Veer Narmad South Gujarat University

M.Sc. –II- Aquatic Biology

Teaching and Examination scheme for Semester – I

Theory Paper /Practical	Teaching schedule Hrs/week	Exam Schedule			Total marks Theory/Practical
		Duration (hrs)	Internal marks	Theory / Practical (Uni)	
Theory papers :					
AQB: 201 : Fish Nutrition, Biochemistry and Feed Technology	3	3	30	70	100
AQB: 202 : Aquatic Pollution and Toxicology	3	3	30	70	100
AQB: 203 : Fisheries legislation	3	3	30	70	100
AQB: 204 : Fish Genetics and Biotechnology	3	3	30	70	100
Practicals :					
AQB: 205 : Biochemistry ,Genetics & Biotechnology	4	5	30	70	100
AQB: 206 : Aquatic Pollution & Fisheries	4	5	30	70	100
		Total	180	420	600

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Syllabus – Semester- II

AQB- 201- Fish Nutrition, Biochemistry and Feed Technology

Unit-I **Hrs 8**

General fish nutrition

Principles of nutrition. Types of aquafeed. Nutritional requirements of fish and prawn at various developmental stages.

Unit-II **Hrs 8**

Biochemistry

Importance of Carbohydrates, Protein, Lipids (energy food), Minerals and Vitamins (non energy food) Proximate composition of fish and feeds.

Unit-III **Hrs 12**

Chemical and Biological analysis

Chemical and Biological evaluation – Growth, Gastro-somatic Index (GSI), Feed Conversion Ratio (FCR), Food Conversion Efficiency (FCE), Protein Efficiency Ratio (PER), Productive Protein Value (PPV), Net Protein Utilization (NPU).

Unit-IV **Hrs 12**

Feed Technology

Feed processing and manufacture machineries, steam pelleting, extrusion:

Sources of feed ingredients. eco-friendly and Economic feed formulation. Role of feed attractants, binders, growth promoters, feed microbial, antibiotics, probiotics, coloring and flavoring agents. Antinutritional factors.

References:

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- D' Abramo, LR., Conklin, D.E and Aklyama. D.M, (1977), Crustacean Nutrition: Advances in Aquaculture Vol. 6. World Aquaculture Society, Baton Roughe, L.A.

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Syllabus –Semester-II

AQB- 202 : Aquatic Pollution & Toxicology

Unit – I **Hrs 8**

Historical background, dynamics, transport paths,
Interaction of pollutants and factors affecting toxicity

Unit-II **Hrs 12**

Sewage, industrial & agricultural discharges,
Charateristics of effluent, Biological concern, treatment methods

Unit-III **Hrs 10**

Thermal pollution
Oil pollution
Radioactive pollution their sources, fate, biological effects & management
Acid rain and its effects in aquatic system

Unit-IV **Hrs 10**

Basic toxicology concepts and principles, Toxicity test procedures,
Determination of bioassay, Biological indicators of water pollution.

References:

- Agarwal,S.K.(2008); Water pollution ,ABH publishing corporation ,New Delhi
- Albert, A.(1951): Selective toxicity, John Wiley and Sons,Chichester
- Cremlyn,R.(1978) : Pesticides, John Wiley and Sons,Chichester
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- Goel, P.K. (2006) : Water pollution, New age international publishers, New Delhi.
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Syllabus – Semester- II

AQB- 203- Fisheries Legislation

Unit-I **Hrs 6**

Importance of fisheries legislation:
Role of Central Pollution Control Board (CPCB) and Gujarat Pollution Control Board (GPCB) in management of pollution.

Unit-II **Hrs10**

Inland Fisheries Regulation and Development:
Inland fisheries governance, Inland Fisheries Act, Inland property regime, leasing policies for water bodies. Issues of property rights in Inland water bodies.

Unit-III **Hrs14**

Marine fisheries legislations in India and Gujarat:
Land Reforms Act; Coastal Aquaculture legislations, (Environmental Protection Act, Biodiversity Act, Aquaculture Authority Act) regulations concerning discharge of effluents in water bodies. Coastal Regulation Zone (CRZ) in the context of aquaculture. Sustainability, Integrated Coastal Zone Management and ecosystem management.

Unit-IV **Hrs 10**

International Law of the Sea:
Historical perspectives. Exclusive Economic Zone, Regulatory and developmental issues concerning deep sea fishing – Guidelines for operation Indian deep sea fishing vessels in Indian EEZ. Maritimes Zones of India Act 1981, EEZ 1997 and recent development.

References:

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- Neler, A.P., Rangnar Ameson and Nina Mollett. (1997).Right Based Fishing. Klupner Academic Publisher.

- O'Connell, D.P. (1982) The international law the sea. Clarendon press.

- William E, Devid F, and Elly G. (2001) Legislating for Sustainable Fisheries : A Guide to Implementing the 1993 FAO Compliance Agreement and 1995 UN Fish Stocks Agreement Published by World Bank.

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Syllabus –Semester-II

AQB -204: Fish Genetics & Biotechnology

Unit-I – **Hrs 8**

Fundamentals of Molecular Biology:
- Nucleic acids; Structure of DNA and RNA
- DNA replication
- DNA and Mutations

Unit-II – **Hrs 14**

Principle of fish genetics:
- a) Genetic manipulation
  - Sex-reversion and sex control
  - Role of hormone in sex reversion
  - Chromosomal manipulation
  - Androgenesis and gynogenesis
- b) Chromosome study
  - Fish chromosome preparation method
  - Banding techniques
  - Fish as a cytogenetic model

Unit-III- **Hrs 10**

Fish Biotechnology
- Scope and application of fish biotechnology
- Recombinant DNA technology
- PCR technique
- Transgenic fish

Unit-IV- **Hrs 8**

Bioinformatics
- Historical development of Bioinformatics
- Use of computers in Bioinformatics
- Search engines
- Application of Bioinformatics

References:

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- Michel & Notre C.D. (2003) Bioinformatics, A Beginners Guide Wiley Publ.Inc.

- Murthy C.V.S. (2004) Bioinformatics Himalaya publishing House

- Rashidi H. H., and L.K.Buehler (2003) Bioinformatics Basics: Applications in Biological sciences and Medicine.

- Sinnit E.W., Dunn L.C. and Dobzhansky,T(1998) Principle of Genetics, Macgrodo hill publishing company Ltd.,

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Syllabus –Semester-II (Practical)

AQB-205: Biochemistry, Genetics & Biotechnology

- Proximate analysis of fish
- Proximate analysis of feed
- Measurement of energy by bomb colorimeter
- Metaphase chromosome preparation
- Banding techniques (observation of slides)
- Isolation of DNA from blood
- DNA Staining by Schiff's reagent
- RNA staining by Pyronine- y and toludene blue
- Demonstration : PAGE
  COMET ASSAY
- Field and Institutes visit

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Syllabus –Semester-II (Practical)

AQB-206- Aquatic Pollution & Fisheries

- Estimation of BOD & COD – Micronuclei test
- Histology : Fixation, embedding sectioning and staining of tissues
- Histological and histopathological observation of slides
- Demonstration : Observation of behavioral changes and Lc 50 determination heavy metal analysis
- Field and Institutes visit