREDITS-04

Unit 1: Livestock census; Breeds of Dairy cattle, Buffaloes and Goats. Indigenous,Exotic and Crossbred Cattle breeds

Unit 2: Anatomy of Udder; Development of udder; Lacto genesis and Galactopoises; Letdown of milk.

Unit 3: Artificial insemination; Oestrous cycle; Symptoms of heat in cows and buffaloes. Conception, Pregnancy diagnosis in cattle. Multi ovulation and embryo transfer technique. Cloning.

Unit4: Economic traits of Dairy cattle. Methods of selection of dairy animals

.

Unit5: Systems of Dairy cattle breeding. Inbreeding, out breeding, Cross breeding, Grading up. Breeding systems (Cross breeding of cattle and Grading up of buffaloes).

III. References:

1. Textbook of Animal Husbandry-GC Benarjee
2. Handbook of Animal Husbandry –ICAR Edition
3. Principles and practices of Dairy Farm–Jagdish Prasad
Web resources: 1. http://ecoursesonline.iasri.res.in/course/index.php?categoryid=42 2. https://vetsebooks.blogspot.com/p/e-books.html 3. https://www.basu.org.in/study-materials/veterinary-science/ 4. https://vikaspedia.in/agriculture/livestock/cattle-buffalo/breeds-of-cattle-buffalo

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Board of Studies of B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

ZOOLOGY- V SEMESTER2022-2023

PAPER 6B : LIVE STOCK MANAGEMENT – I

(BIOLOGY OF DAIRY ANIMALS)

MODEL PAPER

Time : 3 Hrs Max. Marks.: 70

Answer any FIVE of the following.

Draw labelled diagrams wherever necessary 4 X 5 = 20

1. Let down of Milk
2. Artificial in Semination
3. Cloning
4. Cross breeding
5. Traits of dairy cattle
6. Live Stocks census
7. Indigenous
8. Lacto genesis

II. Answer any FIVE of the following

Draw labelled diagrams wherever necessary 5 X 10 = 50M

9. (a) Write about breeds of dairy cattle.

(OR)

(b) Explain about exotic cattle breeds.

10.(a) Define about anatomy of udder .

(OR)

(b) Write about Galactopoises.s

11.(a)Describe about oestrous cycle .

(OR)

(b) Explain about pregnancy diagnosis in cattle.

12.(a) Define in detailed about economic traits of dairy cattle.

(OR)

(b) Give in detailed about election of dairy animals

13 (a) Explain about Inbreeding and outbreeding

(OR)

(b) Write about grading up of buffallows.

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Course 6 B: LIVE STOCK MANAGEMENT-IPRACTICAL SYLLABUS

HOURS-02 (BIOLOGY OF DAIRY ANIMALS) CREDITS-01

II. Practical(Laboratory) (Max.50Marks)

1. Points dairy cow. (Explanation with observation of charts- Model evaluation to be performed by the student in the laboratory)

2. Identification of different breeds of dairy cattle and buffaloes.(Observation of Charts of breeds in the laboratory- at least 3 breeds should be identified by the students in their locality with video, photo)

3. Male and female reproductive systems of cow – Model/ Chart (Student has to draw a labeled diagram of the male and female reproductive systems of cow – acquire skill to identify the parts).

4. Symptoms of heat in cow (Study and Understanding the physiological symptoms during heat). 5. Artificial in semi nation (Flow chart of implements – Procedure- precautions)

6. Pregnancy diagnosis in cattle. 7. Study comparative merits of cows and buffaloes; zebu and cross bred cows (Examination of merits

III. Lab References: 1. Principles and practices of Dairy Farm–Jadish Prasad

2. Dairy cow points: https://www.icar.org/Guidelines/05-Conformation-Recording.pdf

3. Pregnancy test protocol: https://cgspace.cgiar.org/bitstream/handle/10568/109408/Milk%20testing%20lab%20protoc o l.pdf?sequence=1&isAllowed=y

Web resources suggested by the teacher concerned and the college librarian including reading material IV.

Co-Curricular Activities

A Mandatory:(Lab/ field training of students by teacher :(lab:10 + filed: 05):

1. For Teacher: Training of students by the teacher in laboratory/field fornotlessthan15hoursonprinciples and practices of dairy industry- breeds – artificial insemination- reproductive behavior of cows etc. as per the syllabus above.
2. For Student: Students shall individually visit to any of the nearby cattle rearing centers/ veterinary hospital/Raithu Bharosa Kendra and make observations of the procedure and quality enhancement activities and submit a handwritten Fieldwork/Project work Report in 10 pages.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: Title page, student details, index page, details of place visited, observations made, findings and acknowledgements
5. (IE)Unit tests,

b) Suggested Co-Curricular Activities

1. Collection of various cattle breed images from the web to prepare a album
2. Visit the sites of Veterinary colleges in India and preparation of brief report on the videos and content/ employment details
3. Sketch a model dairy farm with details
4. Invited lecture and presentation on related topics by experts
5. Seminar, Assignment, Group discussion. Quiz, Collection of Material, Invited lecture, Video preparation etc

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Course 6 B: LIVE STOCK MANAGEMENT-PRACTICAL SYLLABUS

(BIOLOGY OF DAIRY ANIMALS)

V SEMESTER

B.VOCATION –INDUSTRIAL AQUACULTURE& FISHERIES 2022-2023

PRACTICAL MODEL PAPER

MAXMARKS -50

1.Draw a labeled diagram of the ----------reproductive system of cow 1X15=15M

2.Identify the following photographs/charts 2X5=10M
Identification-1M,characters -4M

3. Write procedure for diagnosis of pregnancy in cattle .Write result 1X10=10M

4.Field report 5M

5. Certified record+viva 5+5=10M

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Board of Studies of B.Voc., INDUSTRIAL AQUACULTURE AND FISHERIES

Subject: ZOOLOGY

Semester –V

Course : LIVE STOCK MANAGEMENT -II

(DAIRY PRODUCTION AND MANAGEMENT)

(Skill Enhancement Course (Elective)

HOURS:04 CREDITS :04

Unit 1

Systems of Housing of Dairy cattle- Loose Housing and Conventional Dairy Barns. Drawing of layouts for dairy cattle dwellings; Criteria for selecting site for establishing Dairy farm buildings; Water requirement of dairy animals.

Unit 2

Management of different classes of Dairy animals- Milk producing animals, pregnant animals dry animals, heifers and calves.
Management practices for Dairy farm; Identification,
Dehorning, Castration, Deworming, Vaccination, Disinfection, and Milking.

Unit 3

(a) Pasteurization of milk: Definition, objects of pasteurization, objections to pasteurization, Principles of heat exchange.
Methods of pasteurization: LTLT, HTST and
Uperization.
(b)Sterilization of milk. Homogenization: Factors influencing homogenization

Unit 4

Market milk: Toned milk, double toned milk, Reconstituted milk, Standardized milk and full cream milk–Standards and methods of manufacture.

Unit 5

Cream: Types of cream, composition, methods of cream separation, gravity and centrifugal methods, types of cream separators, factors affecting fat losses in skim milk and fat percentage in cream.

III. References:

1. Textbook of Animal Husbandry-G C Benarjee
2. Handbook of Animal Husbandry –ICAR Edition
3. Principles and practices of Dairy Farm–Jagdish Prasad
4. http://ecoursesonline.iasri.res.in/course/index.php?categoryid=42
5. https://vetsebooks.blogspot.com/p/e-books.html
6. https://www.basu.org.in/study-materials/veterinary-science/
7. https://vikaspedia.in/agriculture/livestock/cattle-buffalo/breeds-of-cattle-buffal

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Dr. PVN RAJU VIDYAPRANGANAM
KAKINADA
MODEL PAPER
III B.VOCATION: INDUSTRIAL AQUACULTURE AND FISHERIES
SEMESTER – V, PAPER – 7B
LIVE STOCK MANAGEMENT – II
(DAIRY PRODUCTION AND MANAGEMENT)

Time : 3 Hrs **Max. Marks.: 70**

I. Answer any FIVE of the follo Draw labelled diagrams wherever necessary 4 X 5 = 20

1. Composition
2. Affecting fat losses in Skim Milk
3. LTLT and HTST
4. Double toned Milk
5. Standardised Milk
6. Uperi zation
7. Dehorning
8. Deworming

II. Answer any FIVE of the following. Draw labelled diagrams wherever necessary

5 X 10 = 50M

9. Write about systems of housing of dairy cattle

OR

Explain about water requirement of dairy animals

10. Define about different classes of dairy animals

OR

Write about Management practices for dairy farm.

11. Explain about Pasteurization of Milk.

OR

Write about sterilization of Milk.

12. Define about standards methods of cream Milk.

OR

Explain about Reconstituted Milk.

13. Write about types of Cream.

OR

Explain about gravity and centrifugal method

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B.VOC:INDUSTRIAL AQUACULTUREAND FISHERIES
Course 7 B: LIVE STOCK MANAGEMENT -II – PRACTICAL SYLLABUS
(DAIRY PRODUCTION AND MANAGEMENT)
VSEMESTER

HOURS-02 **CREDITS-01**
MAX.MARKS-50

II. Practical (Laboratory) Syllabus

1. Dairy Farm layout (In the laboratory student has to sketch a dairy farm with all its components)
2. Identification of cows (students have to identify the breeds of cows form the images/charts – have to identify any two breeds in the vicinity of the college/ their locality).
3. Dehorning of calves : (Method - protocol- precautions)
4. Castration of bulls (Method – Apparatus- Time-importance)
5. Deworming of dairy cattle : (Schedule – method- benefits)
6. Pasteurization of milk (Batch Method- procedure- Observation)
7. Sterilization of milk (In bottle sterilization- procedure – protocol)
8. Cream separation (By gravity method- procedure- hands on experiment)

III. Lab References

1. Handbook of Animal Husbandry –ICAR Edition
2. Dairy farm layout : https://www.youtube.com/watch?v=dmukHUEUvKc
3. Dehorning procedure : http://www.omafra.gov.on.ca/english/livestock/dairy/facts/09-003.htm
4. Castration of bulls: https://vikaspedia.in/agriculture/livestock/general-management-practicesof-livestock/castration-of-ruminants
5. Deworming: https://kvk.icar.gov.in/API/Content/PPupload/k0347_10.pdf
6. Pasteurization of milk : http://www.jnkvv.org/PDF/08042020170652part%203.pdf
7. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1690
8. Cream separation: http://ecoursesonline.iasri.res.in/mod/page/view.php?id=147910

Web resources suggested by the teacher concerned and the college librarian including reading material

Curricular Activities

a) Mandatory: (Lab/field training of students by teacher; lab 10+ field :05)

1. For Teacher: Training of students by the teacher in laboratory and filed fornotlessthan15 hours on skills of dairy management – housing-management of dairy animals of various stages-procedure of preparation of marketable milk with procedures like sterilization, pasteurization and other techniques)
2. For Student: Student shall (individually) visita nearby dairy farm- house hold cattle rearing – make observations on aspects like housing – management – feed- milk- revenue- breed selection- qualities of breed –etc. A handwritten Fieldwork/Project work Report to be submitted inn the given format.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: Title page, student details, index page,

details of place visited, observations made, findings and acknowledgements.
5. (IE)Unit tests.
b) Suggested Co-Curricular Activities
1. Sketch model dairy house with details
2. Web resources on Protocols in the management of stages of cattle
3. Properties of varieties of milk from the market observation
4. Assignment, Seminar, Invited lecture, Group discussion. Quiz, Collection of Material, Video preparation etc.

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B.VOC:INDUSTRIAL AQUACULTURE&FISHERIES
Course 7 B: LIVE STOCK MANAGEMENT -II – PRACTICAL SYLLABUS
(DAIRY PRODUCTION AND MANAGEMENT)
V SEMESTER

1. Write procedure for pasteurization of milk 1X 10=10M

2.Identify the following photographs/charts 3X5=15M
Identification-1M,characters -4M

3. Write procedure for dehorning in cattle 1X10=10M

4.Field report 5M

5. Certified record+viva 5+5=10M

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Dr. PVN RAJU VIDYAPRANGANAM
KAKINADA
B.VOC: INDUSTRIAL AQUACULTURE AND FISHERIES
III YEAR; SEMESTER V; 2022-2023

FISHERY BY-PRODUCRTS

Credits: 4

Hours: 4

Unit 1: Value Addition in Sea Foods

1.1 Value addition in sea food. Different types of value added products from fish and shell fish – status of value addition in Indian seafood sector.

1.2 Advantages of value addition. Significance of value addition in the seafood industry.

Unit 2: Fish Mince Based Products

2.1. Fish mince and Surimi. Production of fish mince – merits and demerits.

2.2. Analog and fabricated products. Quality assessment of surimi,.. Equipment, raw material for surimi,

2.3. Role of cryoprotectants in surimi production

Unit 3: Coated Fishery Products and Other Value Added Products

3.1 Preparation of coated fishery products – Different types of batter and breading and its applications.

3.2. Packaging and storing of coated products – Quality evaluation.

3.3. 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.

Unit 4: Fishery By-Products

4.1. Fish meal, fish protein concentrate, shark fin rays, fish maws, isinglass, fish liver oil,
fish body oil, fish hydrolysates.

4.2. Chitin, chitosan, glucosamine hydrochloride, squalene, pearl essence, ambergris, gelatin, beche-de-mer, fish silage, fish ensilage and seaweed products like agar, alginic acid and carragenan.

Unit 5: Spoilage and quality

5.1 Spoilage in thermal processed products – Quality evaluation of thermal processed products.

5.2. Curing and drying of fish – Spoilage in dry fish products.

References

1. Ninawe, AS. andRatnaKumar, K. (2008). Fish Processing Technology and Product Development. Narendra Publishing House, Delhi
2. Venugopal V. (2006). Seafood Processing. 1st edition Boca Raton CRC Press.
3. Shahidi, F. and Botta, JR.(1994). Seafoods chemistry, Processing Technology and Quality. Blakie Academic and Professional,

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B.VOC: INDUSTRIAL AQUACULTURE AND FISHERIES
III YEAR; SEMESTER V; 2022-2023

PRACTICAL: FISHERY BY- PRODUCTS

Hours:2 **CREDITS-1**

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

Collection:

1. Collection of fishery by-products

References:

4. Gopakumar K. (2002). Text Book of Fish Processing Technology. ICAR.
5. Govindhan, TK. (1985). Fish processing Technology. Oxford & IBH Publ. Co., New Delhi.
6. Hall, GM. (1992). Fish Processing Technology. Blackie. Springer science and business.
7. Balachandran KK. (2001). Post-harvest Technology of Fish and Fish Products. Daya Publ.
8. Clucas,IJ.(1981). Fish Handling, Preservation and Processing in the Tropics. Parts I,II. FAO
9. Sen, D.P. (2005). Advantages in Fish Processing Technology. Allied publ. Pvt.Ltd. Mumbai
10. Wheaton, FW. and Lawson, TB. (1985). Processing Aquatic Food Products, A Wiely-Inter Science Publication. USA.
11. Surendran, PK., Nirmala,T, Narayanan, NV. andLalitha, KV. (2003). Laboratory Manual on Microbiological Examination of Sea food, CIFT, Cochin.
12. Velayutham, P. and Indira Jasmine, G. (1996). Manual on Fishery By-Products, Tamilnadu

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Dr. PVN RAJU VIDYAPRANGANAM
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B.VOC: INDUSTRIAL AQUACULTURE AND FISHERIES
III YEAR; SEMESTER V; 2022-2023
PAPER TITLE: FISHERY BY-PRODUCTS
MODEL PAPER

Time: 3 Hours Maximum: 70 Marks

SECTION-A

I. Answer any FOUR of the following. Draw diagrams wherever necessary. **4x5=20 M**

Draw labeled diagram wherever necessary

1. Surimi
2. Cryoprotectants
3. Advantages of value added products
4. Hydrolysate
5. Types of batter and breading
6. Chitosan
7. Carrageen
8. Curing

SECTION-B

II. Answer any FIVE of the following. Draw diagrams wherever necessary. **5x10=50 M**

9. a) Explain briefly production of fish mince with merits and demerits
   OR
   b) Briefly explain quality assessment of surimi

10. a) Explain present status of value addition products in sea foods
    OR
    b) What is value addition? Explain different types value added products in fishes

11. a) What is coated products ? and preparation of coated fishery products
    OR
    b) Explain briefly about quality evaluation in packaging and storage of coated products

12. a) Fish meal
    b) Fish maws
    c) Isinglass
    d) Beche-de-mer
    e) Fish ensilage
    OR
    b) Give an account on importance of chitosan and its preparation

13. a) Explain quality assessment in thermal processed products
    OR
    b) What is curing? Explain role of curing and drying of fish and its products

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B.VOC: INDUSTRIAL AQUACULTURE AND FISHERIES
III YEAR; SEMESTER V; 2022-2023
Semester – V/ Practical
Fishery By Products

1. Major Experiment? 12 M
2. Minor Experiment? 8 M
3. Identification, salient features and ecological importance of the following.
   (Spotters /Specimens/ Charts/ Pictures etc choose if anyone from syllabus) 4x5= 20 M
   a.
   b.
   c.
   d.
4. Record + Viva-voce 6+4 = 10 M

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III YEAR; SEMESTER V; 2022-2023

Fish Processing Technology and Quality Control

Credits: 4

Hours: 4

Unit 1: Introduction of Fish Processing and Freezing

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

Unit 2: Preservation techniques of Finfish/Shell Fish processing

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

Unit 3: Packing and labeling, storage and Export of Fishery Products

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

Unit 4: Quality Assurance

4.1 Quality Assurance – Concepts of Hazard Analysis Critical Control Point (HACCP),
4.2 Good Manufacturing Practice (GMP), Sanitary Standard Operating Procedure (SSOP).
4.3 Determining the quality assurance of sea food.

Unit 5: Quality Control

5.1. Quality control – Basic concepts and quality control of fish processing.
5.2. Salient features of sea food quality and factors.
5.3. Standards of Sea food.

References

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

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III YEAR; SEMESTER V; 2022-2023

PRACTICAL: Fish Processing Technology and Quality Control

Credits: 1 **Teaching Hours: 2**

Experiments:

1. Lay – out of processing plant
2. Determination of quality assurance of sea food
3. General description – freezing
4. Canning – Flow chart
5. Smoking – Flow chart
6. Drying – Flow chart
7. Preparation of surimi – Flow chart
8. Collection of Air-bladder
9. Preparation of fishery by products
10. Fish pickling
11. Value added fishery products, fish curry, cutlets, fish finger.

References

1. Fish Processing Technology – T.K.Govindan

2. Fish Processing Technology – Ed. K. Gopakumar

3. Post Harvest Technology – K.K. Balachandran

4. Seafood Processing – V. Venugopal

Supplementary Reading

1. Fish Processing Technology – Ed. G.M. Hall – Chapman & Hall, Madras

2. Tropical Fishery Products – K. Gopakumar

Advanced Reading

1. Kreuzer,R. Fishery Products.

2. Borgstrom,G .Fish as Food

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B.VOC: INDUSTRIAL AQUACULTURE AND FISHERIES
III YEAR; SEMESTER V; 2022-2023
PAPER TITLE: FISH PROCESSING TECHNOLOGY AND QUALITY CONTROL
MODEL PAPER

Time: 3 Hours Maximum: 70 Marks

SECTION-A

I. Answer any FOUR of the following. Draw diagrams wherever necessary. **4x5=20 M**

Draw labeled diagram wherever necessary

1. Landing centers
2. RSW
3. Blast freezers
4. Canning
5. MAP
6. Packing materials
7. HACCP and GMP
8. Butterfly cut

SECTION-B

II. Answer any FIVE of the following. Draw diagrams wherever necessary. **5x10=50 M**

9. a) What is processing ? Principals involved in processing technology.
   OR
   b) What are the types refrigerated waters ? Explain briefly about CSW.
10. a) Explain different types preservative methods.
    OR
    b) Explain modern methods of preservation?
11. a) Explain material required for packing and its labeling.
    OR
    b) Explain the purpose of cold storage? And its requirements
12. a) Determine the quality assurance of sea foods.
    OR
    b) Explain briefly about methods and steps of quality of assurance.
13. a) Explain basics concepts and quality control of fish processing.
    OR
    b) Explain salient features of sea food quality and its factors?

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III YEAR; SEMESTER V; 2022-2023
Semester – V/ Practical
Fish processing technology and quality control

—

1. Major Experiment? 12 M
2. Minor Experiment? 8 M
3. Identification, salient features and ecological importance of the following.
   (Spotters /Specimens/ Charts/ Pictures etc choose if anyone from syllabus) 4x5= 20 M
   a.
   b.
   c.
   d.
4. Record + Viva-voce 6+4 = 10 M

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B.VOC: INDUSTRIAL AQUACULTURE AND FISHERIES
III YEAR; SEMESTER V; 2022-2023
AQUACULTURE ENGINEERING

Hours: 4 **Credits-4**

Unit 1: Introduction

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

Unit 2: Planning Aquaculture facilities

2.1. Introduction - Planning process, site selection, production plan, room programme and necessary analysis.
2.2. Drawing up alternative solutions, evaluation of and choosing alternative solutions, Finishing plans, detailed planning, Function test of the plant.
2.3. Design and Construction of Aquaculture Facilities – Introduction, Land-based hatchery, juvenile and on-growing production plant.

Unit 3: Water Transport, Water quality and water treatment

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

Unit 4: Aeration and oxygenation

4.1. Design and construction of aerators – Basic principles; Evaluation criteria; Example of designs for different types of aerator; Oxygenation of water.
4.2. Instruments– Construction of measuring instruments, Measuring water quality; measuring physical conditions; counting fish; measuring fish size and total fish biomass.

Unit 5: Recirculation Aquaculture System

5.1. Recirculation Aquaculture systems – Advantages and disadvantages of RAS,
5.2. Definitions – Degree of Recirculation; water exchange in relation to amount of fish.
5.3. Degree of purification. Components in a RAS; Design of a RAS.

References

1. R. Ramachandran Nair Encyclopedia of fish disease –

2. K.P. Biswas Prevention and control of fish and Prawn diseases –

3. B.K. Mishra, P. Swain, P.K.Sahoo, B.K.Das, N.Sarangi. Disease

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III YEAR; SEMESTER V; 2022-2023
PRACTICAL:AQUACULTURE ENGINEERING

HOURS-2

CREDITS-1

Syllabus

i) Lay-out of fish farm
ii) Lay-out of hatchery
a. Dike deign
b. Design of monk
c. Design of Bundh
d. Design of Sluice gate
e. Various types of surface aerator
a. Automatic feed distribution
b. Major components in a land-based hatchery and juvenile production plant
c. Different ways to prepare a connection analysis.
d. The inlet grating can (A) be made self-cleaning, or (B) placed within the pumping station so that it is close to the surface and easily available for cleaning.
e. Design of Recalculating Aquaculture System (RAS)
1. A centralized RAS serving several fish tanks.
2. Two designs of tank internal RAS serving only one tank

References

1. R. Ramachandran Nair Encyclopedia of fish disease –

2. K.P. Biswas Prevention and control of fish and Prawn diseases –

3. B.K. Mishra, P. Swain, P.K.Sahoo, B.K.Das, N.Sarangi. Disease

management in FW Pisicultue –

4 Wheaton,F.W. Aquacultural Engineering

5 Bose et al. Coastal Aquacultural Engineering

Supplementary Reading

1. Sinderman C.J. Principle diseases of Marine fish and shell fish

2. Schaperclaus Fish Diseass.

Advanced Reading

1. Roberts R.J.Fish Pathology..

2. Post, G. Text Book of Fish Health.

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III YEAR; SEMESTER V; 2022-2023
PAPER TITLE: AQUACULTURE ENGINEERING
MODEL PAPER

Time: 3 Hours Maximum: 70 Marks

SECTION-A

I. Answer any FOUR of the following. Draw diagrams wherever necessary. **4x5=20 M**

Draw labeled diagram wherever necessary

1. Land based hatchery
2. On-growing production plant
3. Types of pumps
4. Types of aerator
5. RAS
6. Aquaculture facilities
7. Construction of aerators
8. Components in a RAS

SECTION-B

II. Answer any FIVE of the following. Draw diagrams wherever necessary. **5x10=50 M**

9. a) Describe the Future trends and increased importance of aquaculture engineering.

OR

b) Explain Technical components in a system.

10. a) Write about Design and Construction of Aquaculture Facilities?

OR

b) Describe the Drawing up alternative solutions in Aquaculture planning.

11.a) Write about Water Transport facilities Aquaculture Engineering?

OR

b) Explain the Water quality and water treatment procedures?

12. a) Explain the basic principles and evaluation criteria for aerators.

OR

b) Describe the Measuring water quality and counting fish.

13. a) Explain the Advantages and disadvantages of RAS?

OR

b) Write an essay on Design of Recirculation Aquaculture systems.

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B.VOC: INDUSTRIAL AQUACULTURE AND FISHERIES
III YEAR; SEMESTER V; 2022-2023
Semester – V Practical
Aquaculture Engineering

1. Major Experiment? 12 M
2. Minor Experiment? 8 M
3. Identification, salient features and ecological importance of the following.
   (Spotters /Specimens/ Charts/ Pictures etc choose if anyone from syllabus) 4x5= 20 M
   a.
   b.
   c.
   d.
4. Record + Viva-voce 6+4 = 10 M

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B.VOC: INDUSTRIAL AQUACULTURE AND FISHERIES
III YEAR; SEMESTER V; 2022-2023
FISHERIES MANAGEMENT, ECONOMICS AND MARKETING
HOURS-4

Credits: 4

Unit 1: Introduction of Management, Human resource Management and Economics

1.1 Definitions and approaches, Scope and importance of Management Comparative Management.

1.2 Functions of Managers- Planning, Organising, Staffing, Directing and Controlling. Contributions of Henry Fayol to the Scientific Techniques of management.

1.3 Manpower planning and recruitment- Organisational Development- Training, Motivation, Leadership, Organizational communication, Conflicts and Decision making.

1.4 Human resource development and its role in the context of fisheries sector. Important Institutions involved in human resource development in Fisheries sector.

1.5. Introduction, fisheries economic definition, objectives, different types of economics. Micro economics and Macro economics and its importance.

1.5 Demand and supply, types of demand, factors affecting demand

Unit 2: Co-operation, Fishery Co-operatives and Rural Development

2.1. Definition, Principles of cooperation, National Federation of Fishermen's Cooperatives (FISHCOPFED); NCDC.

2.2. Status of Indian fishery co-operative movement; programmes for fisheries development.

2.3. Reasons for failure of fishermen co-operative society; Suggestions for the improvement of fisheries co-operatives

Unit 3: Marketing and Export Inspection Council

3.1. Introduction, Components of market; Classification of markets;

3.2. Marketing institutions- MPEDA; Fisheries cooperative societies, Factors affecting length of marketing channels, Types of market information.

3.3. MPEDA, Structure, activities and network, Objectives, Marketing services, financial services, statistics and market research, Research and product development, Export Inspection council, systems of inspection.

Unit 4: Role of Financial Institutions, Socio-Economics & Trade orgranisation

4.1. Role of financial Institutions in fisheries-Introduction, classification of source of finance, RBI, World Bank, IBRD, IDP, IFC, MIGA, ICSID, NABARD.

4.2. Fisheries Socio-Economics- Introduction; Scoico-economics aspects of fishermen; Socio-economic study; Characteristics of a good sample design; Survey schedule on the socio-economic status of fisher folk.

4.3. The world trade organization-Introduction; Agreement on technical barriers to trade (TT); Balance of payments; Anti dumping; Tariffs; Quotas; Tariff quota; MFN; Trade Arrangements and Trade Blocs.

Unit 5: Projects-Concept and Scope, Fisheries Acts

5.1. Introduction, Project cycles, Aquaculture Projects Planning. Stage of planning and formulation –project identification and project design , Organisational setup in processing Industries
5.2. Project implementation.
5.3. Analysis of expected results and appraisal preparation of project report
5.4. Indian fisheries Act, National Institutions of Governance in Marine affairs of India- Criteria for regulation of Fishing effort. Code of conduct for responsible fisheries, Important acts pertaining to fisheries in Andhra Pradesh - Marine Fisheries Act.

References:

1. Shang YC. (1990). Aquaculture Economic Analysis–An Introduction. World Aquaculture Society, USA.
2. Singh, R.K.P. (2003). Economics of Aquaculture. Daya Publishing House, Delhi.
3. Jayaraman, R. (1996). Fisheries Economics. Tamilnadu Veterinary and Animal Science University, Tuticorin.
4. Allen, et al.(Eds). (1984). Bio-Economics of Aquaculture. Elsevier Publ.
5. Chaston I. (1987). Business Management in Fisheries and Aquaculture.Fishing News Books
6. Tripathi SD (1992). Aquaculture Economics. Asian Fisheries Society, Mangalore
7. Subba Rao N (1986). Economics of Fisheries. Daya publishing house, Delhi
8. Ian C. (1984). Marketing in Fisheries and Aquaculture. Fishing News Books.
9. Korakandy, R (1996). Economics of Fisheries Management.DayaPublishing House, Delhi
10. Dewett, K.K. and Varma, J.D. (1993). Elementary Economic Theory. S.Chand, New Delhi.
11. Sathaidhas, R. (1997). Production & Marketing Management of Marine Fisheries in India. Daya Publishing House, Delhi.
12. Kotler, Philip. (1995). Principles of Marketing. Prentice-Hall of India, New Delhi.
13. *Web resources suggested by the teacher concerned and the college librarian including reading material.*

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III YEAR; SEMESTER V; 2022-2023
PAPER TITLE: FISHERIES MANAGEMENT, ECONOMICS AND MARKETING
MODEL PAPER

Time: 3 Hours Maximum: 70 Marks

SECTION-A

I. Answer any FOUR of the following. Draw diagrams wherever necessary. **4x5=20 M**

Draw labeled diagram wherever necessary

1. Importance of comparative management
2. Different types of economics
3. Motivation
4. Fisheries cooperative societies
5. NCDC
6. MPEDA
7. NABARD
8. Project cycles

SECTION-B

II. Answer any FIVE of the following. Draw diagrams wherever necessary. **5x10=50 M**

9. a) What is Management? Explain scope and importance of management?

OR

b) Give the definition of fisheries economics? Write the objectives and types of economics?

10. a) Write about National Federation of Fishermen's Cooperatives (FISHCOPFED)?

OR

b) Definition, Principles of cooperation? Explain the Reasons for failure of fishermen co-operative society

11.a) Write the classification of markets and explain the components of market

OR

b) Give a detail notes on marketing institutions related to fisheries sectors?

12. a) Explain the role of financial Institutions in fisheries?

OR

b) What is WTO? Explain the role and importance fisheries sector?

13. a) Explain the Project implementation?

OR

b) Write about organization setup in processing industries?

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III YEAR; SEMESTER V; 2022-2023
OJT (ON JOB TRAINING)

Hours: 2 **Credits-1**

CONTENT	EVALUATION	MARKS
FIELD TRIPS	3X5	15
PROJECT /INDUSTRIAL OR INSTITUTE TRAINING REPORT & SEMINAR	15+5	20
FIELD COMPONENTS	10X1	10
VIVA VOCE	-	05
TOTAL		50

IDEAL COLLEGE OF ARTS AND SCIENCES
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SYLLABUS
FOR
B.VOC., COMMERCIAL AQUACULTURE

IDEAL COLLEGE OF ARTS AND SCIENCES

AUTONOMOUS , NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM

KAKINADA

BOARD OF STUDIES
2022-2023

COURSE: B.VOC., COMMERCIAL AQUACULTURE

First, Second & Third Year (I ,II , III, IV & V Semester)

DEPARTMENT OF FISHERIES AND AQUACULTURE

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM
KAKINADA

Date: 13.12.2022

Board of Studies of B.Voc., Commercial aquaculture

A meeting of Board of studies of the Department of Fisheries and Aquaculture will be held on **13.12.2022 at 11.00 A.M** in Ideal College of Arts and Sciences (Autonomous), Vidyutnagar, Kakinada, to consider the following Agenda.

You are cordially invited to attend the meeting and make it a success.

Agenda:

1. To ratify the syllabus for the First year & Second year and Third year (I, II, III & IV&Vth Semesters).
2. To prepare and ratify scheme of Examinations for both internal and external examinations.
3. Model Question paper for First year & Second year and Third Year).
4. To fix Panel of paper setters and Examiners.
5. Additional inputs into the curriculum and up gradation of syllabus incorporate the Apprenticeship.
6. Other academic activities of Department.

PRINCIPAL

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM
KAKINADA
DEPARTMENT OF FISHERIES AND AQUACULTURE
Board of Studies of B.Voc., Commercial aquaculture

The Board of Studies for the Department of Fisheries and Aquaculture for the year 2022-2023 is constituted with the following Members.

SI.No.Members Present

1.P.V.Lovaraju	Chairman
2.Dr.S.Jagan mohan	Member
3.P.Srinivas	Student Member
4.V.Supriya.	Student Member

Adikavi Nannaya University Nominee

1 Dr. K. Ramaneswari
Principal UCST
HOD, Aquaculture
Adikavi Nannaya University
Rajamahendravaram
Cell No: 8074112754

Members from other Colleges

1. Dr. Muralidhar P. Ande
Senior Scientist & Office In-Charge, CIFE,
Kakinada
Cell No: 7396182790

2. Dr.P.V.V.Satish
HOD of Fisheries,P.V.R.T.DegreeCollege.
Kakinada
CellNo: 8074194098

Industry/Scientific Organization

1. T.Madhu Mohan
Technical Director,SGS Aqua Solutions,
Kakinada.
Cell No: 9849744984

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KAKINADA

The syllabus and model question papers in Commercial aquaculture subject for B.Vocational course for the First year , Second Year & Third year (I, II, III , IV & V Semesters) in the academic year 2022-2023, list of Examiners and paper setters, Department activities is approved in the Board of Studies meeting held in the Department of Fisheries and Aquaculture on 13.12.2022 at 11:00 AM.

Sl.No.	**Members Present**	**Signatures of Members**
1.	P.V.Lovaraju	Chairman
2.	Dr. K. Ramaneswari	University Nominee
3.	Dr. Muralidhar P. Ande	Expert
4.	Dr. P. V.V.Satish	Expert
5.	T.Mohan Mohan	Representative from Industry
6.	Dr.S.Jagan mohan	Member
7.	P.Srinivas	Student Member
8.	V.supriya	Student Member

IDEAL COLLEGE OF ARTS AND SCIENCES

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KAKINADA

A.Y.2022-2023

DEPARMENT OF FISHERIES AND AQUACULTURE

B.VOC., Commercial aquaculture

Resolutions:

1. Resolved to follow the following pattern for Examinations.
   a) The syllabus is divided in to two semesters each paper has 40% internal and 60%External for 1st semester And ,30% internal and 70% external for III & IV, Vth semester (second year & third Year).
   b) During each semester two internal Examinations for each paper will be conducted as per schedule in descriptive mode.
   c) No internal examination/semester examination will be conducted separately for the absentees.
   d) Average of the two internal Examinations will be considered. Absentee will be awarded zero marks.
   e) The minimum pass mark for external examination is 35%, Candidate should get a total of 40 marks in internal and external examination put together.
   f) The pattern of semester examinations and practical I, II, III & IV is herewith appended.
   g) Practical examination will be conducted at each Semester end.
2. Resolved to approve the model question papers for I, II, III , IV & Vsemesters are here with appended.
3. Resolved to approve the panel of paper setter and examiners as appended herewith.
4. Additional inputs into the curriculum and up gradation of syllabus will be incorporated the OJT (On Job Training) and Project Work.
5. Resolved to introduce fishing methods paper in the place of Fish Seed Production in second semester.
6. Resolved to introduce fish seed production paper in the place of fishing methods in third semester.

7.Resolved to introduce elective paper livestock management in V semester zoology

8. First semester and Third semester followed as per APSCHE syllabus .

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B), KAKINADA

Bachelor of Vocation: Commercial aquaculture 2022-2023

Course structure , Semester I

S.No	Course	Teaching hours	credits	Mid Sem	semend	Total marks
	General Education					
1.	English	4	3	40	60	100
2.	Second language-Telugu	4	3	40	60	100
3.	Life Skill Course	2	2	-	50	50
4.	Skill Development Course	2	2	-	50	50
	Skill Education					
1	Animal Diversity – I Biology of Non-Chordates	4	4	40	60	100
2	Lab Practical	2	1	-	50	50
3	Biology of Fishes	4	4	40	60	100
4	Lab Practical	2	1	-	50	50
5	Principles of Aquaculture	4	4	40	60	100
6	Lab Practical	2	1	-	50	50
7	Fresh water aqua culture(no practical)	4	4	40	60	100
8	OJT	2	1		50	50
	Total	36	30			**900**

IDEAL COLLEGE OF ARTS & SCIENCES

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SAMALKOTA ROAD, KAKINADA

ZOOLOGY SYLLABUS FOR I SEMESTER 2022 – 2023

Bachelor of Vocation: Commercial aquaculture

PAPER – I ANIMAL DIVERSITY – BIOLOGY OF NON CHORDATES

HOURS:04 **CREDITS:04**

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)

UNIT –II

Phylum Porifera

2.1 General characters and classification up to classes with suitable examples

2.2 Skelton in Sponges

2.3 Canal system in sponges

Phylum Coelenterata

2.4 General characters and classification up to classes with suitable examples

2.5 Metagenesis in 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 Ascaris lumbricoides

Unit – IV

Phylum Annelida

4.1 General characters and classification up to classes with suitable examples

4.2 Evolution of Coelom and Coelom ducts

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 Termites

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

Phylum Hemichordata

5.6 General characters and classification up to classes with suitable examples

5.7Balanoglossus - Structure and affinities.

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" ZOOLOGY

IDEAL COLLEGE OF ARTS & SCIENCES

Autonomous, NAAC Accredited B
Dr. PVN RAJU VIDYAPRANGANAM
SAMALKOTA ROAD, KAKINADA

ZOOLOGY MODEL PAPER FOR I SEMESTER
ZOOLOGY - PAPER - I
ANIMAL DIVERSITY – BIOLOGY OF NON CHORDATES

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

I. Answer the following. .Draw labelled diagrams wherever necessary 5X10=50M

1.a) Explain the life history of Elphidium

OR

b) Explain Whittaker's five kingdom concept

2.a) Describe Canal system in sponges

OR

b) Describe polymorphism in Coelenterates

OR

3.a). Describe the life cycle of Fasciola hepatica

OR

b) Explain the Life cycle of Ascaris lumbricoides

4.a) Write general characters of phylum Arthropoda and classify up to classes with examples

OR

b) Describe the structure and affinities of Peripatus

5.a) Describe the structure and affinities of Balanoglossus

OR

b) Describe the pearl formation in Pelecypoda

II. Answer any FIVE of the following. Draw labelled diagrams wherever necessary 5x2=10M

1. Locomotion in protozoa
2. Metamorphosis in insects
3. Skeleton in sponges
4. Rotifera
5. Coelom and coelom ducts
6. Class echinoidea
7. Enteropneusta
8. Castes of Termites

IDEAL COLLEGE OF ARTS & SCIENCES

(Autonomous, NAAC Accredited B)

Dr. P.V.N RAJU VIDYAPRANGANAM

SAMALKOTA ROAD, KAKINADA

ZOOLOGY SYLLABUS FOR I SEMESTER 2022 – 2023

Bachelor of Vocation: Commercial aquaculture

PRACTICAL PAPER – I ANIMAL DIVERSITY – BIOLOGY OF NON CHORDATES

HOURS :02 CREDITS:01

Practical Syllabus:

1. Study of museum slides / specimens / models (Classification of animals up to orders)

Protozoa: Amoeba, Paramecium, Paramecium Binary fission and Conjugation, Vorticella, Entamoebahistolytica, Plasmodium vivax

Porifera: Sycon, Spongilla, Euspongia, Sycon- T.S & L.S, Spicules, Gem mule Coelenterata: Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatulav.

Platyhelminthes: Planaria, Fasciola hepatica, Fasciolalarval forms – Miracidium, Redia, Cercaria, Echinococcusgranulosus, Taeniasolium, Schistosomahaematobiumvii.

Nemathelminthes: Ascaris (Male & Female), Drancunculus, Ancylostoma,Wuchereria

Annelida: Nereis, Aphrodite, Chaetopteurs, Hirudinaria, Trochophore larva

Arthropoda: Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Periapt's, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male &female Anopheles and Culex, Mouthparts of Housefly and Butterfly.

Mollusca: Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium larva

Echinodermata: Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Ante don, Bipinnaria larva

Hemichordata: Balanoglossus, Tornaria larva.

2. Dissections:

Prawn: Appendages, Digestive system, Nervous system, Mounting of Statocyst. Insect Mouth Parts

I **DEAL COLLEGE OF ARTS & SCIENCES**

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VIDYAPRANGANAM
SAMALKOTA ROAD, KAKINADA

ZOOLOGY SYLLABUS FOR I SEMESTER 2022 – 2023

Bachelor of Vocation: Commercial aquaculture

PRACTICAL PAPER – I ANIMAL DIVERSITY – BIOLOGY OF NON CHORDATES

MODEL PAPER

1.Dissection

1.Labelleddiagramofvirtualdissection/dissected animalof..... 1x8=8M
(Diagram–4Marks,Labellingofdiagram–4M.Unlabeleddiagramcarriesnomarks)

2 Identification : 5x4=20M

Museumspecimens/model/photographs
Identification–1M,Labelleddiagram-1M
Identifyingcharacters–2M.

3.Identification: 3x4=12M
Slides/Sections/Photographs/Charts.
Identification–1M,Labelleddiagram-1M
Identifyingcharacters–2M

4.Certified record +viva-voce

5+5=10

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
Bachelor of Vocation: Commercial aquaculture
Course structure and syllabus: 2022-2023 Admitted Batch
Semester I

BIOLOGY OF FISHES

Syllabus

HOURS-04 **CREDITS- 4**

Unit 1: General Characteristics and Taxonomy of Fishes

1.1. General characters and classification of fishes, Osteichthyes and Chondrichthyes fishes and its differences.
1.2. Bioluminescence in fishes.

Unit 2: Food and Feeding – Growth

2.1. Food and feeding habits – structural adaptations, classification based on food and feeding habits.
2.2. Gastrosomatic index in fishes.

Unit 3: Digestion, Respiration and Circulation

3.1. Digestive system – General morphological feature of digestive system in fishes, Digestive system and process of digestion.
3.2. Respiratory system – Types of gills, Structure of gill, mechanism of gill respiration.
3.3. Cardiovascular system – General features of heart and physiology of circulation, Significance of circulation.

Unit 4: Reproduction, Excretion

4.1. Reproduction – ovary and testes, structure, development of primary and secondary sexual & Sexual dimorphism in fishes.
4.5. Parental care in fishes
4.2. Excretion and osmoregulation-freshwater fishes
4.4. Osmoregulation in marine fishes.

Unit 5: Endocrine glands in fishes and Migration

5.1. Sense organs in fishes (Neuromast organs) – lateral line system. Ampullae of Lorenzini.
5.2. Endocrine organs in fishes-Pituitary gland, thyroid gland, adrenal gland, Urohypophysis, pancreatic islets and pineal organs.
5.3. Migration in fishes –anadromous and catadromous.

Suggested readingCore reading

1. Moyle,P.B. and Cech,J.J. Fishes – An Introduction to Ichthyology Norman,J.R. A History of Fishes.
2. Bagenal. Methods of Fish Production in Freshwaters Nicholski, G.V. Ecology of Fishes.
3. Lagler. Ichthyology.
4. Matty. Fish Physiology.
5. Francis Day. Fishes of India.
6. Munro,I.S.R. The Marine and Freshwater Fishes of Ceylon.
7. CMFRI. The Industrial Molluscs of India.

Supplementary Reading

1. Purchon,R.D. The Biology of Mollusca.
2. Dorothy E Bliss. The Biology of Crustacea.
3. Nelson,J.S. Fishes of the World Berg,L.S. Classification of Fish Both Recent and Fossil.

Advanced Reading

1. Wootton, R.J. Fish Ecology.
2. FAO Identification Sheets for Fishery Purposes.

Other Reference Books:

1. Marshall & Williams. Textbook of Zoology. Vol.I.
2. Parker and Hasswell. Textbook of zoology, Vertebrates. Vol.II.
3. Barnes. General Zoology
4. Day, F. The fishes of India.
5. S.S. Khanna. An introduction to fishes.
6. K.G. Lagler. Ichthyology.
7. Rath,A.K. Freshwater Aquaculture,
8. Santhanam, et.al. a Manual of Freshwater Aquaculture
9. Pillay,T.V.R. Aquaculture – Principles and Practices
10. Jhingran,V.G. Fish and Fisheries of India
11. Jhingran,V.G and Sehgal,K.L. Coldwater Fisheries of India. 12. Bardach, Rhyther and McLarney. Aquaculture
13. Huet, M. Textbook of Aquaculture.
14. Rogen, Pallin and Shehadeh. Integrated Agriculture and Aquafarming Farming system.
15. Boyd,C.E. Qater Quality in Warmwater Fish Ponds
16. Moyle,P.B. and Cech,J.J. Fishes – An Introduction to Ichthyology

IDEAL COLLEGE OF ARTS AND SCIENCES

(A.P. GOVT., AIDED, AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

I B.Voc. Department of Fisheries and Aquaculture

Semester I 2022-2023

Bachelor of Vocation: Commercial aquaculture

PAPER TITLE: BIOLOGY OF FISHES

Time: 3 Hour Max.Marks: 60

PART - A

Answer all Questions 5 x 10 = 50 Marks

Draw labelled diagram wherever necessary

1. a)Write the general character s and classification of Fishes?

   or

   b)Explain about Bioluminescence in Fishes?

2. a)What is GaSI?Explain about the GaSI in fishes?

   or

   b)Describe Fish classification based on Food and feeding habits?

3. a)Explain about fish digestive system ?

   or

   b)Write an easy on fish Cardiovascular system?

4. a)Describe the parental care of fishes?

   or

   b)Explain about the Reproduction in fishes?

5. a)Write an essay on sense organs fishes?

   or

   b)Explain about the Endocrine glands in fishes?

PART - B

Answer any **FIVE** of the following: 5 x 2 = 10 Marks

Draw labelled diagram wherever necessary

1. Osteichthyes
2. Chondrichthyes
3. Fish classification based on food
4. Fish feeding Habits
5. pancreas
6. Ovary
7. Ampulla of lorenzini
8. Anadromous Migration

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

PRACTICAL BIOLOGY OF FISHES

I Year, I semester 2022-2023

HOURS:02 **CREDITS:01**

Practical Paper: I: Biology of Fishes

S.NO. **NAME OF THE PRACTICAL**

1. Fish Morph metric characters
2. Fish Meristic characters
3. Indian Major carps
    1. *Catla catla*
    2. *Labeo rohita*
    3. *Cirrhinus mrigala*
4. Exotic Fishes
    1. *Hypopthalmycthys molitrix*
    2. *Ctenopharyngodon idella*
    3. *Cypinus carpio*
5. Air breathing Fishes

    a. *Clarias magur*

    b. *Wallago attu*

    c. *Heteropneustes fossilis*

    d. *Anaba testudineus*

    Murrels

    a. Channa striatus

    b. Channa punctatus
6. Migratory fishes
    1. *Hilsa ilisha*
    2. *Anguilla anguilla*
7. Gut content Analysis of Fish
8. GaSI
9. Dissection and study of internal organs: Fishes/Prawns/Shrimps
    a. Digestive system
    b. Respiratory system
    c. Excretory system
    d. Reproductive systems

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

BIOLOGY OF FISHES PRACTICALl MODEL PAPER

I Year, I semester 2022-2023 MAX.MARKS 50

1.Identification of spotters	**5x5=25M**
2. Dissection/analysis (major)	**1x10=10**
3. Dissection/ analysis minor (minor)	**1x5=5**
4. Record +viva	**5+5=10**

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

Bachelor of Vocation: Commercial aquaculture

Course structure and syllabi: 2022-2023 Admitted Batch

Semester I

Principles of Aquaculture

Syllabus

HOURS:04 CREDITS:04

Unit 1: Introduction of Aquaculture

1.1. History, definition, scope and significance of aquaculture, Blue Revolution, concepts of Blue Revolution.
1.2. Different aquaculture systems, classification of Aquaculture, methods of aquaculture
1.3. Criteria for the selection of species.

Unit 2: Pond Ecology

2.1. General concepts of ecology-Ecological factors, pond ecosystem, productivity of culture pond, food chain and food web.
2.2. Nutrient cycles (Biogeochemical cycles) – Nitrogen, Phosphorous and Carbon.
2.4. Significance and important groups of phytoplankton, zooplankton and benthos in culture ponds.

Unit 3: Types of ponds-characteristics of fishes

3.1. Type of ponds – nursery, rearing and Grow-out ponds.
3.2. Cultivable freshwater fishes- carps, Airbreathing fishes, tilapia.

Unit 4: Characteristics of Brackishwater cultivable fishes

4.1. Major brackish water culture systems in India.
4.2. General characters – Milk fish, mullet, seabass, shrimps, crabs.

Unit 5: Characteristics of Marine water cultivable species

5.1. Different cultivable species in Marine water and its characters –Edible oyster, pearl Oyster, mussels and sea weeds and its types

Suggested readingCore reading

1. Rath,A.K. Freshwater Aquaculture,
2. Santhanam, et.al. a Manual of Freshwater Aquaculture
3. Pillay,T.V.R. Aquaculture – Principles and Practices
4. Jhingran,V.G. Fish and Fisheries of India
5. Jhingran,V.G and Sehgal,K.L. Coldwater Fisheries of India. 6.Bardach, Rhyther and McLarney. Aquaculture
7. Huet, M. Textbook of Aquaculture.
8. Rogen, Pallin and Shehadeh. Integrated Agriculture and Aquafarming Farming system.
9. Boyd,C.E. Qater Quality in Warmwater Fish Ponds
10. Moyle,P.B. and Cech,J.J. Fishes – An Introduction to Ichthyology

Supplementary Reading

1. Shepherd,J and Bromage, N. Intensive Fish Farming
2. Pillay,T.V.R. Advances in Aquaculture
3. Beveridge. Cage Culture

Advanced Reading

Stickney,R.R. Principles of Warmwater Aquaculture

Web resources

FAO http://www.fao.org/fishery/topic/4340/en
NACA http://www.enaca.org/
VUAT http://www.vuatkerala.org/static/eng/advisory/fisheries/index.htm
Aquaculture/Pond Dynamics http://pdacrsp.oregonstate.edu/pubs/
Wikipedia http://en.wikipedia.org/wiki/Aquaculture
Fish farming http://www.fishfarming.com/
ICAR http://www.icar.org.in/indiafishvoice/intro.html
CIFA http://www.cifa.in/tech.htm
Aquaculture articles: http://aquafind.com/articles/aquaculture.php
Aquaculture Artices http://www.aquarticles.com/**Other**

Reference Books:

1. Friedrich, H.: Marine Biology
2. Raymont, J.E.C.: Plankton and productivity in the Oceans, Volume 1.
3. Balakrishna Nair. N. and D.M. Thampy: A text book of Marine ecology
4. Broecker, W.S.: Chemical Oceanography
5. Sverdrup, H.V., M.W., Johnson and R.H. Fleming.: The Oceans - Their physics, chemistry and general biology. Prentice-Hall Inc. 1942.

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

I B.Voc. Department of Fisheries and Aquaculture

Semester I 2022-2023

Bachelor of Vocation: Commercial aquaculture

Principles of Aquaculture

Time: 3 Hour Max.Marks: 60

PART - A

Answer all Questions 5 x 10 = 50 Marks

Draw labelled diagram wherever necessary

1 a) Write history definition scope and significance of Aquaculture?

or

b) Write the general criteria for the selection of cultural species ?

2 a) Describe about the productivity of culture pond ?

or

b) Explain about the nutrient cycles?

3 a) Explain about the types of ponds ?

or

b) Describe the cultivable fresh water fishes ?

4 a) Write about major brackish water culture systems in India ?

or

b) Write the general characters of milk fish, mullet, sea bass, shrimp and crab ?

5 a) Explain about different cultivable species in marine water and its characters ?

or

b)Describe about the sea weeds and its types ?

PART - B

Answer any **FIVE** of the following: 5 x 2 = 10 Marks

Draw labeled diagram wherever necessary

1.Blue revolution
2. Classification of Aquaculture
3. Food chain
4. Phosphorous Cycle
5. Nursery pond
6. Milk fish
7. Pearl oyster
8. Sea weeds

***

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

Practical

I Year, I semester 2022-2023

HOURS:02 (Credits:1)

Practical Paper: II: **Principles of Aquaculture**

S.No	NAME OF THE PRACTICAL
1.	Ponds Lay-outs a. Nursery Pond b. Rearing Pond c. Grow-out Pond
2.	Dikes
3.	Types of Aerators a. Pedal wheel aerators b. Propeller-aspirator pumps c. Diffused-air systems
4.	Sluice gate
5.	Aquatic Weeds and their control A. Floating weeds B. Emergent weeds C. Submerged weeds D.Marginal weeds 1. Pistia 1. Typha 1. Vallisneria 1. Marsilia 2. Eichhornia 2. Nymphaea 2. Hydrilla 2. Ipomoea
B.	Mahula oil
C.	Liming
D.	Predatory Fishes and their control a. *Channa* sp., *b. Wallago attu,* *c. Heteropneustes fossilis,* *d. Clarias batrachus* *e. Anabas testudineus*
E.	Identification and general characters of Larvivorous fishes a. *Gambusia afinis* b. *Lebistes reticulates* c. *Puntius ticto* d. *Colisa fasciatus*

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

Practical Model paper

I Year, I semester 2022-2023

Practical Paper: II: **Principles of Aquaculture**

MAX MARKS -50

1.Identification of spotters	**5x5=25M**
2. Major experiment	**1x10=10**
3. Minor experiment	**1x5=5**
4 Certified Record +viva	**5+5=10**

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
Bachelor of Vocation: Commercial aquaculture
Course structure and Syllabus: 2022-2023 Admitted Batch
Semester I

Fresh water Aquaculture

Syllabus

HOURS:04 CREDITS:04

Unit 1: Freshwater Fish Culture

1.1. Management of carp culture ponds- Nursery rearing and stocking ponds.
1.2. Preparation of ponds– different methods for the eradication of weed fishes, predators, aquatic insects and aquatic weeds, stocking and post stocking management, harvesting.

Unit 2: Culture of Prawns, cage and pen culture

2.1. Cultivable species of freshwater prawns and their biology
2.2. Management techniques of nursery and Grow-out ponds.
2.3. Cages and pens.

Unit 3 Integrated Farming-Organic farming

3.1. Recent development in integrated farming – Rice cum fish culture, Duck cum fish culture, Poultry cum fish culture and Pig cum fish culture.
3.3. Organic aqua farming.

Unit 4: Fresh water cultivable fishes

4.1 Culture of air breathing fishes- Channa, Heteropneustes, Clarius, Anabas.
4.2. Freshwater pearl culture

Unit 5: Aquaculture for stable environment

5.1. Sewage fed fish culture
5.2. Larvivorous fishes in relation to public health
5.3. Effluent Treatment Ponds (ETP).

Suggested reading

Core reading

1. Jhingran, V.G. Fish and fisheries of India. Hindustan Publ. Corporation (India), 1982.
2. Santhanam, R. et. Al. A Manual of Freshwater Aquaculture. Oxford & IBH Publishing Co. Pvt. Ltd., 1987.
3. Pilley, T.V.R. Aquaculture – Principles and Practices. Fishing News (Books) Ltd., London, 1990.
4. Pandey, A.C. Air Breathing Fishes. Reliance Publishing House, New Delhi, 1990.

Supplementary Reading

1. Welch, P.S. Limnology. McGrawHill, NY, 1952.
2. Hutchinson, G.E. A Treatise on Limnology, Vols. I & II. John Wiley & Sons, 1957.
3. Ruttner, F. Fundamentals of Limnology. Translated by D.G. Frey and F.E.Fry. University of Toronto Press, 1968.
4. Wetzel, R.G. Limnology. W.B. Saunders Co., 1975.
5. Reid, G.K. & R.D. wood. Ecology of inland waters and Estuaries. Van Nostrand Company, 1976.

Other Reference Books:

1. Cole, C.A. Textbook of Limnology. The C.V. Mosby Co., 1983.
2. Bardach, et. Al. Aquaculture – The Farming and Husbandry of Freshwater and Marine Organisms. John Wiley & Sons, NY, 1972.
3. Stickney, R.R. Principles of Water Aquaculture. John Wiley & Sons, NY, 1979.
4. Chondar, C.L. Hypophysation of Indian major carps. Satish Book Enterprise, Agra, 1980.
5. Janardhana Rao, K. & S.D. Tripathi. A Manual of Giant Freshwater Prawn Hatchery. CIFA, Kausalyaganga, Orissa, India, 1993.
6. Iso Matsui. Theory and Practice of Eel Culture. American Publishing Co. Pvt. Ltd., 1980.

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

I B.Voc. Department of Fisheries and Aquaculture

Semester I 2022-2023

Bachelor of Vocation: Commercial aquaculture

Fresh water Aquaculture

Time: 3 Hour Max.Marks: 60

PART - A

Answer all Questions 5 x 10 = 50 Marks

Draw labelled diagram wherever necessary

1 a) Write about the management of carp culture pond?

or

b) Describe different methods for the Eradication aquatic Insects and Aquatic weeds?

2 a)Explain about the Fresh water Prawn?

or

b) Write about Management Techniques of Nursery and Grow out ponds?

3 a)Write an essay on Integrated farming?

or

b)Explain about the organic aqua farming ?

4 a) Describe about the Fresh water pearl culture?

or

b) Explain about the Culture of Air breathing fishes?

5 a) Describe about the sewage fed fish culture?

or

b) Explain about the Effluent treatment plant ?

PART - B

Answer any **FIVE** of the following: 5x 2 = 10 Marks

Draw labelled diagram wherever necessary

1 .stocking ponds

2 weed fishes.

3 cages

4 pig cum fish culture

5 .Rice cum fish culture

6Channa species

7.Anabus

8.Larvivorus fishes

***

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

Bachelor of Vocation: Commercial aquaculture

Course structure and syllabus: 2022-2023 Admitted Batch

Semester I

OJT (ON JOB TRAINING)

HOURS -02 CREDIT -01

CONTENT	EVALUATION	MARKS
FIELD TRIPS	3X5	15
PROJECT REPORT/ INDUSTRIAL OR INSTITUTE TRAINING& SEMINAR	15+5	20
FIELD COMPONENTS	10X1	10
VIVA VOCE	-	05
TOTAL		50

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

I Year ,II semester 2022-2023

S.No	Course	Teaching hours	credits	Mid Sem	semend	Total marks
	General Education					
1.	English	4	3	40	60	100
2.	Second language-Telugu	4	3	40	60	100
3.	Life Skill Course	2	2	-	50	50
4.	Skill Development Course-1	2	2	-	50	50
5.	Skill Development Course-1	2	2	-	50	50
	Skill Education					
1	Animal Diversity – II Biology of – Chordates(Zoology)	4	4	40	60	100
2	Lab Practical	2	1	-	50	50
3	Biology of shell Fishes	4	4	40	60	100
4	Lab Practical	2	1	-	50	50
5	Brackish water Aquaculture&mariculture	4	4	40	60	100
6	Lab Practical	2	1	-	50	50
7	Fishing methods (no practical)	4	4	40	60	100
	OJT	2	1	-	50	50
8	Apprenticeship		4		100	100
	Total	34	36			**1050**

First spell between First year and Second Year Apprenticeship

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
Bachelor of Vocation: COMMERCIAL AQUACULTURE
Course structure and syllabus: 2022-2023 Admitted Batch
ZOOLOGY SYLLABUS FOR II SEMESTER
PAPER - II : ANIMAL DIVERSITY - BIOLOGY OF CHORDATES

HOURS-04 **CREDITS-04**

UNIT-1

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 ofPetromyzon 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

2.6Dipnoi

UNIT-III

3.1 General characters of Amphibia

3.2 Classification of Amphibia up 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 and Skul l in reptiles

UNIT- - IV

4.1 General characters of aves

4.2 Columba livia –external fetures, digestive system,respiratory system,structure and functions of heart ,structure of function of brain

4.3 Flight adaptation in birds

UNIT-V

5.1 General characters of mammalian

5.2 Classification of mammala upto subclass with example

5.3 Comparision of prtotherians, metatherians and eutherians.

5.4 Dentition in mammals

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

I Year, II semester 2022-2023

Zoology- BIOLOGY OF CHORDATES

Time: 3 Hour Max.Marks: 60

PART – A

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

1a) Explain the life history of Herdmania

OR

b) Explain the origin and general characters of chordates

2a) Compare the characters of Petromyzon and Myxine

OR

b) Describe the structure of heart in Scoliodon

3a) . Describe the brain of Ranahexadactyla

OR

b) Explain the external features of Calotes

4a) Write an essay on flight adaptations in birds

OR

b) Explain the respiratory system of Columba livia

5a) Compare the characters of Metatheria and Eutheria

OR

b) Write an essay on dentition in mammals

PART - B

Answer any **FOUR** of the following: 5x 2 = 10 Marks

Draw labeled diagram wherever necessary

1. Amphioxus
2. Placoidscale
3. Quillfeather
4. Prototheria
5. Anadromousmigration
6. Draco
7. Emu
8. Apoda

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B.Voc., Commercial aquaculture
I Year, II semester 2022-2023
ZOOLOGY- BIOLOGY OF CHORDATES
PRACTICAL SYLLABUS

HOURS-02 **CREDIT-01**

I.Observation of the Following Slides / Spotters / Models :

Protochordata: Herdmania, Amphioxus, Amphioxus T.S through pharynx.

- **Cyclostomata** : Petromyzon and Myxine.
- **Pisces**: Pristis, Torpedo, Hippocampus, Exocoetus, Echeneis, Labeo, Catla,Claries, Channa,Anguilla.
- **Amphibian** : Ichthyophis, Amblystoma, Axolotl larva,Hyla,
- **Reptilia**: Draco, Chameleon, Uromastix, Testudo, Trionyx, Russels viper,Naja Krait, Hydrophis, Crocodile.
- **Aves**: Psittacula, Eudynamis, Bubo, Alcedo.
- **Mammalian**: Ornithorhynchus, Pteropus, Funambulus.

II. 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.

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B.Voc., Commercial aquaculture
I Year, II semester 2022-2023
ZOOLOGY- BIOLOGY OF CHORDATES

PRACTICAL MODEL PAPER
MAX.MARKS-50

1.Dissection

Labelled diagram of virtua ldissection/dissected anima lof.....
(Diagram–5Marks,Labellingof diagram–5M. 1x10=10M
Unlabeled diagram carries no marks)

2.Minor dissection/mounting 1x10=10M

3. Identification

5x4=20M

Museumspecimens/slides/model/photographs.
Identification–1M,Labelleddiagram-1M
Identifyingcharacters–2M.

4. Certified Record +Viva 5+5=10M

IDEAL COLLEGE OF ARTS AND SCIENCES
(A.P. GOVT., AIDED, AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.Voc., Commercial aquaculture
I Year, II semester 2022-2023
Biology of Shell Fish
Syllabus

Hours:04 **Credits-04**

Unit – I: General Characters and Classification of Cultivable Shell Fish

1.1 General characters and classification of crustaceans and molluscs up to the level of class.
1.2 Commercial importance of crustaceans and molluscs.
1.3 Prawn external parts and appendages, exoskeleton and integument.
1.4 Respiration and circulatory systems of prawn. Structure of gills, mechanism of respiration.
1.5 Nervous and excretory system of crustacean molluscs.
1.6 Sense organs in crustaceans and molluscs.

Unit – II: Food, Feeding and Growth

2.1 Natural food, feeding habits, feeding intensity utilization of food, gut content analysis.

2.2 Digestive system of shrimp, crab and molluscs.

2.3 Integument and exoskeleton of crustaceans, their structure and functions.

Unit – III: Reproductive Biology

3.1 Induced maturation in shrimp – induced maturation technology physiological changes after induced maturation.
3.2 Breeding in Oysters, Mussel, Clams, Pearl Oyster, Pila, Fresh water Mussel and Cephalopods.

3.3 Reproductive organs in Shrimp.

3.4 Life cycle of Shrimp.

Unit – IV: Development

4.1 Embryonic and larval development of Shrimp, Crab and Molluscs.

4.2 Environmental factors affecting reproduction and development of cultivable shell fish.

Unit – V: Hormones & Growth

5.1 Endocrine system of Prawn and Crab, Oyster.
5.2 Neurosecretary cells Androgenic gland, ovary, cuticle.
5.3 Moulting, Moulting stages, Metamorphosis in Crustaceans.

Reference Books:

1. Borradile & R.A. Potts. The Invertebrates. Asia Publishing House, 1962.
2. Kaestner, A. Invertebrate Zoology. Vol. I – III, John Wiley & Sons, 1967.
3. Barrington, F.J.W. Invertebrates : Structure and Functions. EIBS, 1971.
4. Kurian, C.V. & V.O. Sabastian. Prawns and Prawn Fisheries of India. Hindustan Pub. Co., 1976.
5. Parker, J. & W.A. Haswell. The Textbook of Zoology. Vol. I. Invertebrates (eds. A.J. Marshall & W.D. Williams), ELBS & McMillan & Co., 1992.

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DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.Voc., Commercial aquaculture
I Year, II semester 2022-2023
Biology of Shell Fish

Time: 3 Hour Max.Marks: 60

PART - A

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

1 a) Describe respiratory system in Prawn.

or

b) Give a detailed account on Cephalic appendages of Prawn.

2 a) Write an essay on integument in Crustaceans.

or

b) Explain digestive system of Crab.

3 a) Give a detailed account on induced maturation in Shrimp.

or

b) Write an essay on breeding in Oysters.

4 a) Write an essay on different larval stages of Shrimp.

or

b) Give an account on development of molluscs.

5 a) Describe endocrine glands in Prawn

or

b) Describe the moulting stages in Crustaceans.

PART - B

Answer any **FIVE** of the following: 5 x 2 = 10 Marks

Draw labeled diagram wherever necessary

6.Sense organs in crustaceans.
7. Gastropoda
8.Feeding intensity.
9.Radula
10. Pearl Oyster
11.Megalopa
12.Neuro secretary cells
13.Androgenic glands

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DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.Voc., Commercial aquaculture
I Year, II semester 2022-2023
Biology of Shell Fish
PRACTICALS

,**Hours -2** **Credits-1**

, 1. Identification of commercially important shell fishes
.
2. Study of different larval stages of shrimp

. 3. Mouth parts and appendages of cultivable prawns , shrimp and other crustaceans .

4. Study of eggs of shrimps , prawns and other crustaceans .

5. Observations of Molluscan larva

6. Study of visceral organs of fresh water mussels

7. Dissections
A. Mounting of the shrimp / prawn appendages
B. Digestive system of shrimp / prawn
C. Nervous system of shrimp / prawn
D. Eye stalk ablation in shrimp / Prawn
E. Pituitary gland extract in fishes

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B.Voc., Commercial aquaculture

I Year, II semester 2022-2023

Biology of Shell Fish

Practical Model paper

MAX .MARKS- 50

1.Dissection

Labelled diagram of virtua ldissection/dissected anima lof.....
(Diagram–5Marks,Labellingof diagram–5M. 1x10=10M
Unlabeled diagram carries no marks)

2.Minor dissection/mounting 1x10=10M

3. Identification

5x4=20M

Museumspecimens/slides/model/photographs.
Identification–1M,Labelleddiagram-1M
Identifyingcharacters–2M.

4. Certified Record +Viva 5+5=10M

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(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

I Year, II semester 2022-2023

Brackishwater Aquaculture and Mari culture

Hours:04 **Credits:04**

Unit 1: Introduction to Brackishwater and Construction

1.1. Present status of brackishwater farming in India.
1.2. Abiotic and biotic factors.

Unit 2: Brackishwater Finfish Culture

2.1. Biology and culture practices – monoculture and polyculture
2.2. Biology and culture - *Chanos chanos, Mugil cephalus, Lates calcarifer*.

Unit 3: Brackishwater Shellfish Culture

3.1. Species of shrimps cultured in brackishwater and their biology – *Penaeus monodon, Penaeus indicus, Litopenaeus vannamei*.
3.1. Shrimp culture, Traditional, extensive, modified extensive, semi- intensive culture and intensive
3.2. Crab culture

Unit 4: Water Parameters in Brackishwater Culture Ponds

4.1. Soil parameters: Soil texture, Soil reaction (pH), organic carbon content, Carbon to nitrogen ratio (C:N) and General nutrient status
4.2. Water quality parameters: Temperature, Dissolved Oxygen (DO), salinity, pH, Turbidity, Total alkalinity, CO_2, Ammonia, Nitrite, H_2S.
4.3. Role of Microalgae in Aquaculture.

Unit 5: Mariculture

5.1. Introduction to mariculture.
5.2. Farming of Molluscs (Example: Edible Oyster, Mussel and pearls-Raft)
5.3. Seaweed farming in India.

Suggested reading

Core reading

1. Pillay T.V.R - Aquaculture – Principles and practices
2. Chen, L.C. – Aquaculture in Taiwan
3. Milne P H. – Fish and Shell fish farming in coastal waters
4. Ivenson E.S. – Farming the edge of the sea
5. Bandach, Rhyster V McLarney – Aquaculture
6. Jhingwa V.A – Fish and Fisheries of India
7. Kurian,C.V and Sebastian V.O. – Prawn and Prawn fisheries of India

Supplementary Reading

1. Pillay TVR – Advances in Aquaculture
2. Pillay TVR – Coastal Aquaculture in the Indo-Pacific

Advanced Reading

1. Heut M. – Text book of fish culture
2. Sheperd and Bromage N. – Intensive Fish Farming

Other references:

1. Welch, P.S. Limnology. McGrawHill, NY, 1952.
2. Hutchinson, G.E. A Treatise on Limnology, Vols. I & II. John Wiley & Sons, 1957.
3. Ruttner, F. Fundamentals of Limnology. Translated by D.G. Frey and F.E.Fry. University of Toronto Press, 1968.
4. Wetzel, R.G. Limnology. W.B. Saunders Co., 1975.
5. Reid, G.K. & R.D. wood. Ecology of inland waters and Estuaries. Van Nostrand Company, 1976.
6. Cole, C.A. Textbook of Limnology. The C.V. Mosby Co., 1983.
6. Friedrich, H.: Marine Biology
7. Raymont, J.E.C.: Plankton and productivity in the Oceans, Volume 1.
8. Balakrishna Nair. N. and D.M. Thampy: A text book of Marine ecology
9. Broecker, W.S.: Chemical Oceanography
10. Sverdrup, H.V., M.W., Johnson and R.H. Fleming.: The Oceans – Their physics, chemistry and general biology. Prentice-Hall Inc. 1942.

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B.Voc., Commercial aquaculture

I Year, II semester 2022-2023

BRACKISH WATER AQUACULTURE AND MARI CULTURE

Time: 3 Hour Max.Marks: 60

PART - A

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

1 a) Write Present status of brackishwater farming in India.

or

b) Describe the Abiotic and biotic factors in brackishwater culture pond

2 a) Write an essay on brackishwater finfish culture.

or

b) Write in detail about monoculture and polyculture.

3 a) Write an essay on brackishwater shellfish culture.

or

b) Write an essay on shrimp culture

4 a) Describe the soil parameters in brackishwater culture pond

or

b) Describe role of Microalgae in Aquaculture

5 a) Write in detail about mariculture

or

b) Explain the Molluscs farming

PART - B

Answer any **FIVE** of the following: 5 x 2 = 10 Marks

Draw labeled diagram wherever necessary

1. Abiotic factors
2. Brackishwater fishes
3. Monoculture
4. Chanos chanos
5. Penaeus indicus
6. pH
7. Dissolved Oxygen (DO)
8. Mariculture

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B.Voc., Commercial aquaculture
I Year, II semester 2022-2023

PRACTICALS

Title : BRACKISH WATER AQUACULTURE AND MARICULTURE

HOURS-2 **CREDITS-1**

I Identification of cultivable fishes A. Brackish water fishes / Estuarine fishes

1. Chanos chanos

2. Etroplus surantensis

. Mugil cephalus

4. Megalopa cyprinoides

5. Eleutheronema tetradachylum

B. Marine water fishes

1. Lates calcarifer

2. Scomberomorus guttatus

3. Scomberomorus commerson

4. Rachycentron canadom

5. Stromateus argenteus

C. Migratory fishes :

3. Hilsa ilisha

4. Anguilla Anguilla

D. Soil (Soil texure , pH , organic matter) and Water Quality parameters . (DO , Salinity , pH , Hardness , Alkalinity)

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B.Voc., Commercial aquaculture
I Year, II semester 2022-2023

PRACTICAL MODEL PAPER

Title : BRACKISH WATER AQUACULTURE AND MARICULTURE

MAX .MARKS -50

1.. Identification 5x5=25M

Museumspecimens/slides/model/photographs.

Identification–1M, Labelled diagram-1M
Identifyingcharacters–3M.

2.Major experiment 1x15=15M
(principle-5, procedure-5,result-5)

3. Certified Record +Viva 5+5=10M

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(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

I Year, II semester 2022-2023

FISHING METHODS

Hours:04 **Credits:04**

Unit 1: Inland Fishing Crafts and Gears

1.1. Introduction, Different types of fishing crafts and gears in India; Crafts-Rafts, Boats; Gears-Trap net, Hand net, Drag net, fixed net and miscellaneous types.

1.2. Boat building materials - wood, steel, FRP, ferro-cement, aluminum etc.

Unit 2: Marine Fishing Crafts and Gears

2.1. Introduction, - crafts of the east coast and west coast. Gears-Fixed nets, Trawl nets, shore seines, drift nets, cast nets, trap nets, dip nets (scoop nets), long line and hoocks.

2.2. Factors affecting the design of fishing gears and fish catching methods. Fishing accessories.

2.3. Introduction to netting materials - natural and synthetic fishing gear materials. Yarn numbering systems.

Unit 3: Active Fishing Gears, Passive Gears

3.1. Active fishing gears- 1. Fishing hooks:Parts of hooks, Numbering of hooks, Artificial baits or jigs, Trolling lines; 2. Seining:Trawls, Surrounding net, Lift net

3.2. Passive gears- 1. Gill net; 2. Fish traps, Traps, Pots; 3. Hooks and lines (passively operated), Bottom set line, Drift longline, Demersal longline, Drifting long line

Unit 4: Unconventional Fishing methods

4.1. Destructive and Prohibited fishing practices,

4.2. Fishing methods like electrical fishing,

4.3. Light fishing; Angling (line fishing) poisoning and use of dynamites.

Unit 5: Fish Finding Devices

5.1 Introductory information on echo sounder, sonar, net sonde, global positioning systems, remote sensing.

5.2 Geographic Information Systems (GIS) in aquaculture.

Suggested reading

Core reading

1.Boopendranath, M.R., Meenakumari, B., Joseph, J., Sankar, T.V., Pravin,P., and Edwin, L. (Eds.) 2002, Riverine and ReservoirFisheries of India, Society of Fisheries Technologists (India), Cochin.

2. Brandt. A. v. (1984) Fish catching methods of the world. Fishing News Books Ltd., London: 432 p.

3. George V.C. (1971) An account of the inland fishing gears and methods of India. Spl. Bull.No.1.CIFT

4. Hameed, M.S. and Boopendranath, M.R. (2000) Modern Fishing Gear Technology, Daya Publishing House, Delhi:186 p.

5.Klust, G. (1982) Netting materials for fishing gear, FAO Fishing Manual, Fishing News Books (Ltd)., Farnham, 192p.

6.Sainsbury, J.C. (1986) Commercial fishing methods- An introduction to vessels and gear. Fishing News Books, Oxford: 208pp

7.Sreekrishna, Y. and Shenoy L. (2001) Fishing gear and craft technology, Indian Council of Agricultural Research, New Delhi.

Supplementary & advanced reading

1. Gulland, J.A.1974, Guidelines for Fishery Management, IOFC Dev. 74-36 FAO Rome

2. FAO (1997) Fisheries management. FAO Technical Guidelines for Responsible Fisheries. No. 4. Fishery Resources Division and Fishery Policy and Planning Division, FAO. Rome: 82p.

3. FAO (1995) Code of Conduct for Responsible Fisheries, FAO, Rome: 41 p.

4. FAO (1997) Inland fisheries. FAO Technical Guidelines for Responsible Fisheries. No. 6 Fisheries Department, FAO, Rome: 36 p.

Other Reference Books:

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

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B.Voc., Commercial aquaculture
I Year, II semester 2022-2023
FISHING METHODS

Time: 3 Hour Max.Marks: 60

PART - A

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

1 a) Write Different types of fishing crafts and gears in India

or

b) Explain about the Boat building materials.

2 a) Write Crafts of the east coast and west coast

or

b) Write about the Factors affecting the design of fishing gears

3 a) Write an essay on active fishing gears

or

b) Write an essay on passive gears

4 a) Describe the fishing methods

or

b) Describe the Destructive and Prohibited fishing practices

5 a) Write in detail about fish finding devices

or

b) Write the notes on Geographic Information Systems (GIS) in aquaculture

PART - B

Answer any **FIVE** of the following: 5 x 2 = 10 Marks

Draw labeled diagram wherever necessary

1. Trap net
2. Rafts
3. Trawl nets
4. Hooks
5. Artificial baits
6. Gill net
7. Eco sounder
8. Remote sensing

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IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

Bachelor of Vocation: Commercial aquaculture

Course structure and syllabi: 2022-2023Admitted Batch

Semester II

OJT(ON JOB TRAINING)

HOURS-2 **CREDITS-1**

CONTENT	EVALUATION	MARKS
FIELD TRIPS	3X5	15
PROJECT REPOT/ INDUSTRIAL OR INSTITUTE TRAINING& SEMINAR	15+5	20
FIELD COMPONENTS	10X1	10
VIVA VOCE	-	05
TOTAL		50

IDEAL COLLEGE OF ARTS AND SCIENCES
AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM,
KAKINADA
Bachelor of Vocation: Commercial aquaculture Course structure and syllabus:
2022-2023 Admitted Batch II Year
III SEMESTER

S.No	Course	Teaching hours	credits	Mid Sem	semend	Total marks
	General Education					
1.	English	4	3	30	70	100
2.	Second language-Telugu	4	3	30	70	100
3.	Life Skill Course-1	2	2	-	50	50
4.	LifeSkill Course-II	2	2	-	50	50
5.	Skill Development Course	2	2	-	50	50
	Skill Education					
1	Zoology (Cell biology, Genetics, Molecular Biology & Evolution	4	4	30	70	100
2	Lab Practical	2	1	-	50	50
3	Capture fisheries	4	4	30	70	100
4	Lab Practical	2	1	-	50	50
5	Aquaculture nutrition	4	4	30	70	100
6	Lab Practical	2	1	-	50	50
7	Fish Seed Production (nopractical	4	4	30	70	100
8.	OJT	2	1	-	50	50
9.	Yoga	-	1	-	-	-
	Total	38	33			**950**

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

Bachelor of Vocation: Commercial aquaculture II Year, Semester III

Cell biology, Genetics, Molecular Biology & Evolution

HOURS:04 **CREDITS:04**

Unit – I **Cell Biology**

1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma

1.2 Electron microscopic structure of animal cell.

1.3 Plasma membrane –Models and transport functions of plasma membrane.

.4Structure and functions of Golgi complex, Endoplasmic Reticulum and Lysosomes

1.5 Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes

(**Note: 1. General pattern of study of each cell organelle** – Discovery, Occurrence, Number, Origin, Structure and Functions with suitable diagrams)

2. Need not study cellular respiration under mitochondrial functions)

Unit – II **Genetics - I**

2. 1 Mendel's work on transmission of traits

2. 2 Gene Interaction – Incomplete Dominance, Codominance, Lethal Genes

2. 3 Polygenes (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance

2. 4 Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo-diploidy types of sex determination)

2. 5 Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)

Unit – III **Genetics - II**

3.1 Mutations & Mutagenesis

3.2 Chromosomal Disorders (Autosomal and Allosomal)

3.3 Human Genetics – Karyotyping, Pedigree Analysis (basics)

3.4 Basics on Genomics and Proteomics

UNIT IV: **Molecular Biology**

4.1 Central Dogma of Molecular Biology

Unit – I **Cell Biology**

1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma

1.2 Electron microscopic structure of animal cell.

1.3 Plasma membrane –Models and transport functions of plasma membrane.

.4Structure and functions of Golgi complex, Endoplasmic Reticulum and Lysosomes

1.5 Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes

(Note: 1. General pattern of study of each cell organelle – Discovery, Occurrence, Number, Origin, Structure and Functions with suitable diagrams)

2. Need not study cellular respiration under mitochondrial functions)

Unit – II **Genetics - I**

2. 1 Mendel's work on transmission of traits

2. 2 Gene Interaction – Incomplete Dominance, Codominance, Lethal Genes

2. 3 Polygenes (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance

2. 4 Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo-diploidy types of sex determination)

2. 5 Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)

Unit – III **Genetics - II**

3.1 Mutations & Mutagenesis

3.2 Chromosomal Disorders (Autosomal and Allosomal)

3.3 Human Genetics – Karyotyping, Pedigree Analysis (basics)

3.4 Basics on Genomics and Proteomics

UNIT IV: **Molecular Biology**

4.1 Central Dogma of Molecular Biology

4.2 Basic concepts of -

a. DNA replication – Overview (Semi-conservative mechanism, Semi-discontinuous mode, Origin & Propagation of replication fork)

b. Transcription in prokaryotes – Initiation, Elongation and Termination, Post-transcriptional modifications (basics)

c. Translation – Initiation, Elongation and Termination

4.3 Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes

Unit - V

5.1 Origin of life

5.2 Theories of Evolution: Lamarckism, Darwinism, Germ PlasmTheroy, Mutation Theory

5.3Neo-Darwinism: Modern Synthetic Theory of Evolution, Hardy-Weinberg Equilibrium

5.4Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection, Speciation

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.Voc., Commercial aquaculture
II Year, III semester 2022-2023
Cell biology, Genetics, Molecular Biology & Evolution
MODEL PAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any FOUR of the following: 4 x 5 = 20 Marks
Draw labeled diagram wherever necessary

1. Prokaryotic cell
2. Golgi complex
3. Polygenes
4. Multiple alleles
5. Mutations
6. Karyotyping
7. Lac operon concept
8. Genetic drift

PART - B

Answer any FIVE of the following: 5 x 10 = 50 Marks
Draw labeled diagram wherever necessary

9. a) Describe the ultra structure of animal cell
   OR
   b) Explain the structure of mitochondria. Add a note on its functions.

10. a) Write an essay on gene interactions
    OR
    b) Discuss sex linked inheritance.

11. a) What are chromosomal disorders? Explain various types of autosomal and allosomal disorders
    OR
    b) Explain About Human Karyotyping ?

12. a) Give an account of DNA replication
    OR
    b) Explain the mechanism of Prokaryotic transcription

13. a) An essay on modern synthetic theory of evolution
    OR
    b) Define isolation. Discuss various isolating mechanisms.

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IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

II Year, III semester 2022-2023

Cell biology, Genetics, Molecular Biology & Evolution

PRACTICAL SYLLABUS

HOURS:02 CREDITS:01

I. Cell Biology

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 and problems.
2. Problems on blood group inheritance and sex linked inheritance.
3. Study of human Karyo types (Down's syndrome, Edwards, syndrome, Patausyndrome, Turner's syndrome and Klinefelter syndrome).

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. Study of Genetic Drift by using examples of Darwin's finches(pictures).
5. Visit to Natural History Museum and submission of report.

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

II Year, III semester 2022-2023

Cell biology, Genetics, Molecular Biology & Evolution

PRACTICAL MODEL PAPER

MAX.MARKS-50

1.Prepare temporary slideof----------. Write the procedure, Precautions, Identify the stage ,write with characters 1x15=15M
(Procedure–6M,Precautions–3M,Identification–2M,Characters–4M)

2. Solve the following two genetic problems. 1x5=5M
(Eachproblem–5M)

3.Identify and write notes on the following evolution spotters A,B,C 3x5=15M
(Identification–1M,Characters–3M,Diagram-1M)

4.Record+viva 5+5=10M

5.Field report 5M

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

Bachelor of Vocation: Commercial aquaculture

II Year, Semester III

CAPTURE FISHERIES

HOURS-04 **CREDITS -04**

Unit 1: Riverine and Estuarine Fisheries

1.1. Riverine fisheries – Major river systems in India, important characteristic features of Rivers

1.2. Estuarine fisheries- definition, Ecological significance of estuary, Biota of estuary, classification and categories of estuaries- capture fisheries- resident and migrant species.

Unit 2: Reservoir and Lakesterine Fisheries

2.1. Reservoir fisheries- Major reservoirs in India- important characteristic features of reservoirs.

2.2. Lakesterine fisheries- definition, Types of lakes based on circulation, nutrients and surface temperature.

Unit 3: Coastal fisheries

3.1. Coastal fisheries – Elasmobranch fishery; Teleost fishery- Sardines, Anchovies, Mackerel, Mumbai duck, Catfishes, Eels, Ribbon fish, Perches, Mullets, Polnemids, Pomfrets, Scianids, Seer fishes, Flying fishes

Unit 4: Marine Pelagic, Demersal and Deep Sea Resources

4.1. Pelagic resources and Major demersal resource groups- elasmobranchs, cephalopods, silver bellies, flat fishes, crabs, sciaenids, pomfrets, bombay duck, prawns, lobsters, molluscan resources.

4.2. Introduction-Fisheries potential, Major Deep sea resources and scope of their exploitation**,** Present fishing pattern and deep sea fishing in India

4.3. Regulations-Conservation and regulation of fishing pressure - closed season, mesh size regulations, sanctuaries., Deep Sea Fishing Policy

Unit 5: Fisheries institutes

5.1. Different organizations and institutes involved in fisheries and aquaculture research and development – FAO, NACA, SEAFDEC, INFOFISH, MPEDA,World Fish Centre, Bay of Bengal Programme.

5.2. Institutes under ICAR, CSIR; NABARD, Ministry of Agriculture and Ministry of Commerce, Aquaculture Authority of India, NRSA, INCOIS etc.

5.3. State organizations like Matsyafed, FFDA, BFFDA, ADAK, FIRMA and State Fisheries Department.

Suggested Reading:

Core reading

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

Supplementary Reading

1. S.S. Khanna. An introduction to fishes
2. Kurian, C.V. and Sebastian, V.O. 1986. Prawns and prawn fishery of India. Hindustan Publishing Corporation (India), New Delhi.
3. Yadav, B.N. Fish and Fisheries. Daya Publishing House

Advanced Reading

1. Blake, D.J.H. 2006. *The Songkhram River wetlands – a critical floodplain ecosystem of the lower Mekong Basin*. International River Symposium 06, Brisbane, Australia. pp. 1-25.
2. Boonkumjad, S. 2004. *Analysis on fisheries cooperation between Thailand and Union of Myanma*r. Technical paper No. 6/2004. Fisheries Foreign Affairs Division, Department of Fisheries. 66 pp. [in Thai]
3. Coates, D. 2002. *Inland capture fishery statistics in Southeast Asia: current status and information needs*. Asia-Pacific Fishery Commission, Bangkok, Thailand. RAP Publication No. 2002/11. 114 pp.
4. Pawaputanon Na Mahasarakarm O. 2007. *An Introduction to the Mekong fisheries of Thailand*. Mekong Development Series No. 5. Vientiane, Lao PDR, Fisheries Programme, Mekong River Commission. 49 pp.
5. Royal Irrigation Department 2004. *Data cited in* Country review paper on inland capture fisheries information – Thailand. FAO. FI:TCP/RAS/3013, Field Document 11, 31 pp.
6. SAS Institute Services. *JMP statistics andgraphic guide version 4*. 2000. SAS Institute Inc. United State of America. 613 pp.

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

I Year, II semester 2022-2023

CAPTURE FISHERIES

MODEL PAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Biota of Estuary
2. Reservoir fisheries
3. Costal fishery
4. Pelagic resources
5. FAO & NABARD
6. Sanctuaries
7. Lakesterine fisheries
8. Capture fisheries

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Define Estuary? Explain about the Ecological significance of estuary?

OR

b) Write an essay on Major river systems in India?

10. a) Define Reservoir? Major reservoirs in India

OR

b) Write an essay on Types of lakes and based on circulation?

11. a) Write about the general characters of teleost fishes?

OR

b) Write about the general characters of Eels and Mullets?

12. a) Explain the pelagic fish resources?

OR

b) Write an essay on deep sea fishing policy?

13. a) Explain about the FAO and MPEDA?

OR

b) Write a short notes on 1. ICAR 2. INCOIS

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IDEAL COLLEGE OF ARTS AND SCIENCES

(A.P. GOVT., AIDED, AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

II Year, III semester 2022-2023

CAPTURE FISHERIES

PRACTICAL SYLLABUS

HOURS-02 CREDITS-01

I. Identification of Reservoir Fisheries
   1. *Labeo rohita, L. calbasu,*
   2. *Cirrhinus mrigala*
   3. *Catla catla*

II. Identification of Estuarine Fisheries
   1. Chanos
   2. Lates
   3. Mullets

III. Identification of Marine Fisheries
   a. Pelagic Fisheries (3 to 5 species)
   b. Demersal Fisheries (3 to 5 species)
   c. Deep sea Fisheries (3 to 5 species)

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IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.Voc., Commercial aquaculture
II Year, III semester 2022-2023
CAPTURE FISHERIES
PRACTICAL MODEL PAPER

MAX..MARKS-50

1. Identification of marine species 5x5=25M

Identification–1M,Labelleddiagram-1M
Identifyingcharacters–3M.

2 Identification of reservoir/ estuarine species 3x5=15M

Identification–1M,Labelleddiagram-1M
Identifyingcharacters–3

3. Certified Record +Viva 5+5=10M

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

Bachelor of Vocation: Commercial ASquaculture II Year, Semester III

AQUACULTURE NUTRITTION

HOURS-O4 **CREDITS-04**

Unit 1: Nutritional Requirements of Fish

1.1. Principles of fish nutrition (Proteins, Carbohydrates and lipids)
1.2. Vitamin and mineral requirements, vitamin C for fish and shell fishes.
1.3. Feeds and feed additives

Unit 2: Feed ingredients & quality

1.1. Different feed ingredients
1.2. Types of feeds, Compounded feeds, pellets, crumbles and microencapsulated feed. Storage, quality standards, proximate composition.
1.3. Digestibility studies and methods.

Unit 3: Feed & Feed Manufacturing

3.1. Feed formulation - methods, square method.
3.2. Feed manufacturing processes, Extrusion, Pelletization.

Unit 4: Feed Management

4.1. Feed schedule in finfish and shellfish, calculations and daily ration.
4.2. Artificial feed formulations of different cultural species.
4.3. Feed Check tray observations and management.

Unit 5: Feed Quality

5.1. Feed energetic, Feed Conversion Efficiency(FCE), Protein Efficiency Ratio (PER),
5.2. Feed Conversion Ratio (FCR), Net Protein Utilization NPU, leaching,
5.3. Water stability. Quality standards

Suggested reading

Core reading

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

Supplementary Reading

1. Halver J.E. Fish Nutrition
2. Hepher Nutrition of pond fishes

Advanced Reading

1) Muir,J.F. and Donald,R. Recent Advances in Aquaculture

Other Reference Books :

1. Prosser & Brown. Comparative Physiology
2. Hoar. Comparative Physiology
3. Hoar & Randall. Fish Physiology
4. Lockwood. Physiology of Crustacea
5. Watermann. Physiology of Crustacea
6. Leninger. Principles of Biochemistry
7. Harper. Physiological Chemistry
8. Bell Patterson & Smith. Textbook of Physiology & Biochemistry
9. Wilson. Textbook of animal Physiology.

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.Voc., Commercial aquaculture
I Year, II Semester 2022-2023

AQUACULTURE NUTRITTION.

MODEL PAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Ascorbic acid
2. Pellet feed
3. Extrusion
4. Artificial feeds
5. FCR
6. Feed additives
7. Types of Feeds
8. PER

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Write an essay on the Principles of fish nutrition?

OR

b) Write about the Feeds and feed additives?

10. a) Explain the different types of feed ingredients?

OR

b) Write an essay on proximate feed composition?

11. a) Write about the fish Feed formulations?

OR

b) Write about the fish Feed manufacturing processes?

12. a) Describe the feeding schedule in shrimp farming?

OR

b) Write an essay on Artificial feed formulations of different cultural species?

13. a) Explain about the Feed energetic and Protein efficiency ratio?

OR

b) Write a short notes on 1. FCE 2. Water stability of feeds

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IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

II Year, III semester 2022-2023

AQUACULTURE NUTRITION

PRACTICAL SYLLABUS

HOURS-02 CREDITS-01

I. Feed management (Proximate Analysis)

1. Estimation of Crude proteins in fish feed.
2. Estimation of carbohydrates
3. Estimation of Fats
4. Estimation of Ash content
5. Estimation fiber

II. Preparation of supplementary feeds with locally available ingredients,

III. Determination of water stability of pellet feeds.

V. Feed calculation and daily ration

VI. Check-trays in shrimp farming ponds.

VIII. Estimation of FCR.

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B.Voc., Commercial aquaculture

II Year, III semester 2022-2023

AQUACULTURE NUTRITION

PRACTICAL MODEL PAPER

MAX.MARKS-50

1. MAJOR EXPERIMENT	1X20=20M
2. MINOR EXPERIMENT S	2X10=20M
A.	
B.	
3.CERTIFIED RECORD+VIVA	5+5 = 10

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

Bachelor of Vocation: Commercial aquaculture

II Year, Semester III

FISH SEED PRODUCTION

HOURS-04 **CREDITS-04**

Unit1: Carp Hatchery and Seed production

1.1. Types of hatcheries

1.2. Cap brood management; Recruitment, pond management, management of spent broods

1.3. Induced breeding technology and Synthetic hormones.

Unit 2: Carp Seed procurement-Bundh Breeding

2.1. Carp seed resources in major rivers India.

2.2. Bundh breeding, types of bundh breeding techniques.

Unit 3: Seed Production of Crustaceans

3.1. Seed production shrimp and prawn

3.2. Operation and management of maturation section.

Unit 4: Seed Production of Molluscs

4.1.Hatchery operations of pearl oysters

4.2.Hatchery operations of Edible oysters

Unit 5: Transportation seed

5.1. Transportation of brooders (Fin fish/shrimp/prawn)

5.2. Transportation of fish seed

Suggested Reading

Core reading

1. Chodar SL Hypophysation in Indian Major Carps
2. CMFRI Spl. Bul. Hatchery Operation of Penaied Shrimps
3. Venkataraman GS The Cultivation of Algae
4. MPEDA Sea Fishes
5. CMFRI sp Bul Artificial Reefs and Sea Farming Techniques

Supplementary Reading

1. Jhingran VG Fish and Fisheries of India
2. Raymond EG Plankton and Productivity of Oceans
3. Boney AD Phytoplankton

Advanced Reading

1. Pillay, TVR and Kutty MN, Principles and Practices of Aquaculture
2. Harvey BJ and Hoar WS, Principle and Practice of Induced Fish Breeding
3. Woyanarovich E and Horrath L., The Artificial Propagation of Warm, Water Fishes-Manual for Extension.

Other Reference Books:

1. Pillay, T.V.R. & M.A. Dill. Advances in Aquaculture. Fishing News (Books) Ltd., England,
1979.
2. Stickney, R.R. Principles of Warm water Aquaculture. John Wiley & Sons Inc.,1979.
3. Hepher, B. & Y. Prugim. Commercial Fish Farming. John Wiley & Sons Inc.,1981.
4. Boyd, C.E. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing
Company, 1982.
5. Jhingran, V.G. Fish and Fisheries of India. Hindustan Publishing Corporation India, 1982
6. Turcker, C.S. (ed.). Channel Catfish Culture. Elsevier, 1985.
7. Bose, A.N. et. Al. Coastal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt.
Ltd., 1991.

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.Voc., Commercial aquaculture
I Year, II semester 2022-2023
FISH SEED PRODUCTION
MODEL PAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following:

Draw labeled diagram wherever necessary

1. Synthetic hormones
2. Fish Pituitary gland
3. Bundh breeding
4. Eye stalk ablation
5. Hatchery
6. Edible oysters
7. Open seed transport method
8. Characters of finfish brooders

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Write the types of hatcheries

OR

b) Explain Carp brood management.

10. a) Carp seed resources in major rivers India

OR

b) Write about Bundh breeding and its types

11. a) Write an essay on seed production of shirmp.

OR

b) Write an essay on Operation and management of maturation section

12. a) Describe the Hatchery operations of pearl oysters

OR

b) Describe the Hatchery operations of Edible oysters.

13. a) Write in detail manner the Transportation of brooders

OR

b) Write the notes on Transportation of fish seed

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IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

Bachelor of Vocation: Commercial aquaculture

Course structure and syllabus: 2022-2023Admitted Batch Semester

OJT (ON JOB TRANING)

Credit:01

Hours:02

CONTENT	EVALUATION	MARKS
FIELD TRIPS	3X5	15
PROJECT REPOT/ INDUSTRIAL OR INSTITUTE TRAINING& SEMINAR	15+5	20
FIELD COMPONENTS	10X1	10
VIVA VOCE	-	05
TOTAL		50

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.Voc., Commercial aquaculture
II Year, IV semester 2022-2023

S.No	Course	Teaching hours	credits	Mid Sem	semend	Total marks
	COREPAPERS					
1.	Zoology(Physiology, Cellular Metabolism & Embryology)	4	4	30	70	100
2.	LAB	2	1	-	50	50
3.	Zoology(Immunology &Animal Biotechnology)	4	4	30	70	100
4.	LAB	2	1	-	50	50
5.	Fish Genetics and aquaculture Biotechnology	4	4	30	70	100
6.	LAB	2	1	-	50	50
7	Fish Pathology and Fish Immunology	4	4	30	70	100
8	LAB	2	1	-	50	50
9	Ornamental fish culture	4	4	30	70	100
10	LAB	2	1	-	50	50
11	Larval Nutrition&culture of fish food organisms.(nopractical)	4	4	30	70	100
12	OJT	2	1	-	50	50
13	NCC/NSS/Sports/Extra Curricular	-	2	-	-	-
14	Yoga		1	-	-	-
15	Apprenticeship	-	4	-	100	100
	Total	-	1	-	-	-
		36	37			**1000**

- **Second spell between First year and Second Year Apprenticeship**

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
Bachelor of Vocation: Commercial aquaculture
ZOOLOGY II Year, Semester IV
PAPER-IV: ANIMAL PHYSIOLOGY ,CELLULAR MRTABOLISM AND EMBRYOLOGY

HOURS:04 **CREDITS :04**

UNIT I ANIMAL PHYSIOLOGY-I

1.1 Process of digestion and assimilation

1.2 Respiration-Pulmonary ventilation,transport of oxygen and Co_2

(note : Need not to study cellular respiration here)

1.3Circulation- Structure and functioning oh heart, cardiac cycle

1.4 Excretion-structre and functions of kidney urine formation,counter current mechanism

UNIT II **Animal Physiology II**

2.1 Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non myelinated nerve fibers

2.2. Muscle contractions- Ultra structure of muscle, molecular and chemical basis pf muscle contractions

2.3 Hormonal control of reproduction in a mamal

UNIT III CELLULAR METABOLISM-I (BIOMOLECULAR)

3.1 Carbohydrates –Classification of Carbohydrtes structure of glucose

3.2 proteins – classification pof protein- general properties of amina acids

3.3 Lipids – classification of lipids

3.4 Enzymes – classification and mechanism of action

UNIT IIV CELLULAR METABOLISM - II

4.1 Carbodydrates metabolism – glycosis ,krebs cycle Electron transport chain,glycogen metabolism,gluconeogensis

4.2 Lipid Metabolism - β oxidation of palmatic acid

4.3 protein metabolism – Transamination,deamination and urea cycle

UNIT V EMBRYOLOGY

5.1 Gametogenesis

5.2 Fertilization

5.3 Types of eggs

5.4 Development of Frog uptoformation of primary germ layer

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., Commercial aquaculture

Title :ANIMAL PHYSIOLOGY,CELLULAR METABOLISM AND EMBRYOLOGY

MODEL PAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Assimilation
2. Cardiac cycle
3. Ultra structure of muscle
4. Pancreas
5. Structure of glucose
6. Lipids
7. Gluconeogenesis
8. Types of eggs

PART - B

Answer any FIVE of the following: 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Explain the process of digestion.

OR

b) Describe the structure and function of heart

10. a) Give an account of nerve impulse transmission.

OR

b) Write an essay on the hormonal control of reproduction in mammals

11. a) Write an essay on the classification of carbohydrates

OR

b) Classify the enzymes. Discuss the mechanism of enzyme action

12. a) Write an account on Kreb's cycle.

OR

b) Explain B- oxidation of palmitic acid

13. a) Discuss the process of fertilization

OR

b) Write an essay on gametogenesis.

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IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
II B.Voc. Department of Fisheries and Aquaculture
Semester IV 2022-2023
B.Voc., Commercial aquaculture
Title :ANIMAL PHYSIOLOGY,CELLULAR METABOLISM AND EMBRYOLOGY
PRACTICAL SYLLABUS

HOURS-02 CREDITS-01

Practical Syllabus:

I. Animal physiology

1. Qualitative tests for identification of carbohydrates, proteins and fats
2. Study of activity of salivary amylase under optimum conditions
3. T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage
4. Differential count of human blood

II. Cellular metabolism 1. Estimation of total proteins in given solutions by Lowry's method.
2. Estimation of total carbohydrate by Anthrone method.
3. Qualitative tests for identification of ammonia, urea and uric acid
4. Protocol for Isolation of DNA in animal cells

III. 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. Construction of fate map of frog blastula

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., Commercial aquaculture

Title :ANIMAL PHYSIOLOGY,CELLULAR METABOLISM AND EMBRYOLOGY

PRACTICAL MODEL PAPER

MAX.MARKS-50

1.Identify draw a labelled diagram and write notes on A,B,C. 3x5=15M

2.Esimate the total amount in the givensample 1X15=15M

3.Identify the given samples. 1x10=10

4.CertifiedRecord+Vivavoce 5+5=10

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
Bachelor of Vocation: COMMERCIAL AQUACULTURE
II Year, Semester IV
IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

HOURS:04 **CREDITS:04**

UNIT - I Immunology - 1 (Overview of Immune system)

1.1 Introduction to basic concepts in immunology

1.2 Innate and adaptive immunity , Vaccines and Immunization programme

1,3 Cells of immune system

1.4 Organs of immune system

UNIT – II Immunology - II (Antigens , Antibodies , MHC and Hypersensitivity)

2.1 Introduction to basic concepts in Immunology
Antigens : Basic properties of antigens , B and T cell epitopes , haptens and adjuvants ; Factors influencing inumunogenicity

2.2 Antibodies : Structure of antibody , Classes and functions of antibodies

2.3 Structure and functions of major lusto compatibility complexes

2.4 Exogenous and Endogenous pathways of antigen presentation and processing

2.5 Hypersensitivity - Classification and Types

UNIT-III Techniques

3.1 Animal Cell Tissue and Organ culture media : Natural and Synthetic media

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

3.3 Stem cells : Types of stem cells and applications

3.4 Hybridoma Technology : Production & applications of Monoclonal antibodies (mAb) O

UNIT - IV Applications of Animal Biotechnology

4.1 Genetic engineering basic concepts vectors ,restriction endonucleases and recombinant DNA technology

4.2 Gene delivery:micro injection , electroporation,biolistic method (gene gun), liposome and viral mediated gene delivery

4.3 transgenic animals :strategies of gene transfer , Transgenic sheep ,fishapplications

4.4 Manipulation of reproduction in animals :Artificial insemination,invitrofertilization,super ovulation,Embryo transfer,Embryo cloning

UNIT-V

5.1 **PCR:**Basics of PCR

5.2 DNA sequencing; Sangers method of DNA sequencing – traditional and automated sequencing- traditional and automated sequencing

5.3 Hybridization techniques:Southern,Northern and western blotting

5.4 DNA finger printing: Proced and applications

5.5 Applications in industry and agriculture: Fermentation different types of fermentation and Downstream processing: Agriculture:Monoculture in fishes polyploidy in fishes

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
II B.Voc. Department of Fisheries and Aquaculture
Semester IV 2022-2023
B.Voc., COMMERCIALAQUACULTURE
Title :IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY
MODELPAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Vaccines
2. Primary lymphoid organs
3. Hapten
4. Hypersensitivity
5. Natural media
6. Cell lines
7. Endo nucleases
8. Polyploidy in fishes

PART - B

Answer any FIVE of the following: 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9. a) Define immunity. Write in detail about innate immunity.

OR

b) Explain various cells of immune system

10. a) Describe the structure of antibody. Add a note on their functions.

OR

b) Describe the structure of MHC molecules. Discuss their role in the mechanism of exogeneous and endogeneous pathway of antigen processing and presentation

11. a) Write an essay on different types of stem cells and their applications

OR

b) Explain the production and applications of monoclonal antibodies.

12. a) Write an account on recombinant DNA technology

OR

b) Write an essay on transgenic animals

13. a) Explain hybridization techniques.

OR

b) Write an essay on PCR

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IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
II B.Voc. Department of Fisheries and Aquaculture
Semester IV 2022-2023

B.Voc., COMMERCIALAQUACULTURE AND FISHERIES

Title :IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

PRACTICAL SYLLABUS

HOURS :02 **CREDITS :01**

I. Immunology

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination
4. Demonstration of

a. ELISA
b. Immune electrophoresis .

II. Animal biotechnology

1. DNA quantification using DPA Method.
2. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
3. Separation, Purification of biological compounds by paper, Thin-layer and Column chromatography
4. Cleaning and sterilization of glass and plastic wares for cell culture.
5. Preparation of culture media.

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Semester IV 2022-2023

B.Voc., COMMERCIAL AQUACULTURE

Title :IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

PRACTICAL MODEL PAPER

I.**MAJOR EXPERIMENT** 1x25=25M

(Principle-5M ,Procedure-15M,Result-5)

II. **Identify the following and write characters**? 2x2½=5M

(Identification-1M,Labelleddiagram-1/2M,Characters-2M)

III. **Write procedure for preparation of culture media? 1x10=10M**

(Procedure-10M)

IV**. Record+vivavoce** 5+5=10

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., Commercial aquaculture

Title : **FISH GENETICS AND AQUACULTURE BIOTECHNOLOGY**

Syllabus

HOURS 04 **CREDITS-04**

Unit 1: Basic Genetics and Biotechnology

1.1. Introduction- Genetics, Mendel's law of inheritance, interaction of gene.
1.2. Supplementary and complementary genes.
1.3. Introduction to Biotechnology in Aquaculture.

Unit 2: Selection and Hybridization

2.1. Introduction-Hybridization of fish-Indian studies; Objectives of fish hybridization
2.2. Interspecific hybrids, Intergeneric hybrids among Indian carps.
2.3. Hybrid vigor, Inbreeding, cross-breeding and hybridization

Unit 3: Sex determination & Chromosome manipulation in fish and shell fishes

3.1. Practical application of genetics in aquaculture. Genetics of sex determination in fish.
3.2. Gonochorism, Hermaphroditism, Protandry, Protogyni, Environmental Influence of Sex Determination.
3.3. Induction of Gynogenesis and Androgenesis, Performance of Gynogens and Androgens, Monosex Populations.

Unit 4: Aquaculture Biotechnology

4.1. Recombinant DNA technology, determinants of DNA replication, cloning, vectors, transformation. Gene manipulation in fish, transgenic fish production.
4.2. Use of PCR for the detection of white spot syndrome in shrimp.
4.3. Cryopreservation technique in Aquaculture.

Unit 5: Marine Biotechnology

5.1. Introduction-Scope and the present status of marine biotechnology;
5.2. Industries Based on Marine Biotechnology
5.3. Use of probiotics and antibiotics in aquaculture operations.

Suggested reading

Core reading

1. Karinasagar I, Karunasagar I and Reily A. Aquaculture Biotechnology
2. Varun Mehta. Fisheries and Aquaculture biotechnology
3. Pandian TD, Kumar A and Prasad K. Aquaculture and Biotechnology
4. Lopes L.- Gene transfer in aquatic organisms
5. Singleton – Elementary Genetics
6. Gjedrem T- Genetics in aquaculture
7. Gupta,S.C. and Kapoor,V.K. Fundamentals of Applied Statistics.
8. Snedecor and Cochran,W.G. Statistical Methods.

Supplementary Reading

1. Sandhya Mitra- Genteics
2. Varma and Agarwal- Genetics
3. Rath RK- Freshwater Aquaculture

Advance Reading

1. NBFGR- Training manual for DNA finger printing
2. Gupta PK- Elements of Biotechnology
3. Padhi BR – Genetics and Aquaculture

Reference Text Books :

1. Hepher, B. and Y. Pruginin. Commercial fish farming. John Wiley & Sons Inc., 1981.
2. Jhingran, V.G. Fish and Fisheries of India, 1982.
3. Bhattacharya, S. Hormones in Pisciculture. Biology Education. Vol.9, No.1, pp.31-41, 1992.
4. Subramonium, T. Endocrine regulation of reproduction and molting in crustacean and its importance in shrimp aquaculture development.
5. Summer School Manuals of CIFE. Recent Developments in Biotechnology. CIFE, 1998.
6. Genetics and Biotechnological tools in Aquaculture and Fisheries, CIFE, 1998.
7. I.C.A.R. Biotechnology in Aquaculture – Training Manual. CIKA, Bhubaneswar, 1992.
8. Darnell. Molecular Cell Biology.

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B.Voc., Commercial aquaculture

II Year, IV semester 2022-2023

FISH GENETICS AND AQUACULTURE BIOTECHNOLOGY

MODEL PAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Mendals law of inhritence
2. Complementary genes
3. Inbreeding depresion
4. Vectors
5. Probiotics
6. Cryopreservation
7. Gynogenesis
8. Hermaphroditism

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Explain about the Role of biotechnology in aquaculture

OR

b) Write briefly about supplementary and complimentary genes

10. a)Explain about Hybridization techniques in fishes

OR

b) Write about Intergeneric hybrids in imc

11. a) Describe about Gynogenesis

OR

b) Explain about Genetics of sex determination in aquaculture

12. a) Explain about Gene manipulation in fishes

OR

b) Define PCR? role of PCR in WSSV in shrimp

13. a) Present status of marine biotechnology in aquaculture

OR

b) Explain briefly about industries based on marine biotechnology

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., Commercial Aquaculture

FISH GENETICS AND AQUACULTURE BIOTECHNOLOGY

HOURS-02 **CREDITS -01**

1. Problems on Mendelian inheritance.
2. Mitotic and meiotic chromosomes preparation.
3. Demonstration of protocol of androgenesis, gynogenesis and polyploidy.
4. Cryopreservation protocols, Quality evaluation of fish milt.
5. Isolation and quantification of Fish and Prawn DNA
6. Electrophoresis
7. ELISA
8. Immunofluorescence
9. DNA Hybridisation
10. Bioprocessing of organic wastes
11. Practicals on genebank sequence database.
12. PCR

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Semester IV 2022-2023

B.Voc., Commercial Aquaculture

FISH GENETICS AND AQUACULTURE BIOTECHNOLOGY

PRACTICAL MODEL PAPER

MAX. MARKS-50

1.MAJOR EXPERIMENT **1X20=25M**

2.MINOR EXPERIMENT **1X15=15M**

3. CERTIFIED RECORD +VIVA **5+5=10M**

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II B.Voc. Department of Fisheries and Aquaculture
Semester IV 2022-2023
B.Voc., Commercial aquaculture
Title : **FISH PATHOLOGY AND FISH IMMUNOLOGY**
Syllabus

HOURS-04 **CREDITS 04**

Unit 1: Pathology and Parasitology

1.1. Introduction, Symptoms of sick/diseased fish, causes of fish diseases.
1.2. Stress as a factor in the occurrence of diseases.
1.3. Types of parasites-Ectoparasites, Endoparasites, Commensalism; Mutualism.

Unit 2: Fungal and Bacterial Diseases

2.1. Fungal diseases in fish: Saprolegniasis, Branchiomycosis and Ichthyophonosis; Fungal diseases in prawns/shrimps: Fusarium, Lagenidium and Prevention and therapy.
2.2. Bacterial diseases of fish caused by Aeromonas, pseudomonas, columnaris, Vibro sps.,Epizootic Ulcerative Syndrome Identification, epidemiology, preventive and therapeutic methods. Bacterial diseases in prawns/shrimps: caused by Vibrio sps, luminous bacterial disease, Aeromonas, pseudomonas, filamentous bacterial disease.
2.3. Viral Diseases in shrimp: Monodon Baculo Virus (MBV), White Spot Syndrome (WSSV), Yellow Head Virus (YHV), Infectious Hypodermal and Haematopoietic Necrosis Virus (IHHNV). Prevention and therapeutic methods.

Unit 3: Protozoan and Metazoan Diseases.

3.1. Protozoan diseases- Ichthyophthiriasis, Costiasis, whirling diseases, trypanosomiasis.
3.2. Metazoan Diseases- diseases caused by annelids, helminthes, crustaceans and molluscs.

Unit 4: Fish Microbiology and Nutritional diseases

4.1. Spoilage microflora of fish and shell fish
4.2. Intrinsic and extrinsic factors affecting spoilage of fish and shell fish.
4.3. Nutritional deficiency diseases in fish and shell fishes.

Unit 5: Immunology and Fish Health Management

5.1. Application and development of vaccines.
5.2. Diagnostic tools – immune detection- DNA/RNA techniques (PCR). Evaluation criteria of healthy seeds.
5.3. Best Management Practices in Aquaculture. Quarantine management.

Suggested reading

Core reading

1. R. Ramachandran Nair Encyclopedia of fish disease –
2. K.P. Biswas Prevention and control of fish and Prawn diseases –
3. B.K. Mishra, P. Swain, P.K.Sahoo, B.K.Das, N.Sarangi. Disease management in FW Pisicultue –

4 Wheaton,F.W. Aquacultural Engineering

5 Bose et al. Coastal Aquacultural Engineering

Supplementary Reading

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

Advanced Reading

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

Other Reference Text Books :

1. Cheng, T.C. The Biology of Animal Parasites. Saunders, Philadelphia, 1964.
2. Reichenbach, H.H. Fish Pathology. T.F.H. (Great Britain) Ltd., England, 1965.
3. Conroy, D.A. & R.L. Herman. Textbook of Fish Diseases. Ibid, 1968.
4. Ribelin, W.E. & G. Miguki. The Pathology of Fishes. The Univ. of Wisconsin Press Ltd., Great Russel st., London, 1975.
5. Schauperclaus. Fish Diseases. Vol. I & II.
6. Lightner, D.V. Shrimp Disease Diagnosis, 1998.
7. Sinderman. Fish Diseases, Vol. I. Shell Fish Diseases, Vol. II.

IDEAL COLLEGE OF ARTS AND SCIENCES
(AUTONOMOUS & NAAC B)
DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA
B.Voc., Commercial aquaculture
II Year, IV semester 2022-2023
FISH PATHOLOGY AND FISH IMMUNOLOGY
MODEL PAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Commensalism
2. Causative factors for diseased shrimp
3. IHHNV
4. Ichthyophonosis
5. Microflora
6. Quarantine management
7. Vaccines
8. Trypanosomiasis

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Explain briefly about different types of parasites with examples

OR

b) Explain disease caused by stress as a factor.

10. a) Brief note on Bacterial diseases and its causative organisms with preventive measures

OR

b) Brief note on Viral disease and its causative organisms with preventive measures

11. a) Protozoan disease causative organisms with preventive measures

OR

b) Metazoan disease causative organisms with preventive measures

12. a) Disease caused by deficiency of nutrients both shell and fin fishes

OR

b) What are the factors affecting the spoilage of fin and shell fishes

13. a) Explain briefly about best management practices in quarantine ponds

OR

b) Give briefly about application and development of vaccines

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IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., Commercial aquaculture

FISH PATHOLOGY AND FISH IMMUNOLOGY

Practical syllabus

HOURS-2 **CREDITS-1**

I.Collection preservation , Identification of disease - causing agents .

II . Preparation of media for culture , Familiarisation with techniques of bacterial culture and identification , fungal isolation , characterization

.

III . Preparation of the list of chemicals and drugs used to control the diseases and medicines , visit to fish and shrimp farms and Disease diagnostic centers.

.IV . Collection , preservation and identification of parasites , preparation of case studies of diseased fish and prawns .

V. Study of life - cycle stages . Estimation of dose and administration of various chemicals and drugs .

VI . Visit to fish farms . Shrimp farms and diagnosis of diseases .

VII . PCR Technique Demonstration .

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B.Voc., Commercial aquaculture

II Year, IV semester 2022-2023

FISH PATHOLOGY AND FISH IMMUNOLOGY

PRACTICAL MODEL PAPER

MAX. MARKS-50

1.MAJOR EXPERIMENT **1X20=20M**

2.MINOR EXPERIMENT **1X10=10M**

3.IDENTIFY THE FOLLOWING CHARTS/PHOTOGRAPHS

A.

B. **2X5=10M**

4.FIELD VISIT REPORT+CERTIFIED RECORD **5+5=10M**

IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS & NAAC B)

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., Commercial aquaculture

Title : **ORNAMENTAL FISH CULTURE**

Syllabus

HOURS 04 **CREDITS 4**

Unit 1: Introduction

1.1. Introduction to aquarium, ornamental fishes and Equipment and accessories- Aerators, filters and lighting.

1.2. World aquarium trade and present status. Design and construction of public fresh water and marine aquaria and oceanarium.

1.3. Water quality management in aquarium fishes, Biofilters in aquarium.

Unit 2: Aquarium Management

2.1. Setting up of aquarium – under gravel filter, pebbles, plants, drift wood, ornamental objects and selection of fishes, Quarantine measures.

2.2. Aquarium maintenance and water quality. Control of snail and algal growth.

2.3. Handling, care and transportation of fish. Temperature acclimation, oxygen packing.

2.4. Food and feeding-Source of feed, different types of food for aquarium fish, monitoring and adjusting.

Unit 3: Freshwater Ornamental Fishes

3.1. Species of ornamental fishes; their taxonomy and biology- Live bearers, Gold fish and koi, Gourami, Barbs and Tetras, angel fish, cichlids.

3.2. Setting up the tank-Choosing the tank, lighting and heating, filtration and aeration, choosing plants, preparing the tank.

3.3. Reproduction-General principles, Vitellin sack, Reproduction strategies, Egg-laying.

Unit 4: Marine Ornamental Fishes

4.1. Marine ornamental fishes – varieties and their habitat.

4.2. Setting up the tank-lighting considerations, siting and substrate, heating and filtration, preparing the tank.

4.3. Reproduction and breeding- Breeding of marine ornamental fishes (clown fishes).
4.4. Other ornamental organisms – Sponges, anemones, Crustaceans, mollusks, annelids, Echinoderms.

Unit 5: Nutrition and Disease

5.1. Nutritional requirements of aquarium fishes. Different kinds of feeds. Culture of fish food organisms; Preparation of dry feeds; feeding methods.
5.2. Use of pigments for colour enhancement. Larval feeds and feeding.
5.3. Common parasites infecting ornamental fishes. Bacterial, viral, fungal diseases of ornamental fishes and their control and prophylaxis.

Suggested reading

Core reading

1.Biswas. S.P., J.N.Das, U.K.Sarkar and Lakra W.S. 2007 Ornamental fishes of North East India An Atlas : NBFGR
2.Marine Aquarium keeping : The Sciences, Animals and Art. John Wiley & Sons, New York
3. Ramachandran.A, Breeding, Farming and Management of Fishes, CUSAT
4. Madhusoodanakurup etal – Ornamental Fish - Breeding, Farming and Trade CUSAT.
5. Jhingran,V.G. Fish and Fisheries of India.
6. Bijukumar,A. Rearing of Aquarium Fishes.
7. Rath,A.K. Freshwater Aquaculture,
8. Santhanam, et.al. a Manual of Freshwater Aquaculture.

Supplementary Reading :

1. Murthi.V.S. 2002 Marine ornamental Fishes of Lakshadweep CMFRI, Special publication 72

Advanced Reading

1. Butting.B., Holthus, P.S. Dalding,S. 2003, Marine Aquarium Industry and conservation.
2. Oliver, K 2003. World trade in ornamental species
3. Marine Ornamental species; collection,……. and Conservation
4. Fish Disease and Disorders, CAB international, Oxford.

Other Reference Books:

1. Bardach, et. Al. Aquaculture – The Farming and Husbandry of Freshwater and Marine Organisms. John Wiley & Sons, NY, 1972.
2. Stickney, R.R. Principles of Water Aquaculture. John Wiley & Sons, NY, 1979.
3. Chondar, C.L. Hypophysation of Indian major carps. Satish Book Enterprise, Agra, 1980.
4. Jhingran, V.G. Fish and fisheries of India. Hindustan Publ. Corporation (India), 1982.
5. Santhanam, R. et. Al. A Manual of Freshwater Aquaculture. Oxford & IBH Publishing Co. Pvt. Ltd., 1987.

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DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

II Year, IV semester 2022-2023

ORNAMENTAL FISH CULTURE

MODEL PAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Aerators
2. Oceanarium
3. Gravel filters
4. Types of food for aquarium
5. Live bearers
6. Clown fishes
7. Prophylaxis
8. Importance of ornamental fishes

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Water quality management in aquarium fishes.

OR

b) Design and construction of public fresh water aquaria

10. a) Set up the aquaria with quarantine measure.

OR

b) Maintenance of Aquaria with control of snail and algal growth.

11. a) Explain briefly taxonomy and biology of ornamental fishes.

OR

b) General principles of reproduction in ornamental fishes.

12. a) Breeding of marine ornamental fishes.

OR

b) Explain habit and habitat of different types of marine ornamental fishes.

13. a) Give notes on bacterial disease and causative organisms and prophylaxis.

OR

b) Importance of pigments in ornamental fishes.

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II B.Voc. Department of Fisheries and Aquaculture
Semester IV 2022-2023
B.Voc., Commercial aquaculture

Hours -2 **ORNAMENTAL FISH CULTURE** **Credits : 1**

1. Identification of common Freewater and marine aquarium fishes (10 No

2. Construction of aquarium

3. Setting up of aquarium (maintained by students can be evaluated after one month)

4. Water quality management in aquariums

5. Aquarium plants and décor materials

6. Air pump and biological filter

7. Breeding of live bearers – Guppy

8. Breeding of egg layers- gold fishes

9. Breeding of bubble nest builder- Gourami

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., Commercial aquaculture

ORNAMENTAL FISH CULTURE

PRACTICAL MODEL PAPER

MAX.MARKS- 50

1. Identification of spotters 5x4=20M

Identification–1M,Labelled diagram-1M

Identifying characters–2M.

2. Identify the given spotter/chart write a note on breeding 1x10=10M

3.Aquarium maintenance report 1x10=10

4.Certified record+viva 5+5=10M

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II B.Voc. Department of Fisheries and Aquaculture

Semester IV 2022-2023

B.Voc., Commercial aquaculture

Title : **LARVAL NUTRITION AND CULTURE OF FISH FOOD ORGANISMS**

Syllabus

HOURS -04 **Credit- 04**

Unit 1: Live Feeds

1.1. Different live feeds and their nutritional value. Manipulation of pond for natural feed production.

1.2. Candidate species of phytoplankton and zooplankton for fish and shell fish culture – diatoms, micro algae, nano planktons, Artemia, copepods, cladocera and rotifers.

Unit 2: Culture of Phytoplankton

2.1 Methods of collection and preservation; maintenance of pure culture of Phytoplankton.

2.2 Mass culture. Culture of important microalgae, Chaetoceros, Tetraselmis, Skeletonema, Spirulina and Chlorella.

Unit 3: Culture of Zooplankton

1.1. Methods of collection and preservation; maintenance and rearing of Rotifers, Cladocerans, Copepods, and insect larvae. Mass culture of zooplankton.

1.2. Harvest, storage and feeding.

Unit 4: Artemia culture

4.1 Different strains of Artemia. Artemia culture. Cyst production. Enrichment of Artemia cyst and larvae.

4.2 Decapsulation of Artemia cysts. Hatching, storage and feeding.

Unit 5: Alternative live feeds and Periphyton culture

5.1. Culture methods of Infusoria, Chironomids, polychaetes.

5.2. Nutritional qualities of alternative live feeds.

5.3. Applications Importance of periphyton in aquaculture.

Reference Books:

1. Fundamentals of mathematical statistics – Gupta and Kapoor.
2. Fundamentals of Statistics – S.P. Gupta
3. Elementary Statistics – Yule and Kendall
4. Introduction to Biostatistics – Sokal & Rohlf
5. Fundamentals of Biostatistics – By Khan and Khanum

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DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

B.Voc., Commercial aquaculture

II Year, IV semester 2022-2023

LARVAL NUTRITION AND CULTURE OF FISH FOOD ORGANISMS

MODEL PAPER

Time: 3 Hour Max.Marks: 70

PART - A

Answer any **FOUR** of the following: 4 x 5 = 20 Marks

Draw labeled diagram wherever necessary

1. Artemia salina
2. Phytoplankton
3. Rotifers
4. Mysis larva
5. Periphyton
6. Feed additives
7. Micro Algae
8. Polychaete culture

PART - B

Answer all Questions 5 x 10 = 50 Marks

Draw labeled diagram wherever necessary

9.a) Write an essay on Different live feeds and their nutritional value

OR

b) Write about the important species of plankton in fish culture?

10. a) Explain the Methods of collection and preservation of phytoplankton?

OR

b) Write an essay on Culture of important microalgae?

11. a) Write about the Methods of collection and preservation of zooplankton?

OR

b) Write about the Mass culture of zooplankton?

12. a) Describe the culture of Artemia?

OR

b) Write an essay on Decapsulation of Artemia cysts?

13. a) Explain about the Applications Importance of periphyton in aquaculture?

OR

b) Describe the Nutritional qualities of alternative live feeds.

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IDEAL COLLEGE OF ARTS AND SCIENCES

(AUTONOMOUS , NAAC B)

DR. P.V.N. RAJU VIDYAPRANGANAM, KAKINADA

Bachelor of Vocation: Commercial aquaculture

Course structure and syllabi: 2022-2023Admitted Batch

Semester IV

OJT (ON JOB TRAINING)

HOURS-2 **CREDITS-1**

CONTENT	EVALUATION	MARKS
FIELD TRIPS	3X5	15
PROJECT REPOT/ INDUSTRIAL OR INSTITUTE TRAINING& SEMINAR	15+5	20
FIELD COMPONENTS	10X1	10
VIVA VOCE	-	05
TOTAL		50

IDEAL COLLEGE OF ARTS AND SCIENCES(A)
Bachelor of Vocational: Commercial aquaculture
Course structure and syllabi: w.e from 2022-2023 Admitted Batch
B.Voc. Commercial aquaculture

Semester V, from 2022-23
(Syllabus-Curriculum)

III Year; Semester V								
Sem	Course no	Course name	Course type (T/L/P)	Hrs/Week (Sciences 4+2)	Credits (Science 4+1)	Each course Evaluation		
						MID	SEM	Total
V	1	Zoology (live stock management I) *	T	4	4	30	70	100
	2	Zoology (practical) *	L	2	1	0	50	50
	3	Zoology (live stock management II) *	T	4	4	30	70	100
	4	Zoology (practical) *	L	2	1	0	50	50
	5	Fishery By-Products	T	4	4	30	70	100
	6	Fishery By-Products Practical	L	2	1	0	50	50
	7	Fish Processing Technology and Quality Control	T	4	4	30	70	100
	8	Fish Processing Technology and Quality Control Practical	L	2	1	0	50	50
	9	Aquaculture Engineering	T	4	4	30	70	100
	10	Aquaculture Engineering Practical	L	2	1	0	50	50
	11	Aquatic Pollution (No Practical)	T	4	4	30	70	100
	12	On Job Training	L	2	1	0	50	50
		Total		**36**	**30**			**900**

IDEAL COLLEGE OF ARTS & SCIENCES

(Autonomous, NAAC Accredited B)
Dr. PVN RAJU VIDYAPRANGANAM ,KAKINADA
B.VOCATION –COMMERCIAL AQUACULTURE–Semester –V

Max. Marks 100

Course6 B: LIVE STOCK MANAGEMENT-I (BIOLOGY OF DAIRY ANIMALS)

HOURS -04 (Skill Enhancement Course (Elective) CREDITS-04

Unit 1: Livestock census; Breeds of Dairy cattle, Buffaloes and Goats. Indigenous,Exotic and Crossbred Cattle breeds

Unit 2: Anatomy of Udder; Development of udder; Lacto genesis and Galactopoises; Letdown of milk.

Unit 3: Artificial insemination; Oestrous cycle; Symptoms of heat in cows and buffaloes. Conception, Pregnancy diagnosis in cattle. Multi ovulation and embryo transfer technique. Cloning.

Unit4: Economic traits of Dairy cattle. Methods of selection of dairy animals

.

Unit5: Systems of Dairy cattle breeding. Inbreeding, out breeding, Cross breeding, Grading up. Breeding systems (Cross breeding of cattle and Grading up of buffaloes).

III. References:

1. Textbook of Animal Husbandry-GC Benarjee
2. Handbook of Animal Husbandry –ICAR Edition
3. Principles and practices of Dairy Farm–Jagdish Prasad
Web resources: 1. http://ecoursesonline.iasri.res.in/course/index.php?categoryid=42 2. https://vetsebooks.blogspot.com/p/e-books.html 3. https://www.basu.org.in/study-materials/veterinary-science/ 4. https://vikaspedia.in/agriculture/livestock/cattle-buffalo/breeds-of-cattle-buffalo

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Dr. PVN RAJU VIDYAPRANGANAM

,KAKINADA

ZOOLOGY BLUE PRINT FOR V SEMESTER

B.VOCATION –COMMERCIAL AQUACULTURE 2022-2023

PAPER 6B : LIVE STOCK MANAGEMENT – I

(BIOLOGY OF DAIRY ANIMALS)

MODEL PAPER

Time : 3 Hrs Max. Marks.: 70

Answer any FIVE of the following.

Draw labelled diagrams wherever necessary 4 X 5 = 20

1. Let down of Milk
2. Artificial in Semination
3. Cloning
4. Cross breeding
5. Traits of dairy cattle
6. Live Stocks census
7. Indigenous
8. Lacto genesis

II. Answer any FIVE of the following

Draw labelled diagrams wherever necessary 5 X 10 = 50M

9. (a)Write about breeds of dairy cattle.

(OR)

(b) Explain about exotic cattle breeds.

10.(a) Define about anatomy of udder .

(OR)

(b) Write about Galactopoises.s

11. .(a) Describe about oestrous cycle .

(OR)

(b) Explain about pregnancy diagnosis in cattle.

12.(a) Define in detailed about economic traits of dairy cattle.

(OR)

(b) Give in detailed about election of dairy animals

13 (a) Explain about Inbreeding and outbreeding

(OR)

(b) Write about grading up of buffallows.

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V SEMESTER

B.VOCATION –COMMERCIAL AQUACULTURE 2022-2023
Course 6 B: LIVE STOCK MANAGEMENT-IPRACTICAL SYLLABUS
HOURS-02 (BIOLOGY OF DAIRY ANIMALS) CREDITS-01

II. Practical(Laboratory) (Max.50Marks)

1. Points dairy cow. (Explanation with observation of charts- Model evaluation to be performed by the student in the laboratory)

2. Identification of different breeds of dairy cattle and buffaloes.(Observation of Charts of breeds in the laboratory- at least 3 breeds should be identified by the students in their locality with video, photo)

3. Male and female reproductive systems of cow – Model/ Chart (Student has to draw a labeled diagram of the male and female reproductive systems of cow – acquire skill to identify the parts).

4. Symptoms of heat in cow (Study and Understanding the physiological symptoms during heat). 5. Artificial in semi nation (Flow chart of implements – Procedure- precautions)
6. Pregnancy diagnosis in cattle. 7. Study comparative merits of cows and buffaloes; zebu and cross bred cows (Examination of merits

III. Lab References: 1. Principles and practices of Dairy Farm–Jadish Prasad

2. Dairy cow points: https://www.icar.org/Guidelines/05-Conformation-Recording.pdf
3. Pregnancy test protocol: https://cgspace.cgiar.org/bitstream/handle/10568/109408/Milk%20testing%20lab%20protoc o l.pdf?sequence=1&isAllowed=y
Web resources suggested by the teacher concerned and the college librarian including reading material IV.

Co-Curricular Activities

A Mandatory:(Lab/ field training of students by teacher :(lab:10 + filed: 05):

1. For Teacher: Training of students by the teacher in laboratory/field fornotlessthan15hoursonprinciples and practices of dairy industry- breeds – artificial insemination- reproductive behavior of cows etc. as per the syllabus above.
2. For Student: Students shall individually visit to any of the nearby cattle rearing centers/ veterinary hospital/Raithu Bharosa Kendra and make observations of the procedure and quality enhancement activities and submit a handwritten Fieldwork/Project work Report in 10 pages.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: Title page, student details, index page, details of place visited, observations made, findings and acknowledgements
5. (IE)Unit tests,

b) Suggested Co-Curricular Activities

1. Collection of various cattle breed images from the web to prepare a album
2. Visit the sites of Veterinary colleges in India and preparation of brief report on the videos and content/ employment details
3. Sketch a model dairy farm with details
4. Invited lecture and presentation on related topics by experts
5. Seminar, Assignment, Group discussion. Quiz, Collection of Material, Invited lecture, Video preparation etc

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Course 6 B: LIVE STOCK MANAGEMENT-PRACTICAL SYLLABUS

(BIOLOGY OF DAIRY ANIMALS)

V SEMESTER

B.VOCATION –COMMERCIAL AQUACULTURE 2022-2023

PRACTICAL MODEL PAPER

MAXMARKS -50

1.Draw a labeled diagram of the ----------reproductive system of cow 1X15=15M

2.Identify the following photographs/charts 2X5=10M
Identification-1M,characters -4M

3. Write procedure for diagnosis of pregnancy in cattle .Write result 1X10=10M

4.Field report 5M

5. Certified record+viva 5+5=10M

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Subject: ZOOLOGY

Semester –V

B.VOCATION –COMMERCIAL AQUACULTURE 2022-2023

Course : LIVE STOCK MANAGEMENT -II

(DAIRY PRODUCTION AND MANAGEMENT)

(Skill Enhancement Course (Elective)

HOURS:04 CREDITS :04

Unit 1

Systems of Housing of Dairy cattle- Loose Housing and Conventional Dairy Barns. Drawing of layouts for dairy cattle dwellings; Criteria for selecting site for establishing Dairy farm buildings; Water requirement of dairy animals.

Unit 2

Management of different classes of Dairy animals- Milk producing animals, pregnant animals dry animals, heifers and calves.
Management practices for Dairy farm; Identification,
Dehorning, Castration, Deworming, Vaccination, Disinfection, and Milking.

Unit 3

(a) Pasteurization of milk: Definition, objects of pasteurization, objections to pasteurization, Principles of heat exchange.
Methods of pasteurization: LTLT, HTST and
Uperization.
(b)Sterilization of milk. Homogenization: Factors influencing homogenization

Unit 4

Market milk: Toned milk, double toned milk, Reconstituted milk, Standardized milk and full cream milk–Standards and methods of manufacture.

Unit 5

Cream: Types of cream, composition, methods of cream separation, gravity and centrifugal methods, types of cream separators, factors affecting fat losses in skim milk and fat percentage in cream.

III. References:

1. Textbook of Animal Husbandry-G C Benarjee
2. Handbook of Animal Husbandry –ICAR Edition
3. Principles and practices of Dairy Farm–Jagdish Prasad
4. http://ecoursesonline.iasri.res.in/course/index.php?categoryid=42
5. https://vetsebooks.blogspot.com/p/e-books.html
6. https://www.basu.org.in/study-materials/veterinary-science/
7. https://vikaspedia.in/agriculture/livestock/cattle-buffalo/breeds-of-cattle-buffal

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MODEL PAPER

III B.VOCATION: COMMERCIAL AQUACULTURE SEMESTER – V, PAPER – 7B
LIVE STOCK MANAGEMENT – II
(DAIRY PRODUCTION AND MANAGEMENT)

Time : 3 Hrs Max. Marks.: 70

7

I. Answer any FIVE of the following. Draw labelled diagrams wherever necessary 4 X 5 = 20

1. Composition
2. Affecting fat losses in Skim Milk
3. LTLT and HTST
4. Double toned Milk
5. Standardised Milk
6. Uperi zation
7. Dehorning
8. Deworming

II. Answer any FIVE of the following. Draw labelled diagrams wherever necessary 5 X 10 = 50M

9. Write about systems of housing of dairy cattle

OR

Explain about water requirement of dairy animals

10. Define about different classes of dairy animals

OR

Write about Management practices for dairy farm.

11. Explain about Pasteurization of Milk.

OR

Write about sterilization of Milk.

12. Define about standards methods of cream Milk.

OR

Explain about Reconstituted Milk.

13. Write about types of Cream.

OR

Explain about gravity and centrifugal methods

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MODEL PAPER

III B.VOCATION: COMMERCIAL AQUACULTURE SEMESTER – V, PAPER – 7B
LIVE STOCK MANAGEMENT – II
(DAIRY PRODUCTION AND MANAGEMENT

(Max.50Marks)

HOURS-2 **CREDITS-01**

II. Practical (Laboratory) Syllabus

1. Dairy Farm layout (In the laboratory student has to sketch a dairy farm with all its components)
2. Identification of cows (students have to identify the breeds of cows form the images/charts – have to identify any two breeds in the vicinity of the college/ their locality).
3. Dehorning of calves : (Method - protocol- precautions)
4. Castration of bulls (Method – Apparatus- Time-importance)
5. Deworming of dairy cattle : (Schedule – method- benefits)
6. Pasteurization of milk (Batch Method- procedure- Observation)
7. Sterilization of milk (In bottle sterilization- procedure – protocol)
8. Cream separation (By gravity method- procedure- hands on experiment)

III. Lab References

1. Handbook of Animal Husbandry –ICAR Edition
2. Dairy farm layout : https://www.youtube.com/watch?v=dmukHUEUvKc
3. Dehorning procedure : http://www.omafra.gov.on.ca/english/livestock/dairy/facts/09-003.htm
4. Castration of bulls: https://vikaspedia.in/agriculture/livestock/general-management-practicesof-livestock/castration-of-ruminants
5. Deworming: https://kvk.icar.gov.in/API/Content/PPupload/k0347_10.pdf
6. Pasteurization of milk : http://www.jnkvv.org/PDF/08042020170652part%203.pdf
7. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1690
8. Cream separation: http://ecoursesonline.iasri.res.in/mod/page/view.php?id=147910

Web resources suggested by the teacher concerned and the college librarian including reading material

COCurricular Activities

a) Mandatory: (Lab/field training of students by teacher; lab 10+ field :05)
1. For Teacher: Training of students by the teacher in laboratory and filed fornotlessthan15 hours on skills of dairy management – housing-management of dairy animals of various stages- procedure of preparation of marketable milk with procedures like sterilization, pasteurization and other techniques)
2. For Student: Student shall (individually) visita nearby dairy farm- house hold cattle rearing – make observations on aspects like housing – management – feed- milk- revenue- breed selection- qualities of breed –etc. A handwritten Fieldwork/Project work Report to be submitted inn the given format.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.
5. (IE)Unit tests.
b) Suggested Co-Curricular Activities
1. Sketch model dairy house with details
2. Web resources on Protocols in the management of stages of cattle
3. Properties of varieties of milk from the market observation
4. Assignment, Seminar, Invited lecture, Group discussion. Quiz, Collection of Material, Video preparation etc.

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B.VOC:COMMERCIAL AQUACULTURE
Course 7 B: LIVE STOCK MANAGEMENT -II – PRACTICAL SYLLABUS
(DAIRY PRODUCTION AND MANAGEMENT)

MAXMARKS-50

1. Write procedure for pasteurization of milk 1X 10=10M

2.Identify the following photographs/charts 3X5=15M
Identification-1M,characters -4M

3. Write procedure for dehorning in cattle 1X10=10M

4.Field report 5M

5. Certified record+viva 5+5=10M

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B.VOC: COMMERCIAL AQUACULTURE
III YEAR; SEMESTER V; 2022-2023

FISHERY BY-PRODUCTS

Max Marks : 100

HOURS-04 **CREDITS-04**

Unit 1: Value Addition in Sea Foods

1.1 Value addition in sea food. Different types of value added products from fish and shell fish – status of value addition in Indian seafood sector.

1.2 Advantages of value addition. Significance of value addition in the seafood industry.

Unit 2: Fish Mince Based Products

2.1. Fish mince and Surimi. Production of fish mince – merits and demerits.

2.2. Analog and fabricated products. Quality assessment of surimi,.. Equipment, raw material for surimi,

2.3. Role of cryoprotectants in surimi production

Unit 3: Coated Fishery Products and Other Value Added Products

3.1 Preparation of coated fishery products – Different types of batter and breading and its applications.

3.2. Packaging and storing of coated products – Quality evaluation.

3.3. 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.

Unit 4: Fishery By-Products

4.1Fish meal, fish protein concentrate, shark fin rays, fish maws, isinglass, fish liver oil, fish body oil, fish hydrolysates.

4.2. Chitin, chitosan, glucosamine hydrochloride, squalene, pearl essence, ambergris, gelatin, beche-de-mer, fish silage, fish ensilage and seaweed products like agar, alginic acid and carragenan.

Unit 5: Spoilage and quality

5.1 Spoilage in thermal processed products – Quality evaluation of thermal processed products.

5.2. Curing and drying of fish – Spoilage in dry fish products.

References

1. Ninawe, AS. andRatnaKumar, K. (2008). Fish Processing Technology and Product Development. Narendra Publishing House, Delhi
2. Venugopal V. (2006). Seafood Processing. 1st edition Boca Raton CRC Press.
3. Shahidi, F. and Botta, JR.(1994). Seafoods chemistry, Processing Technology and Quality.

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III YEAR; SEMESTER V; 2022-2023

PRACTICAL: FISHERY BY PRODUCTS

HOURS -02 **CREDITS-01**

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

Collection:

1. Collection of fishery by-products

References:

4. Gopakumar K. (2002). Text Book of Fish Processing Technology. ICAR.
5. Govindhan, TK. (1985). Fish processing Technology. Oxford & IBH Publ. Co., New Delhi.
6. Hall, GM. (1992). Fish Processing Technology. Blackie. Springer science and business.
7. Balachandran KK. (2001). Post-harvest Technology of Fish and Fish Products. Daya Publ.
8. Clucas,IJ.(1981). Fish Handling, Preservation and Processing in the Tropics. Parts I,II. FAO
9. Sen, D.P. (2005). Advantages in Fish Processing Technology. Allied publ. Pvt.Ltd. Mumbai
10. Wheaton, FW. and Lawson, TB. (1985). Processing Aquatic Food Products, A Wiely-Inter Science Publication. USA.
11. Surendran, PK., Nirmala,T, Narayanan, NV. andLalitha, KV. (2003). Laboratory Manual on Microbiological Examination of Sea food, CIFT, Cochin.
12. Velayutham, P. and Indira Jasmine, G. (1996). Manual on Fishery By-Products, Tamilnadu

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III YEAR; SEMESTER V; 2022-2023
PRACTICAL: FISHERY BY PRODUCTS
PRACTICAL MODEL PAPER
MAX.MARKS-50

1. MAJOR EXPERIMENT	1X25=25M
2. MINOR EXPERIMENT	1X15=15 M
3.CERTIFIED RECORD+VIVA	5+5=10M

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III YEAR; SEMESTER V; 2022-2023
PAPER TITLE: FISHERY BY-PRODUCTS
MODEL PAPER

Time: 3 Hours **SECTION-A** Maximum: 70 Marks

IAnswer any FOUR of the following. Draw diagrams wherever necessary **4x5=20 M**

Draw labeled diagram wherever necessary

1. Surimi
2. Cryoprotectants
3. Advantages of value added products
4. Hydrolysate
5. Types of batter and breading
6. Chitosan
7. Carrageen
8. Curing

SECTION-B

I. Answer any FIVE of the following. Draw diagrams wherever necessary. **5x10=50 M**

9. a) Explain briefly production of fish mince with merits and demerits
   OR
   b) Briefly explain quality assessment of surimi

10. a) Explain present status of value addition products in sea foods
    OR
    b) What is value addition? Explain different types value added products in fishes

11. a) What is coated products ? and preparation of coated fishery products
    OR
    b) Explain briefly about quality evaluation in packaging and storage of coated products

12. a) Fish meal
    b) Fish maws
    c) Isinglass
    d) Beche-de-mer
    e) Fish ensilage
    OR
    b) Give an account on importance of chitosan and its preparation

13. a) Explain quality assessment in thermal processed products
    OR
    b) What is curing? Explain role of curing and drying of fish and its products

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III YEAR; SEMESTER V; 2022-2023
Semester – V/ Practical
Fishery By Products

HOURS:02 **CREDITS:01**

1. Major Experiment? 12 M
2. Minor Experiment? 8 M
3. Identification, salient features and ecological importance of the following.
   (Spotters /Specimens/ Charts/ Pictures etc choose if anyone from syllabus) 4x5= 20 M
   a.
   b.
   c.
   d.
4. Record + Viva-voce 6+4 = 10 M

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III YEAR; SEMESTER V; 2022-2023

Fish Processing Technology and Quality Control

Max Marks: 100

HOURS:04 **CREDITS- 04**

Unit 1: Introduction of Fish Processing and Freezing

1.1. Introduction of fish processing global supply and demand. Principles of fish preservation- Precautions taken in handling fish in the fishing vessel, landing center and processing plant.

1.2. Fundamental principles involved in chilling and freezing of fish and fishery products. Various freezing construction and methods used in shrimps and fishes.

1.3. Preservation by refrigerated seawater and chilled sea water.

Unit 2: Preservation techniques of Finfish/Shell Fish processing

2.1. Principles of preservative methods - Drying, Salting, Smoking and Canning.

2.2. Principles of freeze drying. Accelerated freeze drying and packing of freeze dried products.

2.3. Modern methods of preservation by irradiation and modified atmospheric storage.

Unit 3: Packing and labeling, storage and Export of Fishery Products

3.1. Packing requirements and regulations. Labeling of fish and fishery products.

3.2. Different types of cold storages. Requirements in retail outlet; Insulated and refrigerated vehicles.

3.3. Export of fishery products from India – major countries, important products, export documents and procedures.

Unit 4: Quality Assurance

4.1 Quality Assurance – Concepts of Hazard Analysis Critical Control Point (HACCP),

4.2 Good Manufacturing Practice (GMP), Sanitary Standard Operating Procedure (SSOP).

4.3 Determining the quality assurance of sea food.

Unit 5: Quality Control

5.1. Quality control – Basic concepts and quality control of fish processing.

5.2. Salient features of sea food quality and factors.

5.3. Standards of Sea food.

References

1. Fish Processing Technology – T.K.Govindan

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B.VOC: COMMERCIAL AQUACULTURE
III YEAR; SEMESTER V; 2022-2023

PRACTICAL: Fish Processing Technology and Quality Control

HOURS-02 **CREDITS-01**

Experiments:

1. Lay – out of processing plant
2. Determination of quality assurance of sea food
3. General description – freezing
4. Canning – Flow chart
5. Smoking – Flow chart
6. Drying – Flow chart
7. Preparation of surimi – Flow chart
8. Collection of Air-bladder
9. Preparation of fishery by products
10. Fish pickling
11. Value added fishery products, fish curry, cutlets, fish finger.

References

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

Supplementary Reading

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

Advanced Reading

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

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III YEAR; SEMESTER V; 2022-2023
PAPER TITLE: FISH PROCESSING TECHNOLOGY AND QUALITY CONTROL
MODEL PAPER

Time: 3 Hours Maximum: 70 Marks

SECTION-A

I. Answer any FOUR of the following. Draw diagrams wherever necessary. **4x5=20 M**

Draw labeled diagram wherever necessary

1. Landing centers
2. RSW
3. Blast freezers
4. Canning
5. MAP
6. Packing materials
7. HACCP and GMP
8. Butterfly cut

SECTION-B

II. Answer any FIVE of the following. Draw diagrams wherever necessary. **5x10=50 M**

9. a) What is processing ? Principals involved in processing technology.

OR

b) What are the types refrigerated waters ? Explain briefly about CSW.

10. a) Explain different types preservative methods.

OR

b) Explain modern methods of preservation?

11. a) Explain material required for packing and its labeling.

OR

b) Explain the purpose of cold storage? And its requirements

12. a) Determine the quality assurance of sea foods.

OR

b) Explain briefly about methods and steps of quality of assurance.

13. a) Explain basics concepts and quality control of fish processing.

OR

b) Explain salient features of sea food quality and its factors?

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III YEAR; SEMESTER V; 2022-2023
Semester – V/ Practical MODEL PAPER
Fish processing technology and quality control

Max. Time : 3 Hours Max. Marks : 50

1. Major Experiment? 12 M
2. Minor Experiment? 8 M
3. Identification, salient features and ecological importance of the following.
   (Spotters /Specimens/ Charts/ Pictures etc choose if anyone from syllabus) 4x5= 20 M
   a.
   b.
   c.
   d.
4. Record + Viva-voce 6+4 = 10 M

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III YEAR; SEMESTER V; 2022-2023
AQUACULTURE ENGINEERING

HOURS: 4 **CREDITS: 4**

Unit 1: Introduction

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

Unit 2: Planning Aquaculture facilities

2.1. Introduction - Planning process, site selection, production plan, room programme and necessary analysis.
2.2. Drawing up alternative solutions, evaluation of and choosing alternative solutions, Finishing plans, detailed planning, Function test of the plant.
2.3. Design and Construction of Aquaculture Facilities – Introduction, Land-based hatchery, juvenile and on-growing production plant.

Unit 3: Water Transport, Water quality and water treatment

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

Unit 4: Aeration and oxygenation

4.1. Design and construction of aerators – Basic principles; Evaluation criteria; Example of designs for different types of aerator; Oxygenation of water.
4.2. Instruments– Construction of measuring instruments, Measuring water quality; measuring physical conditions; counting fish; measuring fish size and total fish biomass.

Unit 5: Recirculation Aquaculture System

5.1. Recirculation Aquaculture systems – Advantages and disadvantages of RAS,
5.2. Definitions – Degree of Recirculation; water exchange in relation to amount of fish.
5.3. Degree of purification. Components in a RAS; Design of a RAS.

References

1. R. Ramachandran Nair Encyclopedia of fish disease –

2. K.P. Biswas Prevention and control of fish and Prawn diseases –

3. B.K. Mishra, P. Swain, P.K.Sahoo, B.K.Das, N.Sarangi. Diseases

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III YEAR; SEMESTER V; 2022-2023
PRACTICAL:AQUACULTURE ENGINEERING

HOURS: 02 **CREDITS: 1**

Syllabus

i) Lay-out of fish farm
ii) Lay-out of hatchery
a. Dike deign
b. Design of monk
c. Design of Bundh
d. Design of Sluice gate
e. Various types of surface aerator
a. Automatic feed distribution
b. Major components in a land-based hatchery and juvenile production plant
c. Different ways to prepare a connection analysis.
d. The inlet grating can (A) be made self-cleaning, or (B) placed within the pumping station so that it is close to the surface and easily available for cleaning.
e. Design of Recalculating Aquaculture System (RAS)
1. A centralized RAS serving several fish tanks.
2. Two designs of tank internal RAS serving only one tank

References

1. R. Ramachandran Nair Encyclopedia of fish disease –

2. K.P. Biswas Prevention and control of fish and Prawn diseases –

3. B.K. Mishra, P. Swain, P.K.Sahoo, B.K.Das, N.Sarangi. Disease

management in FW Pisicultue –

4 Wheaton,F.W. Aquacultural Engineering

5 Bose et al. Coastal Aquacultural Engineering

Supplementary Reading

1. Sinderman C.J. Principle diseases of Marine fish and shell fish

2. Schaperclaus Fish Diseass.

Advanced Reading

1. Roberts R.J.Fish Pathology..

IDEAL COLLEGE OF ARTS AND SCIENCES(A)
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Dr. PVN RAJU VIDYAPRANGANAM
KAKINADA
B.VOC: COMMERCIAL AQUACULTURE
III YEAR; SEMESTER V; 2022-2023
PAPER TITLE: AQUACULTURE ENGINEERING
MODEL PAPER

Time: 3 Hours Maximum: 70 Marks

SECTION-A

I. Answer any FOUR of the following. Draw diagrams wherever necessary. **4x5=20 M**

Draw labeled diagram wherever necessary

1. Land based hatchery
2. On-growing production plant
3. Types of pumps
4. Types of aerator
5. RAS
6. Aquaculture facilities
7. Construction of aerators
8. Components in a RAS

SECTION-B

II. Answer any FIVE of the following. Draw diagrams wherever necessary. **5x10=50 M**

9. a) Describe the Future trends and increased importance of aquaculture engineering.

OR

b) Explain Technical components in a system.

10. a) Write about Design and Construction of Aquaculture Facilities?

OR

b) Describe the Drawing up alternative solutions in Aquaculture planning.

11.a) Write about Water Transport facilities Aquaculture Engineering?

OR

b) Explain the Water quality and water treatment procedures?

12. a) Explain the basic principles and evaluation criteria for aerators.

OR

b) Describe the Measuring water quality and counting fish.

13. a) Explain the Advantages and disadvantages of RAS?

OR

b) Write an essay on Design of Recirculation Aquaculture system

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III YEAR; SEMESTER V; 2022-2023
Semester – V/ Practical
Aquaculture Engineering

HOURS:02 **CREDITS:01**

1. Major Experiment? 12 M
2. Minor Experiment? 8 M
3. Identification, salient features and ecological importance of the following.
   (Spotters /Specimens/ Charts/ Pictures etc choose if anyone from syllabus) 4x5= 20 M
   a.
   b.
   c.
   d.
4. Record + Viva-voce 6+4 = 10 M

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III YEAR; SEMESTER V; 2022-2023
Max Marks: Theory: 100 + Practical: 50
AQUATIC POLLUTION

HOURS: 4 **CREDITS:4**

Syllabus
Unit:1

1.1.Water and its pollution: Water resources of the Earth; Classification of natural waters; Hydrologic cycle;

1.2. Definition of pollution; Point and non-point source of pollution, Fundamental concepts; Categories of additions / inputs: degradable wastes, disease causing wastes, particulate wastes, conservative wastes; dissipating wastes
.
1.3. Water quality: Quality of water for drinking: bacteriological quality, physical characteristics, chemical characteristics. Quality of water for industrial use; Quality of water for recreation.

Unit:2
2.1.Adverse effects of water pollutant: Oxygen-demanding wastes: Importance of dissolved oxygen; Oxygen demand; Biochemical Oxygen Demand (BOD); Chemical Oxygen Demand (COD);Oxygen budget; Biological effects of organic matter.

2.2. Excessive plant nutrients: Eutrophication; Red tides and fish kills; Sources of excessnutrients; Hypertrophic ecosystems and their characteristics; Cultural eutrophication.

2.3. Agents of biological dysfunction: Pesticide types and categories; Organo-chlorinecompounds; Organophosphorous compounds; polychlorinated biphenyls (PCBs);Bioaccumulation and impact on aquatic fauna and human health; Toxicology.

Unit:3
3.1. Adverse effects of water pollutant: Oil Pollution: Crude oil and its fractions; Source of oil pollution; Treatment of oil spill at sea; Beach cleaning; Toxicity of petroleum hydrocarbons; Ecological impact of oil pollution-case studies.

3.2.Sewage and domestic wastes: Composition, pollution effects, treatment and reuse; Heavy metals: Interaction of heavy metals with water and aquatic organisms, their ill effects

. 3.3. Radioactive wastes: Radioactivity and background radiation of the Earth; Radionuclidepolluting; Special effects of pollution. Thermal pollution: Thermal pollution and its effects;Physical and chemical nature of possible effluents from major industries.

Unit:4

4.1. Microbial pollution: Types of aquatic microbes; Autotrophs and Heterotrophs; Saprotrophs and Necrotrophs; Sewage fungus complex; Transmission of human pathogenic organisms;Zoonosis

4.2. Development of antibiotic resistance and its impact.

4.3. Ground water pollution: Underground source of drinking water; Contamination of ground water and its impact.

Unit:5

5.1. Monitoring and Control of pollution: Biological indicators of pollution in Natural Waters.

5.2. Solid waste management; Bioremediation; Phytoremediation

5.3.Advanced waste treatment measures and Pollution control boards.

References:

1. Shang YC. (1990). Aquaculture Economic Analysis–An Introduction. World Aquaculture Society, USA.
2. Singh, R.K.P. (2003). Economics of Aquaculture. Daya Publishing House, Delhi.
3. Jayaraman, R. (1996). Fisheries Economics. Tamilnadu Veterinary and Animal Science University, Tuticorin.
4. Allen, et al.(Eds). (1984). Bio-Economics of Aquaculture. Elsevier Publ.
5. Chaston I. (1987). Business Management in Fisheries and Aquaculture.Fishing News Books
6. Tripathi SD (1992). Aquaculture Economics. Asian Fisheries Society, Mangalore
7. Subba Rao N (1986). Economics of Fisheries. Daya publishing house, Delhi
8. Ian C. (1984). Marketing in Fisheries and Aquaculture. Fishing News Books.
9. Korakandy, R (1996). Economics of Fisheries Management.DayaPublishing House, Delhi
10. Dewett, K.K. and Varma, J.D. (1993). Elementary Economic Theory. S.Chand, New Delhi.
11. Sathaidhas, R. (1997). Production & Marketing Management of Marine Fisheries in India. Daya Publishing House, Delhi.
12. Kotler, Philip. (1995). Principles of Marketing. Prentice-Hall of India, New Delhi.
13. *Web resources suggested by the teacher concerned and the college librarian including reading material.*

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III YEAR; SEMESTER V; 2022-2023
PAPER TITLE: AQUATIC POLLUTION
MODEL PAPER

Time: 3 Hours Maximum: 70 Marks

SECTION-A

I. Answer any FOUR of the following. Draw diagrams wherever necessary. **4x5=20 M**

Draw labeled diagram wherever necessary

1. Hydrological cycle.
2. BOD
3. Sewage.
4. Ground Water Pollution.
5. Bioremediation.
6. COD.
7. Thermal Pollution
8. Bioaccumulation

SECTION-B

II. Answer any FIVE of the following. Draw diagrams wherever necessary. **5x10=50 M**

9. a) Define Pollution ? Classify sources of Pollution?

OR

b) Describe the physical and chemical characters of water?

10. a) Define Eutrophication? Explain the causes of Eutrophication?

OR

b) Describe types and categories of Pesticides?

11.a) Describe Oil Pollution its sources and treatment of oil pollution ?

OR

b) Explain about Radioactive pollution and its causes?

OR

12. a) Write down the types of Aquatic Microbes ?

OR

b) Describe the development of Antibiotic Resistance and its impacts?

13. a) Write an essay on Advanced waste treatment Methods?

OR

b) Describe the process of Solid Waste management?

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III YEAR; SEMESTER V; 2022-2023
OJT (ON JOB TRAINING)

HOURS-2 **CREDITS-1**

CONTENT	EVALUATION	MARKS
FIELD TRIPS	3X5	15
PROJECT /INDUSTRIAL OR INSTITUTE TRAINING REPORT & SEMINAR	15+5	20
FIELD COMPONENTS	10X1	10
VIVA VOCE	-	05
TOTAL		50