SRI VENKATESWARA UNIVERSITY: TIRUPATI
SVU COLLEGE OF SCIENCES
MASTER OF SCIENCES
DEPARTMENT OF FISHERY SCIENCE & AQUACULTURE
Re – Structured P.G Programme (CHOICE BASED CREDIT SYSTEM (C.B.C.S), as per NEP – 2020, National Higher Education Qualification Frame Work (NHEQF) And Guidelines Of APSCHE
(WITH EFFECT FROM THE BATCH ADMITTED IN THE ACADEMIC YEAR 2025-2026)
CHOICE BASED CREDIT SYSTEM (C.B.C.S), SYLLABUS AND SCHEME OF EXAMINATION
(WITH EFFECT FROM THE ACADEMIC YEAR 2025-2026)
M.Sc., AQUACULTURE

SEMESTER - III

S.No	COURSE	Code	Title of the course	H/W	Credits	SEE	IA	Total Marks
1.	CC	**AQC 301**	**Core Course – 7 - :** Microbiology and Fish Pathology	4	4	70	30	100
2.		**AQC 302**	**Core Course – 8 (A) -** Fish Immunology	4	3	50	25	75
			Core Course – 8 (B) - Fish Breeding and Hatchery Management					
3.		**AQC 303**	**Core Course – 9 (A)** - Cell Biology and Genetics	4	3	50	25	75
			Core Course – 9 (B) - Bioinformatics In Aquaculture					
4.	*P	**AQC- 304**	**Practical – V -** Microbiology and Fish Diseases	6	2	35	15	50
5.	SOC	**AQC 305**	**Skill Oriented Course – 5 (A) -** Fish Nutrition Technology	4	3	50	25	75
			Skill Oriented Course – 5(B) - Seed production and Hatchery Management					
6.		**AQC 306**	**Skill Oriented Course – 6(A) -** Computer Applications, Information Technology And Biostatistics In Aquaculture	4	3	50	25	75
			Skill Oriented Course – 6 (B) - Fishing Technology and Fishery Management					
7.	*P	**AQC: 307**	**Practical – VI -** Biotechnology And Biochemical Estimations	6	2	35	15	50
8.	OOTC / OE	AQC: 308	**Open Elective-** General Principles and Practices of Aquaculture	4	2	70	30	100
*	Seminar / tutorials / remedial classes and quiz as part of internal assessment			--	--	--	--	--
	Total			**36**	**20**	**410**	**190**	**600**

- CC (Core Courses) – 7th Core Course is mandatory and 8th & 9th Core Courses Student can choose one from each code
- *SOC (Skill Oriented Courses) – Student can choose one from each code
- *Open Online Transdisciplinary Course (OOTC) / OPEN ELECTIVE – Students can choose any relevant course of his /her choice from the online courses offered by government agencies like SWAYAM, NPTEL, etc.,
- *Practical – V relating to 5th & 6th Core Courses and Practical – VI relating to 5th & 6th Skill Oriented Courses (SOC)

SEMESTER- IV

SL. NO	COURSE	CODE	TITLE OF THE COURSE	H/W	C	SEE	IA	TOTAL MARKS
1	OOSDC / SDC	AQC:401	OPEN ONLINE SKILL DEVELOPMENT COURSES	--	8	--	200	200
			Skill Development Course - 1 (A)AQUACULTURE BIOTECHNOLOGY	6	4	70	30	100
			Skill Development Course - 1 (B) FINFISH AND SHELL FISH PATHOLOGY					
			Skill Development Course – 2 (A) Essentials Of Biochemistry	6	4	70	30	100
			Skill Development Course - 2 (B) RESEARCH METHODOLOGY, BIOINFORMATICS AND BIOSTATISTICS					
2.	PW	AQC :402	PROJECT WORK – Orientation Classes	24	12	300	0	300
*	Conducting classes for competitive exams communication skills UGC/ CSIR and NET/SLET examinations			12	--	--	--	--
			TOTAL	**36**	**20**	**300**	**200**	**500**
			TOTAL SEMESTERS	**144**	**84**	**1320**	**880**	**2200**

*Open Online Skill development Course (OOSDC)/ SDC – Students can choose any **Two** relevant courses of his / her choice from the online courses offered by governmental agencies like SWAYAM, NPTEL, etc., **to get 8 credits (with 4 credits from each course).**

Note: AQC 402 : PROJECT WORK

Each Student will be under the guidance of a faculty member and the students will put in field oriented research work which mainly consists of visiting to the field for sample collection, farming in fish and prawn culture, hatcheries, processing units, marketing and aquatic diseases analysing in the laboratory. Data collected is compiled and submitted as a dissertation to the department. During viva – voce the students has to present his/ her work to the panel of examiners. The attendance of the student during project work period is considered were they do in Aqua companies / Industries.

AQC: 308 OPEN ELECTIVE - GENERAL PRINCIPLES AND PRACTICES OF AQUACULTURE

COURSE OBJECTIVE

To enable the students to

1. Understand types of culture systems in aquaculture
2. Acquire knowledge on aquatic weeds
3. Understand induced breeding and seed fish production
4. Determined culture of Indian major carps

UNIT – I

1.Definition of Aquaculture: Types of culture, pond preparation and selection of species for culture.

2. Control of aquatic weeds and predators; management of fish ponds.

UNIT – II

3. Induced breeding and seed fish production in carps; transport of seed fish and breeders.
4. Food and feeding in fish - live feed and artificial feeds.
5. Measurement of growth : Length - weight relationship; determination of age in fishes; growth hormones

UNIT – III

6. Culture of Indian major carps and air breathing fishes.
7. Culture of shrimp and prawn.
8. Integrated fish farming; aquarium fish and their maintenance.

UNIT – IV

9. Bacterial and viral diseases of fish - causes, symptoms diagnosis and control measures.
10. Protozoan and fungal diseases and their control.

SUGGESTED READINGS :

1. Santhanam, R. et.al. 1990. **A Manual of Fresh Water Aquaculture** Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

2. Khanna, S. S. 1997. **An Introduction to Fishes**. Central Book Depot, Allahabad.

3. Pillay, T. V. R. 1993. **Aquaculture : Principles and Practices**. Fishing News Books

4. Jhingran, V. G. 1982. **Fish and Fisheries of India**. Hindustan Publishing Corporation, New Delhi

5. MPEDA 1990. **Aquaculture Engineering and Water Quality Management**. Cochin, India.

6. Piska, R. S. 1999. **Fisheries and Aquaculture**. Lahari Publications. Hyderabad.

7. Conroy, D. A. and Herman, R. L. 1968. **Text Book of Fish Diseases**. T.F.H. (Gt. Britain) Ltd.

COURSE OUT COMES

CO1. Understand the Definition of Aquaculture
CO2. Acquire knowledge on Induced breeding and seed fish production in carps
CO3.Creating awareness on Culture of Indian major carps
CO.4 Knowledge on Bacterial , viral , Protozoan and Fungal diseases
CO-PO MAPPING

POS COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	3	3	2	2	3	1	1	1	1	1	1	2
CO2	3	2	2	2	3	3	1	1	2	2	3	3
CO3	3	3	3	1	3	3	1	1	1	1	1	1
CO4	3	1	1	3	3	2	3	3	3	3	2	2

H-High-3, M- Medium-2, L- Low-1

MODEL QUESTION PAPER
M.Sc. DEGREE EXAMINATION
Branch XV – Aquaculture
AQC- 308 OPEN ELECTIVE – GENERAL PRINCIPLES AND PRACTICS OF AQUACULTURE

Time : 2 hours Maximum : 50 Marks

PART – A

Answer any **Five** questions. All questions carry Equal marks

(Marks : 5x2=10)

1. Types of culture
2. Fish ponds
3. Transport of breeders
4. Artificial feeds
5. Air breathing fishes
6. Fish farming in India
7. Control measures of Bacterial diseases
8. Fungal diseases of fishes

PART – B

(4X10=40)

Answer **ALL** questions. All questions carry Equal marks

9. (a) Discuss in detail selection of species for culture

(OR)

(b)Discuss in detail control of aquatic weeds and predators.

10. (a) Describe the transport of seed fish and explain seed fish production seed fish production in carps

(OR)

(b) Discuss in detail:
i. Food and feeding in fish
ii. Growth hormones in fishes

11. (a) Discuss in detail culture of shrimp and prawn

(OR)

(b) Give a detailed account on aquarium fish and its maintenance

12. (a) Discuss in detail different viral diseases in fishes and its diagnosis and control

(OR)

(b) Give a detailed account on protozoan diseases in fishes and its control measure.

SKILL DEVELOPMENT COURSE – 1 (A)-
AQC: 401: AQUACULTURE BIOTECHNOLOGY

COURSE OBJECTIVE

To enable the students to

1.Understand structure and replication of DNA

2.Acquire knowledge on Hormonal manipulation of genetic sex

3.Comprehensive knowledge on techniques of analysing the PCR in biotechnology and genetic engineering.

4. Acquire knowledge on Bioactive compounds from marine organisms and cryopreservation of gametes.

UNIT – I

1. Structure and replication of DNA: Principles of DNA isolation; DNA blotting

2. DNA : Transcription and translation

UNIT – II

3. CHROMOSOMAL ENGINEERING: Genome manipulation, polyploidy, gynogenesis, androgenesis, method of chromosomal manipulation, Induction of ploidy and evaluation.

4.Hormonal manipulation of genetic sex, strategy of sex reversal, management of hormone treatment, biological effects of sex reversal, integrated approach. Transgenic fish, candidate genes for transfer, making gene constructs, mechanism of gene transfer, characterization of transgenic fish, potential hazards and benefits.

UNIT – III

5. Recombinant DNA and gene cloning – cloning vectors for recombinant DNA, restriction enzymes for cloning, cloning in bacteria and eukaryotes, construction and screening of genomic and cDNA libraries.

6. Polymerase chain reaction and gene amplification - basic PCR and its modifications; applications of PCR in biotechnology and genetic engineering- DNA polymorphism, DNA fingerprinting, Nucleotide probes, mapping and gene sequencing: RAPD, RFLP. DNA bar-coding.

UNIT – IV

7.PHARMACOLOGY: Prospects – Bioactive compounds from marine organisms: Biomedical potential of marine natural products isolation and mode of action. Eicosonoids and related compounds from marine algae. Antitumour and cytotoxic compounds from marine organisms.

8.Cryopreservation of gametes: Implications of cryopreservation in Aquaculture. Bioremediation: Types of bioremediation and their importance; Role of Probiotics in Aquaculture.

SUGGESTED READINGS :

. K. Padhi & R. K. Mandal, **Applied Fish Genetics**. Fishing Chimes, Vishakapatnam.

2. P. S. Verma & V. K. Agarwal, 1999. **Concepts of Molecular Biology**,, S. Chand Company Ltd, NewDelhi.

3. Cherfas, N. B. 1981. Gynogenesis in fishes. **In : Genetic bases of fish selection**. (Ed. Kirpichnikov, V. S.), Springerverlag, Berlin, pp. 255 – 273.

4. Hackett, P. B. 1993. **The molecular biology of transgenic fish. In : Biochemistry and Molecular Biology of Fish**, (Eds. Hochachka, P., Mommsen, T.) Vol. 2, Elsevier Science Publishers, Amsterdam, pp. 207 – 240.

5. Leung, L. K. P. and Jamieson, B. G. M. 1991. **Live preservation of fish gametes. In : Fish Evolution and Systematics : Evidence from spermatozoa** (Ed. Jamieson, B. G. M.) pp. 245 –295, Cambridge University Press.

6. Old, R. W. and Primrose, S. B. 1994. **Principles of gene manipulation : An introduction to genetic engineering,** Blackwell Scientific Publications, Oxford.

7. Balasubramanyam, D. et al. 1998. **Concepts in Biotechnology**, University Press.

8.Gupta, P. K. 1999. **Elements of Biotechnology**, Rastogi Publications, Meerut.

9.David H. Attaway and R.Oskar, 1993. **Marine Biotechnology**. Vol. I **Pharmaceutical and Bioactive Natural** Products. Plenum Press, New York & London,500pp.

10.Milton Fingerman. R.Nagabushanam and Man' – Frances Thompson, 1999. Recent Advances in **Marine Biotechnology**, Vol.I – 514pp. Vol.2-313 pp.Vol3-312pp.
11. Ranga, M. M. 1999. **Animal Biotechnology**, Agrobios, Jodhpur, New Delhi.
12.Karunasagar, **Aquaculture and Biotechnology** (for chapters11& 14). Ranga and Shammi . 1999. **Fish Biotechnology**

COURSE OUT COMES

After completion of this course, students

CO1 Understand the Structure and replication of DNA
CO2 Acquire knowledge on Chromosomal Engineering
CO3 Creating awareness on Recombinant DNA and gene cloning
CO4 Knowledge on Pharmacology

CO-PO MAPPING

POS COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	1	1	1	1	2	1	1	2	3	3	3	3
CO2	1	1	1	1	1	1	1	3	3	3	2	2
CO3	1	1	1	1	1	1	1	3	3	3	2	2
CO4	3	2	3	1	1	3	1	1	2	3	3	3

H-High-3, M- Medium-2, L- Low-1

MODEL QUESTION PAPER

M.Sc. DEGREE EXAMINATION
Branch XV – Aquaculture
SKILL DEVELOPMENT COURSEAQC- 401 - Paper –1 (A) – AQUACULTURE BIOTECHNOLOGY

Time : 3 hours Maximum : 70 Marks

PART – A

Answer any **Five** questions. All questions carry Equal marks

(Marks : 5x4=20)

1. DNA blotting
2. What is translation
3. Gynogenesis
4. Characeristics of transgenic Fish
5. C DNA libraries
6. DNA barcoading
7. Eicosonids
8. Probiotics in Aquaculture

PART – B
(4X12.5)=50)
Answer **ALL** questions. All questions carry Equal marks

9. (a) Write a detailed note on the principles of DNA isolation

(OR)

(b).Explain the process involved in protein synthesis and compare it with prokaryotes and eukaryotes.

10. (a) Discuss in detail Genome manipulation

(OR)

(b)Define transgenic fish and discuss potential hazards and benefits.

11. (a) Write a detailed account on Recombinant DNA and gene cloning?

(OR)

(b) Discuss in detail DNA polymorphism and DNA fingerprinting.

12. (a) Write a detailed note on Bio active components from marine organisms

(OR)

(b)Discuss in detail types and importance of Bioremediation.

SKILL DEVELOPMENT COURSE

AQC- 401 - Paper –1 (B) FINFISH AND SHELL FISH PATHOLOGY

UNIT - I

1. **Fish Diseases**: History, species affected, **C**linical symptoms, pathology and control measures of Viral Hemorrhagic Septicemia (VHS) and Infectious Hematopoietic Necrosis (IHN).
2. **Shrimp Diseases:** History, species affected, Pathology, clinical symptoms, prevention and treatment of Monodon Baculoviral disease (MBV), Infectious Hypodermal and Hematopoietic Necrosis (IHHN), Hepato Pancreatic Parvovirus disease (HPPV), Yellow-head virus disease, Taura syndrome and White spot syndrome.

UNIT – II:

3. **Fish Diseases:** History, species affected, Clinical symptoms, pathology, prevention and control measures of Bacterial Hemorrhagic Septicemia (BHS), Bacaterial gill disease and Tail and fin rot.
4. Pathology, clinical symptoms, prevention and control measures of Saprolegniasis and Branchiomycosis.
5. **Shrimp Diseases:** History, species affected, Clinical symptoms, pathology, prevention and control measures of Black gill disease, Filamentous bacterial gill disease.
6. History, species affected, Clinical symptoms, pathology, prevention and control measures of *Lagenidium* disease (Larval Mycosis) and Brown gill disease.

UNIT – III:

7. **Fish Diseases:** History, species affected Clinical symptoms, pathology and control measures of Ichthyophthiriasis, Enterococcidiasis, Whirling disease and Nodular disease.
8. History, species affected Clinical symptoms, pathology and control measures of Gyrodactylosis and Dactylogyrosis.
9. History, species affected Clinical symptoms, pathology and control measures of Argulosis and Lernaeasis.
10. **Shrimp Diseases**: History, species affected, History, Etiology, morphology and control measures of Zoothamnium and Acineta.

UNIT – IV:

11.**Fish Diseases:** History, species affected clinical symptoms, pathology and control measures of gas bubble disease and lack of oxygen.

12.History, species affected, clinical symptoms, pathology, prevention and control measures of Epizootic Ulcerative syndrome.

13.Shrimp Diseases: History, species affected Clinical symptoms, pathology and control measures of cramped tails, and Blue shell syndrome.

14.History, species affected, Clinical symptoms, pathology and control measures ofMuscle Necrosis, Gas bubble disease, Black death disease and Chronic soft shell syndrome.

REFERENCE BOOKS

1. heng TC. 1964. *The Biology of Animal Parasites*. W.B. Saunders Company, Philadelphia, Pennsylvania, USA.

2. Conroy CA and Herman RL. 1968. *Text book of Fish Diseases*.TFH (Great Britain) Ltd, England.
3. Lightner DV. 1996. *A Handbook of Shrimp Pathology and Diagnostic Procedures for Diseases of Cultured Penaeid Shrimp*. World Aquaculture Society, Lousiana, USA.
4. Reichenbach KH. 1965. *Fish Pathology.* TFH (Gt. Britain) Ltd, England.
5. Ribelin WE and Miguki G. 1975. *The Pathology of Fishes.* The Univ. of Wisconsin Press Ltd, Great Russel Street, London, UK.
6. Shuzo Egusa.1978. *Infectious Diseases of Fish.* Oxonian Press Pvt. Ltd. New Delhi.
7. Van Duijn, C. 1973. *Diseases of Fishes.* Cox and Wyman Ltd. London.

MODEL QUESTION PAPER

M.Sc. DEGREE EXAMINATION

Branch XV – Aquaculture

SKILL DEVELOPMENT COURSEAQC- 401 - Paper –1 (B) – FINFISH AND SHELL FISH PATHOLOGY

Time : 3 hours Maximum : 70 Marks

PART – A

Answer any **Five** questions. All questions carry Equal marks

(Marks : 5x4=20)

1. Septicemia
2. Necrosis
3. Taura syndrome
4. White spot syndrome
5. Bacterial gill disease
6. Saprolegniasis
7. Nodular disease
8. Zoothamnium

PART – B

(4X12.5)=50)

Answer **ALL** questions. All questions carry Equal marks

9. (a) Write a detailed note on the **C**linical symptoms, pathology and control measures of Viral Hemorrhagic Septicemia (VHS)?

(OR)

(b).Explain the prevention and treatment of Monodon Baculoviral disease (MBV)

10. (a) Discuss in detail prevention and control measures of Saprolegniasis and Branchiomycosis.

(OR)

(b)Define Filamentous bacterial gill disease.

11.(a) Write a detailed account on Gyrodactylosis and Dactylogyrosis.?

(OR)

(b) Discuss in detail Whirling disease and Nodular disease..

12.(a) Write a detailed note on clinical symptoms, pathology and control measures of gas bubble disease and lack of oxygen.

(OR)

(b)Discuss in detail Black death disease and Chronic soft shell syndrome.

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SKILL ORIENTED COURSE-
AQC: 401 -2 (A) ESSENTIALS OF BIOCHEMISTRY

COURSE OBJECTIVE

To enable the students to

1.Acquire knowledge on structure and function of biomolecules
2.Understand enzyme classification and their factors
3.Attain knowledge on vitamins and minerls
4.Understand bioenergetics models and energy budget

UNIT – I

1. BIOMOLECULES

A brief account of structure and function of protein, lipid and carbohydrate.

UNIT – II

2. ENZYMES

Nomenclature and classification; chemical nature of enzymes; coenzymes, properties of enzymes, factors affecting enzyme activity.

UNIT – III

3. METABOLISM

Interconversions of protein, lipid and carbohydrates; A general account of vitamins and minerals and their importance.

UNIT – IV

4. BIOENERGETICS

Definition and scope; bioenergetics model; structure of an energy budget; components of the energy budget – measurement of components; faecal losses – the absorption efficiency; excretory loses– the assimilation efficiency; metabolic loses; effects of environmental factors on metabolism – temperature, salinity, oxygen and other abiotic factors; examples of energy budgets.

SUGGESTED READINGS :

1. Furton, H. S. and S. Simonds. 1958. **General Biochemistry.** John Wiley and Sons, New York.
2. Murray et. al. 2002. **Harper's Biochemistry** 25th Edn, Mc Grew Hill.
3. Nelson, D. L. and Cox, M. M. 2000. **Lehninger Principles of Biochemistry.** MacMillan Worth Publishers.
4. Robert J. Wootton. 1991. **Ecology of Teleostean Fishes.** Chapman & Hall.
5. Sibly, R.M. and Calow, P.1986. **Physiological Ecology of Animals.** Blackwell, Oxford.

COURSE OUT COMES

After completion of this course, students

CO1 Understand the Biomolecules
CO2 Acquire knowledge on Enzymes
CO3 Creating awareness on Metabolism
CO4 Knowledge on Bioenergetics

CO-PO MAPPING

POS COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	2	1	3	1	1	2	2	1	1	1	3	3
CO2	2	1	3	1	1	2	2	1	1	1	3	3
CO3	2	1	3	1	1	2	2	1	1	1	3	3
CO4	3	1	3	2	2	3	2	1	1	1	3	1

H-High-3, M- Medium-2, L- Low-1

MODEL QUESTION PAPER

M.Sc. DEGREE EXAMINATION

Branch XV – Aquaculture

SKILL ORIENTED COURSE-

AQC: 401 -2 (A) ESSENTIALS OF BIOCHEMISTRY

Time : 3 hours Maximum : 70 Marks

PART – A

Answer any **Five** questions. All questions carry Equal marks

(Marks : 5x4=20)

1.Types of carbohydrates
2.Note on proteins
3.Coenzymes
4.Role of enzymes
5.Role of minerals
6.βoxidation pathway
7.Energy budget
8.Examples of abiotic factors

PART – B

(4X12.5=50)

Answer **ALL** questions. All questions carry Equal marks

5. (a) Write a detailed account on structure and functions of proteins

(OR)

(b).Explain Lipids - Discuss its structure and functions in detail

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6. (a) Describe in detail the nomenclature and classification of enzymes

(OR)

(b)Illustrate the chemical nature and properties of enzymes.

7. (a) Discuss in detail the metabolism of carbohydrates

(OR)

(b)Give a detailed account on the role of vitamins and minerals in Metabolism

8. (a) Write a detaild note on environmental factors on metabolism

(OR)

(b) Define Bioenergetics and illustrate its model in detail

Skill Development Course - 2 (B) RESEARCH METHODOLOGY, BIOINFORMATICS AND BIOSTATISTICS

COURSE OBJECTIVE

To enable the students to

1.To know meaning and objectives of research, research design and their significance.
2.To Understand and analysis of biological databases
3.To understand the application f statistics in biosciences.

UNIT – I

1.RESEARCH METHODOLOGY: RESEARCH METHODOLOGY – Meaning, Aim And Objective Of Research, Significance Of Research, Types Of Research, Research, problem, selecting the problem. Thrust areas in research in Marine sciences and Technology. Research Design. Collection of primary data through different methods.

UNIT – II

2.BIO INFORMATICS: Introduction – Origin of bioinformatics biological data (genome projects), computer and information technology contributions. Disciplines of bioinformatics – Genomics, transcriptomics, proteomics, functional genomics, structural genomics, metabolomics, pharmacogenomics, structural prediction and drug design. Biological database – Introduction of database (DB), need, organization , search of DB. An over view of biological databases – NCBI, EMBI, DDBJ, SWISS – PROT, PDB, AND KEGG – Sequence analysis – concepts of sequence analysis and their importance, BLAST – blastn, blastp, blasix tblasix, output analysis matrix BLOSSUM, PAM e – value.

UNIT – III

3.DATA ANALYSIS: Collection and analysis of biological data – Mean, Median, Mode, Standard Deviation Standard error, co efficient of variation , Simple random sampling, Use of random number tables.

UNIT – IV

4.BIOSTASTISTICAL METHODS: Student,, t'' test, Skewness, Kurtosis, Chi – Squaretest, Z- test, Correlation and Regression, ANOVA, Duncans Multiple Range Test (DMRT).

REFERENCE BOOKS:

1.S.C.Gupta: Fundamentals of Statistics, Himalaya Publishing House Delhi.
2.Gupta & Kapoor: Fundamentals of Mathematical Statistics. S. Chand & Co., New Delhi.
3.Yule & Kendall: Elementary Statistics, Charless Griffin & Co. London.

COURSE OUT COMES:

On the successful completion of course, students will be able to

CO1: Understand the Research problem selection, design of the research work and the significance .
CO2: Know the collection and analysis of biological data through statistical tools.
CO3: Understand about the different bioinformatics tools for analysis of data.
CO4: Understand the fundamental concepts of biostatistics.

POS COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3

H-High-3, M- Medium-2, L- Low-1

MODEL QUESTION PAPER

M.Sc. DEGREE EXAMINATION

Branch XV – Aquaculture

SKILL DEVELOPMENT COURSEAQC- 401 - Paper –2 (B) – RESEARCH METHODOLOGY, BIOINFORMATICS AND BIOSTATISTICS

Time : 3 hours Maximum : 70 Marks

PART – A

Answer any **Five** questions. All questions carry Equal marks

(Marks : 5x4=20)

1. Significance of Research
2. Types of Research
3. Proteomics
4. NCBI
5. Median
6. Simple random sampling
7. Student., t'' test
8. ANOVA

PART – B

(4X12.5=50)

Answer **ALL** questions. All questions carry Equal marks

9. (a) Write a detailed note on the aim and objective of research?

(OR)

(b).Explain the process involved in sampling?

10. (a) Discuss in detail Origin of genome projects?

(OR)

(b)Define Disciplines of bioinformatics?.

11. (a) Write a detailed account on Collection and analysis of biological data?

(OR)

(b) Discuss in detail use of random number tables?

12. (a) Write a detailed note on concepts of sequence analysis and their importance?

(OR)

(b)Discuss in detail types of biostatistical methods?

AQC: 402: PROJECT WORK

COURSE OBJECTIVE

To enable the students to

1. Effective utilization of aquatic and land resource
2. Providing means of livelihood through commercial and industrial aquaculture.
3. Provide knowledge for sustainable aquaculture.
4. Provide the students on an field exposure to help them in understanding the Aquaculture practices.

AQC 402: PROJECT WORK

Each Student will be under the guidance of a faculty member and the students will put in field oriented research work which mainly consists of visiting to the field for sample collection, farming in fish and prawn culture, hatcheries, processing units, marketing and aquatic diseases analysing in the laboratory. Data collected is compiled and submitted as a dissertation to the department. During viva – voce the students has to present his/ her work to the panel of examiners. The attendance of the student during project work period is considered were they do in Aqua companies / Industries.

COURSE OUT COMES

After completion of this course, students

CO1 Reproduce knowledge on aquaculture farming
CO2 Acquire knowledge on culture and diseases identification
CO3 Creating awareness on self – employment
CO4 Knowledge on aquaculture by products
CO-PO MAPPING

POS COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3

H-High-3, M- Medium-2, L- Low-1