

SYLLABUS
FOR
M. Sc. (Aquatic Biology)
Semester III and IV

Submitted by

Department of Aquatic Biology
Veer Narmad South Gujarat University
Surat (Gujarat) 395007

Veer Narmad South Gujarat University

M.Sc. (Aquatic Biology) Semester – III

Teaching and Examination scheme

Theory Paper /Practical	Teaching schedule Hrs/week	Exam Schedule			Total marks Theory/ Practical	Credit
		Duration (hrs)	Internal marks	Theory / Practical (Uni)		
Theory papers :						
AQB: 301 – Fish Physiology and Endocrinology	4	3	30	70	100	4
AQB:302 – Biostatistics, Economics, Extension Education and Computer Application	4	3	30	70	100	4
AQB: 303 – Fisheries Technology – I	4	3	30	70	100	4
AQB: 304 – Fisheries Technology – II	4	3	30	70	100	4
Practicals :						
AQB: 305 – Fish Physiology, Biostatistics and Computer Application	4	5	30	70	100	4
AQB: 306 – Fisheries Technology	4	5	30	70	100	4
		Total	180	420	600	

**Veer Narmad South Gujarat University
Department of Aquatic Biology**

M. Sc. (Aquatic Biology) Semester – III

Syllabus

AQB : 301 – Fish Physiology and Endocrinology

Unit-I

Hrs 8

Digestion: Alimentary Canal and associated digestive glands (liver, pancreas and gall bladder), Mechanism of digestion

Respiration: Structure and function of gills, Mechanism of respiration, Haemoglobin - Oxygen Uptake and Dissociation, accessory respiratory organs

Unit-II

Hrs 10

Circulation: Blood and its components. Structure of heart and function

Excretion: Structure and function of kidney, nitrogenous end products and pattern of their excretion

Osmoregulation: Introduction, Osmoregulation in fresh water, marine water and estuarine fish

Unit-III

Hrs 10

Reproduction: Structure and function of Gonads, Reproduction and fecundity

Development: Fertilization, Incubation, Hatching, Larvae and Metamorphosis

Unit-IV

Hrs 12

Endocrinology: Fish Endocrine system (structure and functions of pineal, thyroid, pituitary gland) in fish

Hormonal control of Reproduction (oogenesis, spermatogenesis, oocyte maturation)

Pancreatic hormone in fish

Gonadotropin releasing hormone

Pheromone communication in fishes

Endocrinology of ecdysis in crustaceans

References:

- Evans, Devid H. (1998): Physiology of Fishes. R.R. Bowker Company, book trade association of Philadelphia.
- Hoar, W. S., Randal, D. J. and Farrell, A. P. (1992): Cardiovascular system, Vol. 12, Part 2 of Fish Physiology, Academic Press. INC London Ltd.
- Prosser, C. L. (1973): Comparative Animal Physiology, W. B Saunders Co., Philadelphia
- Khanna S.S. and Singh, H.R. (2003): A text book of fish biology and fisheries. Narendra publishing house, New Delhi – 110 006.
- Pandey A.K. and Sandhu G.S. (1992): Encyclopedia of fishes and fisheries of India Vol. I & IV, Amol publication, New Delhi.
- Smith, L.S. (1982): Introduction of fish physiology. Narendra publishing house, New Delhi.
- Yadav, B.N. (1995): Fish endocrinology. Daya Publishing House, New Delhi.
- Hoar, W. S. and Randal, D. J. (1993): Fish endocrinology Vol. I to VII. Academic press, INC (London) Ltd.
- Yadav, B. N. (2006): Fish & Fisheries, Daya Publishing House, New Delhi.
- Khanna S.S. (1989): An Introduction to Fishes. Central Book Depot, Allahabad.
- Nikolsky, G.Y. (1989): The ecology of fishes. Academic Press, London.

**Veer Narmad South Gujarat University
Department of Aquatic Biology**

M. Sc. (Aquatic Biology) Semester – III

Syllabus

**AQB : 302 - Biostatistics, Economics, Extension Education and
Computer Application**

Unit - I

Hrs 08

Fundamental of statistics, Sampling techniques, Standard deviation, Standard error, co- efficient of variation, Correlation and regression, Hypothesis testing (Student test, 't' test X² test and 'f' test), Analysis of variance (ANOVA)

Unit - II

Hrs 10

Economics: Introduction to Fishery Economics, Contribution of fisheries in the national economy, Economics of culture fisheries
Marketing: Classification and role of markets (local, state, national and international trade)
Role of Banks in fisheries development

Unit - III

Hrs 12

Fisheries Extension education: Introduction, history and concept, Fisheries extension education functionaries, Extension methods, Diffusion of innovation, communication, training strategies in transfer of technologies, role of farmers-extension and research linkages
Entrepreneurship development process
Cooperation: Principles, role, structure and organisation of fish cooperatives

Unit - IV

Hrs 10

Computer application: Introduction and definition of computer, Types of computers, Functional components of a computer system
Hardware: Input and Output devices, Introduction to window operating system, Introduction to word processing (MS office), 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:

- Panse, V. G. and Sukhatme, P.V. (1978): Statistical methods for agricultural workers, ICAR, New Delhi.
- Raghava Rao, D. (1983): Statistical techniques in agricultural and biological research, Oxford and IBH Publishing Co., Mumbai
- Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Ashok, C. (1984): Sampling theory of survey with application, Iowa State University Press, Ames Iowa, USA
- Biradar, R.S. (1986): Course manual on fisheries statistics, Central Institute of Fisheries Education, Mumbai
- Phillip K. (2010): Marketing Management, Prentice Hall of India Pvt. Ltd., New Delhi.
- Ian C. (1991): Marketing – In Fisheries and Aquaculture, Fishing News Books Ltd., England.
- Dennis A. Ray B. (2001): Al Halhorg and C. Ross, Marketing Principles and Practice, Pitman Publishing, London.
- Jolson, M. A. (1978): Marketing Management, Macmillan Publishing Inc., New Delhi.
- Amarchand and Varadharajan, B., (1984): An introduction to marketing, Vikash Publishing House, New Delhi
- Balagurusamy, E. (1989): Pogramming in ANSI C. Tata McGraw Hill Publication Co. New Delhi
- Megrey, B.A. and Moksness, E. (1996): Computer in Fisheries Research, 1st Ed. Champman and Hall, UK
- Sadler, C., Badgett, T. and Weingarten, J. (1997): Office 97 for Windows, BPB publication, New Delhi
- Trevor, A. (1995): Information technology. Pitman Publishing Co.
- Dahama, O.P. (1983): Extension and rural welfare. Ramprasad and Son's, Agra
- Dhote, A.K. (1989): Fisheries Management and Extension: Inland fisheries, instructional cum practical manual (VI) NCERT, New Delhi
- Lynton P.R. and Pareek, U. (1978): Training for development, Kumarian Press, 29 Bishop Road, West Hartford, Connecticut 06119
- Ray, G.I. (1991): Extension communication and management, Naya Prakash, Kolkatta
- Srivastva, U. K. and Vathsals, S. (1985): Strategy for development of Inland fishery resources in India: Key issues in production and marketing concept Pub. Co. New Delhi.
- Supe, S.V. (1986): An introduction to extension education, Oxford and IBH Publishing Co., New Delhi.

Veer Narmad South Gujarat University, Surat

M.Sc. (Aquatic Biology) Semester – III

Syllabus

AQB : 303 - Fisheries Technology I

Unit – I

Hrs 6

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

Unit –II

Hrs 12

Hybridization: Significance of hybridization, modification in genomic structure of hybrid off springs, characteristics of hybrids, natural and artificial hybridization, pond breeding of hybrids, stocking of hybrids in reservoir, Introducing of hybrids into sea

Unit –III

Hrs 10

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

Unit –IV

Hrs 12

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 and packaging
Effect of processing and preservation on nutritive aspects of fish
Major products and byproducts of fish and fisheries industries

References:

- Balachandran, K.K. (2001): Post harvest technology of fish and fish products, Daya publishing house, New Delhi.
- Biswas, S.P. (2002): Fundamental of Ichthyology, Narendra publishing house, Delhi.
- Deekshatulu, B.L. and Rajan, Y.S. (1984): Remote sensing, Indian academy of sciences, Bangalore
- Gupta, S.K. and Gupta, P.C. (2002): General and applied Ichthyology (Fish and fisheries), S. Chand and company, New Delhi.
- Harrison, P.J. and Parsons, T. R. (2000): Fisheries oceanography, Blackwell science.
- Jhingran, V.G. (1991): Fish and fisheries of India, Hindustan Publishing Corporation, Delhi.
- Joseph, J. (2009): Post harvest technology of freshwater fish, Central Institute of fisheries technology, Cochin
- Malvi, S. (2008): Fish genetics, SBS publishers and distributors Pvt. Ltd., New Delhi.
- Meenakumari, B. (2009): Handbook of fishing technology, Central Institute of fisheries technology, Cochin
- Rao, D.P. (1995) : Remote sensing for earth resources, Association of exploration geophysicists, Hyderabad
- Rath, R. K. (2000): Freshwater aquaculture, Scientific publishers, Jodhpur
- Sabins, F.F. (1997): Remote sensing, Principles and interpretation, W.H. Freeman & Co., New Delhi
- Sharma, O.P. (2009): Handbook of fisheries and aquaculture, Agrotech publishing academy, Udaipur
- Yadav, B.N. (1997): Fish and fisheries, Daya publishing house, Delhi

Veer Narmad South Gujarat University, Surat

M.Sc. (Aquatic Biology) Semester – III

Syllabus

AQB : 304 – Fisheries Technology II

Unit – I Hrs 10

Hatcheries: Traditional, Circular, Prawn hatcheries and hatchery management

Unit- II Hrs 8

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

Unit - III Hrs 8

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 - IV Hrs 14

Fishing methods: Traditional, conventional and nonconventional fishing methods

Fishing gears: active and passive gears

Fishing crafts: mechanized and non-mechanized fishing crafts

References:

- Agrawal, S.C. (1994): A hand book of fish farming, Narendra publishing house, Delhi
- Balachandran, K.K. (1998): Advances and priorities in fisheries technology, Cohin
- Biswas, S.P. (2002): Fundamentals of Ichthyology, Narendra publishing house Delhi.
- Felix, S. (2007): Aquaculture management techniques, Narendra publishing house, New Delhi
- Gupta, S.K. and Gupta, P.C. (2002): General and applied Ichthyology (Fish and fisheries), S. Chand and company, New Delhi.
- Jhingran, V.G. (1991): Fish and fisheries of India, Hindustan Publishing Corporation, Delhi.
- Khana, S.S. and Singh, H.R. (2003): A text book of fish biology & fisheries, Narendra publishing house, Delhi.
- Krjstjonsson, H. (1959): Modern fishing gear of the world Vol. I, II & Vol. III, Fishing news (books).Ltd., England
- Moyle, P.B. (2002): Fishes-An Introduction to Ichthyology, prentice hall Inc NJ 07458
- Nikolsky, G.V. (1999): Ecology of fishes, Allied scientific publishers, Bikaner
- Rath, R. K. (2000): Freshwater aquaculture, Scientific publishers, Jodhpur
- Regenstein, J.M. and Regenstein, C.E. (1997): Introduction to fish technology, CBS publishers and distributors, New Delhi.
- Sreekrishna, Y. and Shenoy, L. (2001): Fishing gear and craft technology, Indian Council of Agricultural Research, New Delhi.
- Welcomme, R.L. (2007): Inland fisheries, Discovery publishing house, New Delhi
- Yadav, B.N. (1997): Fish and fisheries, Daya publishing house, Delhi
- Yadav, N.K. (2009): Management practices in fish farming, Manglam publications, Delhi.

Veer Narmad South Gujarat University, Surat

M.Sc. (Aquatic Biology) Semester – III

Syllabus (Practical)

AQB : 305 – Fish physiology, Biostatistics and Computer Application

- Study of permanent slides (Stomach, Intestine, Ovary, Testis and Pituitary gland)
- Study of oral region and associate structures (Gill rakers, buccopharynx) and gut content analysis
- Measurement of Fecundity, egg diameter and gonadosomatic index
- Osmoregulation in crabs
- Exercises in probability and distribution
- Problems in analysis of variance, correlation and regression
- Preparation of AV aids
- Word processing by using MS word, MS excel and MS power point
- Visit to fisheries organizations / Fish Markets

Veer Narmad South Gujarat University, Surat

M.Sc. (Aquatic Biology) Semester – III

Syllabus (Practical)

AQB : 306 – Fisheries Technology

- Growth of molluscan shell
- Biometry of fish
- Study of Remote sensing techniques with the help of images
- Study of different gears and crafts (models/drawing)
- Determination of Age and growth using hard parts
- Study of haematological parameters (RBC, WBC, Haemoglobin content, Haematocrit value)
- Isolation of pituitary gland and its extract preparation.
- Study of fishery products and byproducts
- Visit to processing plant/ hatcheries