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VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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ક્રમાંક :એસ./પરિપત્ર/૧૦૨૪૬/૨૦૨૨
તા.૨૫/૦૫/૨૦૨૨

પ્રતિ,
વડાશ્રી,
એકવેટીક બાયોલોજી ડિપાર્ટમેન્ટ,
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી,
સુરત.

વિષયઃ– એકવેટીક બાયોલોજી વિષયનાં સેમેસ્ટર–૧ અને ૨ ના અભ્યાસક્રમ બાબત.

મહાશય,

સવિનય જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૨–૨૩ થી અમલમાં આવનાર એકવેટીક બાયોલોજી વિષયનાં ૨૦૧૮ ના Framework મુજબ સેમેસ્ટર–૧ અને ૨ ના અભ્યાસક્રમ અંગે એકવેટીક બાયોલોજી વિષયની અભ્યાસસમિતિની તા.૦૯/૦૫/૨૦૨૨ની સભાનાં ઠરાવ ક્રમાંકઃ૨ અન્વયે કરેલ ભલામણ વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિજ્ઞાન વિદ્યાશાખાવતી વિજ્ઞાન વિદ્યાશાખાનાં ડીનશ્રીએ મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૨૦/૦૫/૨૦૨૨ની સભાનાં ઠરાવ ક્રમાંકઃ૧૮ થી સ્વીકારી મંજુર કરેલ છે, તેની જાણ સંબંધકર્તા શિક્ષકો અને વિદ્યાર્થીઓને કરવી, તદ્ઉપરાંત તેનો અમલ કરવો.

<u>એકવેટીક બાયોલોજી વિષયની અભ્યાસ સમિતિની તા.૦૯/૦૫/૨૦૨૨ની સભાનાં ઠરાવ ક્રમાંકઃ૨</u>

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૨૨–૨૩ અમલમાં આવનાર એમ.એસસી. એકેવેટીક બાયોલોજી વિષયનાં ૨૦૧૮ ના Framework મુજબ સેમેસ્ટર–૧ અને ૨ ના નવા અભ્યાસક્રમ મંજૂર કરવા વિજ્ઞાન વિદ્યાશાખાને ભલામણ કરવામાં આવે છે.

<u>એકેડેમિક કાઉન્સિલની તા.૨૦/૦૫/૨૦૨૨ની સભાનાં ઠરાવ ક્રમાંકઃ ૧૮</u>

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૨૨–૨૩ અમલમાં આવનાર એકવેટીક બાયોલોજી વિષયનાં ૨૦૧૮ના Framework મુજબ સેમેસ્ટર–૧ અને ૨ ના અભ્યાસક્રમ અંગે એકવેટીક બાયોલોજી વિષયની અભ્યાસ સમિતિની તા.૦૯/૦૫/૨૦૨૨ની સભાનાં ઠરાવ ક્રમાંકઃ૨ અન્વયે કરેલ ભલામણ વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિજ્ઞાન વિદ્યાશાખાવતી વિજ્ઞાન વિદ્યાશાખાનાં ડીનશ્રીએ મંજૂર કરી એકેડમિક કાઉન્સિલને કરેલ ભલામણ સ્વીકારી એમ.એસસી. એકેવેટીક બાયોલોજી વિષયનાં સેમેસ્ટર–૧ અને ૨ નો અભ્યાસક્રમ મંજૂર કરવામાં આવે છે.

(બિડાણ: ઉપર મુજબ)

ઈ.ચા.કુલસચિવ

પ્રતિ,
૨) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા,
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....જાણ સારૂ.

M. Sc. Sem I						
Theory Paper /Practical	Teaching schedule Hrs /week	Exam Schedule			Total marks	Credit
		Duration (Hrs)	Internal marks	External marks		
Theory papers :						
AQB 101: Aquatic resources and management	04	03	30	70	100	04
AQB 102:Aquatic Pollution and Toxicology	04	03	30	70	100	04
AQB 103:Fish physiology and Endocrinology	04	03	30	70	100	04
Elective Paper AQB 104: A-Instrumentation AQB:104: B-Computer Application	04	03	30	70	100	04
Practicals :						
AQB 105: Water & Sediment analysis, Instrumentation and Fish physiology	12	05-06	50	100	150	06
Skill based elective paper AQB 106:Aquarium management for employment	02	02	20	30	50	02
Total	30	20	190	410	600	24

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M.Sc. (Aquatic Biology)
Syllabus - Semester-I
AQB- 101: Aquatic Resources and Management

Total: 60 Hrs

Unit – I

Inland Environment:

Origin, classification and distribution of rivers, Major River system of India and Gujarat

Origin, classification and distribution of lakes, Thermal stratification and thermal exchange in lakes.

Origin, classification and distribution of ponds

Classification and distribution of reservoir, important reservoir of Gujarat, transitional phases of reservoir

Classification, morphology and distribution of Estuaries, Lagoons and Coastal inlets

Unit - II

Marine Environment:

Introduction, origin and zonation of ocean, sea bottom topography: Abyssal, canyons and trenches

Main physical (density, viscosity, surface tension, temperature) and chemical (major and minor constituents) properties of sea water

Introduction, origin and types of tides, currents and waves

Unit – III

Aquatic resources:

Fin fishes: major carps, catfishes, hilsa, mullet, sardine, mackerel

Sport fishes and Ornamental fishes: Introduction and some important species

Shell fishes: Prawn, shrimp and molluscs

Aquatic plants: freshwater higher vascular plants, sea weeds, sea grasses and mangroves

Unit – IV

Management of Aquatic resources

Aquatic resources management practices with reference to present and future aspect

Concept of Integrated Water Resources Management (IWRM) □ water allocation and water scheduling problem □ equitable manners of water management

Role of regulatory bodies in Management of aquatic resources (Pond, Lake, River, Sea, Estuaries and Reservoirs)

Management of fishery resources

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3. Golterman, H.L., Clyno, R.S. and Ohnstad, M.A.M. (1978). Methods for physical and chemical analysis of freshwater.2nd Ed. IBP Handbook no.8 Blackwell scientific publication.
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11. Perkins, E.J. (1980). The Biology of Estuaries and coastal water. Academic Press, London.
12. Mishra, S R (2002). Management of Aquatic Habitats, Daya Publishing House
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15. Wetzel, R.G. 2001. Limnology. Lake and Reservoir Ecosystems (3rd Ed.). Academic Press, San Diego
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21. Khanna, S.S. & H.R. Singh 2006. A Textbook of Fish Biology and Fisheries. Narendra Publishing House., India
22. Meenakshi, J., N.K. Yadava & R.K. Gupta. 2010. Freshwater Ornamental Fishes. Mangalam Publications, Delhi

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M.Sc. (Aquatic Biology)
Syllabus – Semester I
AQB 102: Aquatic Pollution and Toxicology

Total Hrs. 60

Unit – I
General Introduction:
Water pollution: Introduction, Sources and Fate of pollutants
Interaction of pollutants in Aquatic resources
Role of Central Pollution Control Board (CPCB) and Gujarat Pollution Control Board (GPCB) in management of pollution.

Unit – II
Types of Pollution:
Sources, Fate, Biological Effects and Management of Thermal pollution, Oil pollution, Radioactive pollution, Detergent pollution and Acid rain

Unit – III
Effluents and their treatment:
Introduction and characteristics of domestic, industrial and agricultural discharges. Biological concern: Eutophication, Bioaccumulation and Biomagnification
Important methods for waste water treatment.
Water quality standards and water quality indices.

Unit – IV
Toxicology:
Toxicology: Introduction, concepts, principles and factors affecting the toxicity
Classification of toxicants: metals, pesticides, teratogens, xenobiotics, toxin of animal and plant origin
Toxicity test procedures: Bioassay, Biostimulation and Bioinhibition
Biomarkers in Aquatic system

References:

1. Agarwal, S.K. (2008). Water pollution, ABH publishing corporation, New Delhi
2. Albert, A. (1951). Selective toxicity, John Wiley and Sons, Chichester
3. Cremlyn, R. (1978). Pesticides, John Wiley and Sons, Chichester

4. Ghosh, G.K. (2002). Water of India, A.P.H. publishing corporation, New Delhi
5. Goel, P.K. (2006). Water pollution, New age international publishers, New Delhi.
6. Kukal S.S. and Dhaliwal, G.S. (2005). Essential of environmental science, Kalyani Publishers, Ludhiyana
7. Prabhakar, V.K. (2001). Marine ecology & pollution, Anmol publications New Delhi.
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Department of Aquatic Biology
M.Sc. (Aquatic Biology)
Syllabus - Semester-I
AQB- 103: Fish Physiology and Endocrinology

Total Hrs. 60

Unit - I

Digestion: Digestive system of fish and associated digestive glands (liver, pancreas and gall bladder), Mechanism of digestion.

Respiration: Structure and function of gills, Mechanism of respiration, Hemoglobin – Oxygen uptake and dissociation, Accessory respiratory organs.

Unit - II

Circulation: Structure and function of heart, Composition of blood.

Excretion: Structure and function of kidney, Nitrogenous end products and pattern of excretion.

Osmoregulation: Introduction, Osmoregulation in fresh water, brackish water and marine fish.

Unit - III

Reproductive system and Development: Introduction of reproductive system, types of reproduction, GSI, Structure, function and development of gonads. Fecundity, Fertilization, Incubation, Hatching, Larvae and Metamorphosis, Parental care in fishes.

Unit - IV

Endocrinology: Hormonal control of pineal, thyroid, pituitary gland in fishes, pancreatic hormone in fishes, pheromones in fishes, ecdysis in crustacean.

References:

1. Evans, D. H. (1998). Physiology of Fishes. R.R. Bowker Company, Book trade association of Philadelphia.
2. Hoar, W. S. and Randal, D. J. (1993). Fish Endocrinology. Vol. I to VII, Academic press, INC (London) Ltd.
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6. Khanna, S. S. (1989). An Introduction to Fishes. Central Book Depot, Allahabad.
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Production of Finfish and Shellfish. Daya Publishing House, New Delhi.

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Syllabus – Semester I
AQB 104-A: Instrumentation (Elective Paper)

Total - 60 Hrs.

Unit – I

Microscopy:

Microscopes: Introduction, principle and structural description

Types of microscopes: Simple microscope, compound microscope (Student's microscope, Stereoscopic microscope, Phase contrast microscope, fluorescence microscope and interference microscope) and Electron microscope

Unit – II

Photometry:

Introduction, principle and application of Colorimeter, Spectrophotometer, (Single bean & double beam), Infrared, NMR and Mass spectrometer

Unit – III

Separation method:

(A) Centrifuge and Centrifugation:

Centrifuge: Introduction, different parts and types of centrifuge

Centrifugation: Introduction, principle and types (Differential centrifugation and Density gradient centrifugation)

(B) Chromatography and Electrophoretic:

Chromatography: Introduction, Principle and types of chromatography

Electrophoresis: Introduction, Principle and types of electrophoresis

Blotting: Introduction, types and function

Unit - IV

Water quality analyzers:

Introduction, structure, principle and operation of water quality analyzers (Conductivity meter, pH meter, Salino meter, DO meter, turbidometer, COD reflaxor (close and open) and BOD analyser)

References:

1. Brown, S.B. (1980). An introduction to spectroscopy for Biochemists, Academic press, London, New York.
2. Robertis, E.D.P. and Robertis, E.M.F. (2001). Cell and Molecular Biology, Lippincott Williams & Wilkins, London
3. Hawcroft, D.M. (1996). Electrophoresis. The Basics IRL press, Oxford.

4. Jenning, W.G. (1993). Analytical Gas chromatography. Academic Press. New York.
5. Skoogs, H.P. and Nieman, M. (2006). Principle of Instrumental analysis. Thomson Inc. Ltd.

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Syllabus – Semester I
AQB 104-B: Computer Application (Elective Paper)

Total Hrs. 60

Unit – I

Computer and GUI Based Operating System

Introduction, History of Computers, Characteristics of Computer System, Computer and Latest IT gadgets and their applications

Components of Computer System : Hardware, Software

Introduction to GUI Based Operating System

The User Interface : Task Bar, Icons, Start Menu , Running an Application

Simple Setting of Operating System

Unit – II

Processing of Word, Excel and PowerPoint

Basics: Title Bar, Menu Bar, Toolbars & Sidebar, Creating a New Document, Opening and Closing Documents, Save and Save As Document, Page Setup, Print Preview, Printing of Documents and Saving a Document as PDF file

Word

Document Creation, Formatting the Text, Table Manipulation, Mail Merge, Shortcut Keys

Excel

Elements of Spread Sheet, Manipulation of Cells and Sheet, Formulas, Functions and Charts

PowerPoint

Creation of Presentation, Manipulating Slides, Presentation of Slides, Providing Aesthetics to Slides & Printing

Unit-III

Internet and World Wide Web (WWW)

Introduction, Basic of Computer Networks: Local Area Network (LAN), Wide Area Network (WAN), Network Topology

Internet: Concept of Internet & WWW, Applications of Internet, Website Address and URL, Introduction to IP Address, ISP and Role of ISP, Internet Protocol, Modes of Connecting Internet (Hotspot, Wi- Fi, LAN Cable, Broadband, USB Tethering), Identifying and uses of IP/MAC/IMEI of various devices

Popular Web Browsers, Exploring the Internet: Surfing the web, Popular Search Engines, Searching on Internet, Downloading Web Pages, Printing Web Pages

Unit-IV

E-mail, Social Networking and e- Governance Services

Introduction and Structure of E-mail Using E-mails

Social Networking for researcher, Introduction to Blogs, Basics of E-commerce, Netiquettes, Academic Research Databases

Overview of e-Governance Services in education and fisheries sector

Accessing e-Governance Services on Mobile Using "UMANG APP"

Digital Locker

Application of computer, computerized information and data analysis in fisheries

Introduction to various statistical packages and development of programmes and their use in biological data analysis

References

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2. Marilyn W. Meyer and Roberta L. Baber, Computers in your future, 2nd Edition Prentice Hall of India.
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4. Computer Fundamentals: Concepts, Systems & Applications- 8th Edition Priti Sinha, Pradeep K, Sinha
5. Michael Miller, 2007, Absolute Beginner's guide to computer Basics, Fourth Edition, Pearson Education Deborah Morley, Charles S. Parker,2007, Understanding computers today and tomorrow, 11th edition, Thomson

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Syllabus - Semester-I

AQB 105: Water quality analysis and Fish Physiology

Total Hrs. 180

Unit-I

Titrimetric estimation

Dissolved oxygen, Alkalinity (PA and TA), Hardness (total Ca and Mg) and Chloride

Colorimetric estimation of water and sediment

Silicate, Ammonia, nitrate, nitrite and Inorganic phosphate

Unit- II

Instrumentation:

Turbidometer, pH meter, Colorimeter, Conductivity meter, Salinometer, Sechhi disc

Pollution indicating methods

Estimation of TS, TSS, TDS, BOD and COD

Unit- III

Preparations and observations of micronuclei test in fish blood

Study of haematological parameters (RBC, WBC, Haemoglobin content, Haematocrit value)

Unit -IV

Gut content analysis and Gastrosomatic Index (GaSI)

Study of buccal cavity and associate structures (Gill rackers, Bucco pharynx)

Measurement of fecundity, egg diameter and gonadosomatic index

Word processing (MS word, MS excel and MS power point)

Visit of sewage/water treatment plants

Veer Narmad South Gujarat University, Surat
Department of Aquatic Biology
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Syllabus - Semester-I
AQB- 106: Aquarium management for employment
(Skill based elective paper)

Total Hrs. 30

Unit-I
Introduction to Aquaculture and Ornamental Fishes Trading
Introduction, history and present scenario of aquaculture. World trading3 of ornamental fish and export potential. Ornamental fisheries new dimensions in aquaculture entrepreneurship.

Unit- II
Introduction to Ornamental Fishes
Introduction to aquarium and aquarium accessories. Basic knowledge on profile of ornamental fishes in world and Indian ornamental fishes. Profiles of some selected aquarium plants.

Unit-III
Construction of Aquarium
Design and construction of public fresh water and marine aquaria and oceanarium. Construction, settings and maintenance of aquarium, Construction of ornamental fish breeding unit and Ornamental fish farm.

Unit-IV
Maintenance and Management of Aquarium
Ornamental Fish-diseases management, Feeding management and maintenance of ornamental fish.

References:

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4. Spotte, S. (1979). Seawater Aquariums. John Wiley and Sons, New York.
5. Straughan, R. P. L. (1970). Salt water Aquarium in the Home. (2nd Ed.), A.S. Barnes & Co., NY.
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M. Sc. Sem II						
Theory Paper /Practical	Teaching schedule Hrs /week	Exam Schedule			Total marks	Credit
		Duration (Hrs)	Internal marks	External marks		
Theory papers :						
AQB 201: Fisheries Technology	04	03	30	70	100	04
AQB 202: Fish Nutrition and feed Technology	04	03	30	70	100	04
AQB 203: Fish Genetics and Biotechnology	04	03	30	70	100	04
Elective Paper AQB 204: A-Fisheries Legislation AQB:204: B-Biostatistical analysis	04	03	30	70	100	04
Practicals :						
AQB 205: Fisheries Technology and Biostatistics	12	05-06	50	100	150	06
Skill based elective paper AQB 206:Fish products and Byproducts	02	02	20	30	50	02
Total	30	20	190	410	600	24

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Department of Aquatic Biology

M.Sc. (Aquatic Biology)

Syllabus – Semester II

AQB: 201 Fisheries Technology

Total Hrs. 60

Unit – I

Hatcheries: Types of Traditional, Circular, Vertical hatcheries, Shrimp/Prawn hatcheries and hatchery Management (Japanese, Galveston, Indian).

Induced breeding: Selection of brooders, extraction of pituitary gland, preparation of dosage and injection, spawning and fertilization, stripping method, use of inducing agents in induced breeding, Eyestalk ablation technique in shrimp.

Unit – II

Transportation: Causes of mortality during transportation, methods for transportation of fish seeds, fingerlings, brooders and trout eggs, use of chemicals in live fish transportation.

Age and growth of fishes: Utility and methods for determining age and growth, study of maturity, mortality and yield, factors affecting the age and growth.

Unit – III

Techniques for Fishing:

Introduction of fishing crafts, types of fishing crafts (mechanized and nonmechanized)

Introduction of fishing gears, types of fishing gears (Traditional, conventional, non-conventional and Active, Passive), Maintenance and preservation of fishing gears.

Remote sensing: Mechanism, satellites and cameras, Importance and Application of remote sensing in Aquatic biology.

Unit – IV

Post harvest technology: Principles and techniques of processing and preservation, chilling, freezing, drying, salting, smoking, canning, pickling, pasting, preservation with chemicals, preservation by exposure of gamma rays, modern techniques of preservation, packaging of fish and fish products, Effect of processing and preservation on nutritive aspects of fish, fishery products and by-products.

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20. Welcomme, R. L. (2007). Inland Fisheries. Discovery Publishing House, New Delhi.

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Syllabus - Semester-II
AQB- 202: Fish Nutrition and feed technology

Total: 60 Hrs

Unit – I

Fish nutrition: Introduction and Principles of nutrition. Nutritional requirements of fin fish and shell fish, Factors affecting nutritional requirements

Feeding evaluation: Feed dispensing devices, ration size/feeding rate, feeding frequency, check trays, restricted feeding, mixed feeding.

Unit - II

Biochemistry: Introduction, classification and function of nutritional compounds (Protein, Lipid, Carbohydrates, Vitamins and Minerals)

Nutritive value of live food: Algae, Artemia, Cladocerans, Ostracods, Rotifers and Copepods as fish food

Proximate composition of fish and feed

Unit – III

Biological evaluation:

Growth evaluation: Feed Conversion Ratio (FCR), Food Conversion Efficiency (FCE), absolute growth, relative growth. Specific Growth Rate (SGR), weight gain (%), Digestible growth coefficient (DGC), Gastro-somatic Index (GaSI)

Protein evaluation: Protein Efficiency Ratio (PER), Productive Protein Value (PPV), Net Protein Utilization (NPU).

Unit - IV

Feed Technology: Feed ingredients: Introduction, sources and antinutritional factors, Feed formulation, feed preparation methods

Feed attractants, binders, growth promoters (antibiotics, probiotics), colouring and flavouring agents,

Types of feed: pellets, flakes, powdered, micro-encapsulated, micro-bound

and micro-coated diets, Compact pellet feed, floating and sinking pellet feeds

Feed processing: Machineries, Effects of processing on the nutritional value of feeds, Feed Packing and storage

References:

1. ADCP (Aquaculture Development and Co-ordination Programme) (1980). Fish Feed Technology, ADCP/REP/80/11.FAO, Rome.
2. 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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Department of Aquatic Biology
M.Sc.(Aquatic Biology)
Syllabus – Semester II
AQB: 203 Fish Genetics and Biotechnology

Total Hrs. 60

Unit - I
Fundamentals of Molecular Biology
DNA as a genetic material, DNA replication and Mutations, Structure and Types of RNA, Transcription, Protein synthesis.
Recombinant DNA technology, DNA barcoding.

Unit - II
Principle of Fish Genetics
Chromosome study: Fish chromosome preparation method, Banding techniques, Fish as a cytogenetic model.
Genetic manipulation: Sex-reversion and sex control, Chromosomal manipulation.
Transgenic fish

Unit - III
Fish Biotechnology
Scope and application.
PCR technique, Cryopreservation, Vaccination, Hybridization.

Unit - IV
Bioinformatics: Use of computers in Bioinformatics, Search engines and databases, Application of Bioinformatics in Aquatic Biology.
Nanotechnology: Introduction, History, Applications in Aquatic Biology.

References:

1. Lesk, A. M. (2003). Introduction to Bioinformatics Oxford Uni. Press.
2. Falcon, D. S. (2000). An Introduction to Quantitative Genetics. ELBS Publisher, England.
3. Lakra, W. S. (2000). Fish Genetics and Biotechnology. CIFE, Mumbai.
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24. Basega, R. (1989). Cell Growth and Division: A Practical Approach. IRL Press.
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26. Kirpichnikov, V. S. (1981). Genetic Basis of Fish Selection. Springer-Verlag.
27. Wolfe, S. L. (1995). Introduction to Cell and Molecular Biology. Wordsworth Publ. Co., Belmont.
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Department of Aquatic Biology

M.Sc. I- (Aquatic Biology) Semester- II

AQB- 204 -A : Fisheries Legislation (Elective)

Total hrs. 60

Unit – I

Fisheries legislation:

Introduction, History and Importance in aquatic resources management.

Unit – II

Inland Fisheries Regulation and Development:

Inland Fisheries Act, Leasing policies for water bodies. Issues of property rights in Inland water bodies.

Unit – III

Marine fisheries legislations in India and Gujarat:

Coastal Aquaculture legislations (Environmental Protection Act, Biodiversity Act and Aquaculture Authority Act).

Maritimes Zones of India Act 1981, Coastal Regulation Zone (CRZ) and Integrated Coastal Zone Management.

Unit – IV

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.

References:

1. Branson, E.J. (2008). Fish welfare. Pub. Blackwell Publication, Oxford.
2. Malhotra, S.P. & Sinha, V.R.P. (2007). Indian Fisheries and Aquaculture in a Globalizing Economy, 2 Vols. Narendra publishing house New Delhi.
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Department of Aquatic Biology

M.Sc. (Aquatic Biology)

Syllabus - Semester-II

AQB- 204-B: Bio statistical analysis

Total: 60 Hrs

Unit – I

Fundamental of Biostatistics:

Introduction and Scope of biostatistics, Concepts of population and sample, Sampling and its types, Primary and Secondary data, Classification and tabulation of data, Frequency distribution, Graphic representation of data- bar diagram, histograms, pie diagram, frequency polygon and Ogive. Measures of central tendency: mean, median, mode. Measures of Dispersion: variance, standard deviation, coefficient of variation, Skewness, kurtosis and moments

Methods of Data Collection – Quantitative and qualitative

Quantitative Methods: Questionnaire (mail method, interviews through telephone, internet and computers), interview schedule

Questionnaire/interview schedule design and construction: Principles of constructing a questionnaire/interview schedule, Types of questions, framing of questions, sequencing of sections and questions and Interview techniques

Qualitative Method: Walk through and observation (participatory and non-participatory), Social mapping, key informant interview, In-depth interviews, Focus group discussion, content analysis, free listing, pile sorting, mechanical devices (camera, tape recorder)

Applications of statistics in fisheries

UNIT – II

Probability and hypothesis

Probability and probability distributions-definition of probability - binomial, Poisson and normal distributions

Hypothesis testing and its applications in biological data-Null and Alternate Hypotheses, Errors in Hypothesis Testing-Critical Region and error probabilities Level of Significance-One Tailed and Two Tailed tests

Unit - III

Statistical test

Bivariate Data: Scatter diagram. Correlation coefficient and its properties, Correlation ratio. Rank– Spearman's and Kendall's measures of correlation. Principle of least squares, linear regression, fitting of curves reducible to polynomials by transformation. Multiple regression, Multiple and partial correlation coefficients.

Tests of significance: Z test, t test, F test, Chi-square test, ANOVA (one way and two way)

Non parametric test: Wilcoxon test, Mann-Whitney U-test, Kruskal and Wallis test and Friedman's test

Unit - IV

Use of computer software for data analysis

Computer applications: Analyses of data using Microsoft Excel and SPSS

References:

1. Chakravorti S.R. and Giri N.(1997): Basis Statistics South Asian Publishers New Delhi
2. Clarke G.M. and Cooke D.(1994): A Basic Course in Statistics Arnold London.
3. Goon A.M. Gupta M.K. and Dasgupta B. (1985): Fundamental of Statistics Vol. I The World Press Private Ltd. Calcutta.
4. Gupta S.C. and Kapoor V.K. (1986): Fundamental of Mathematical Statistics Sultan Chand and Sons Publishers
5. Whitlock, C. & Schluter, D. (2014). The analysis of biological data, 2nd Edition. Roberts and Company Publishers. ISBN 978-1936221486.
6. Dutta, N. K. (2004). Fundamentals of Biostatistics, Kanishka Publishers.
7. Gurumani N. (2005) . An Introduction to Biostatistics, MJP Publishers.
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Department of Aquatic Biology
M.Sc. (Aquatic Biology)
Syllabus – Semester II (Practical)
AQB 205: Fisheries Technology and Biostatistics

Total Hrs. 180

Unit I
Biochemical quantification of Protein, Lipid, Sugar and Ash in fish
Biochemical quantification of Protein, Lipid, Sugar and Ash in feed
Feed formulation by Pearson square formula

Unit II
DNA Staining using Schiff's reagent in aquatic plants
RNA staining by Pyronine-Y and toluidine blue in aquatic plants
Study of banding techniques with the help of images
Demonstration: Isolation of DNA from aquatic organism

Unit III
Determination of Age and Growth of fin fishes
Biometric study of fish
Study of different gears and crafts (models/ drawing)
Study of Remote sensing techniques with the help of images
Study of fish products and by-products with the help of images

Unit IV
Standard deviation, CV, SE, Independent t-test, Paired t-test, Chi square test, co-relation, regression, ANOVA
Visit to induced breeding farms/ processing plants

References :

1. Ravindranath, M. H. (1981). Manual of Research Methods for Crustacean Biochemistry and Physiology. CMFRI, Cochin-682018.
2. Nielsen, S. S. (2017). Food Analysis. Purdue University, Springer International Publishing.
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Raghavarao, D. (1983): Statistical Techniques in Agricultural and Biological Research. Oxford and IBH Publishing Co., Mumbai.

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Department of Aquatic Biology
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Syllabus - Semester-II
AQB- 206 Fish Products and Byproducts
(Skill based elective paper)

Total:30 Hrs

Unit- I

Principle of fish preservation and processing. Processing of fish by traditional methods – salting, sun drying, smoking, marinading and fermentation. Theory of salting, methods of salting – wet salting and dry salting. Drying and dehydration – theory, importance of water activity in relation to microbial growth. Sun drying and artificial drying – solar dryer.

Unit- II

Principles, specification, methods of preparation, packaging and storage of various fish products: Fish and prawn pickles, fish sauce and Fish paste, fish sausage, fish ham, surimi, fish cake, kamaboko battered and braided products fish finger, fish cutlet, fish wafer, and fish soup powder etc.

Unit- III

Principles, specification, methods of preparation, packaging and storage of various fish byproducts: fish oil, chitosan, fish protein concentrate, fish hydrolysate, fish silage, fish maws, Shark leather, Fish glue, Fish gelatin, Isinglass, Pearl essence, Shark fin rays, Beach-de-mer etc.

Unit- IV

Quality dimensions of seafood – sensory, intrinsic, quantitative and affective parameters. Importance of quality, definitions and terminologies. Application of HACCP concept in surveillance and quality assurance programmes for packaged and freeze-dried products.

References :

15. Gupta, S.K. and Gupta, P.C. (2002): General and Applied Ichthyology (Fish and Fisheries). S. Chand and Company, New Delhi.
16. Joseph, J. (2009): Post Harvest Technology of Freshwater Fish. Central Institute of Fisheries Technology, Cochin.
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