

COURSE STRUCTURE AND SYLLABI

B.F.Science

2017-18 Batch



Centurion

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Shaping Lives... Empowering Communities...

**M.S.SWAMINATHAN SCHOOL OF AGRICULTURE
CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT
Odisha-761211, INDIA,**

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B.F.Sc. Degree Programme
M. S. Swaminathan School of Agriculture
Centurion University of Technology and Management

Course structure

First Semester

Course No	Course title	Credits
FSAQ 1101	Principles of Aquaculture	2(1+1)
FSRM 1101	Taxonomy of Finfish	3(1+2)
FSRM1102	Taxonomy of Shellfish	2(1+1)
FSEM1101	Meteorology, Climatology and Geography	2(1+1)
FSEE1101	Statistical Methods	3(2+1)
FSAQ1112	Fundamentals of Biochemistry	3(2+1)
FSHM1107	Fundamentals of Microbiology	3(2+1)
FSEM1102	Soil and Water Chemistry	3(2+1)
FSPT1101	Fish in Nutrition	1(1+0)
FSCC1101	Swimming CNC*	1(0+1)
	Total	22(13+9)

*CNC= Compulsory non-credit course.

SEMESTER – I

1. Principles of Aquaculture **[FSAQ 1101]** **2(1+1)**

Theory

Basics of aquaculture, definition and scope. History of aquaculture: Present global and national scenario. Aquaculture vs Agriculture. Systems of aquaculture - pond culture, pen culture, cage culture, running water culture and zero water exchange system,. Extensive, semi-intensive, intensive and super intensive aquaculture in different types of water bodies viz., freshwater, brackish water inland saline and marine water. Principles of organic aquaculture. Pre-stocking and post stocking pond management. Carrying capacity of pond, factors influencing carrying capacity. Criteria for selection of candidate species for aquaculture. Major candidate species for aquaculture: freshwater, brackish-water and marine. Monoculture, polyculture and integrated culture systems. Water and soil quality in relation to fish production. Physical, chemical and biological factors affecting productivity of ponds.

Practical

Aquaculture production statistics- world and India. Aquaculture resources of world and India. Components of Aquaculture farms. Estimation of carrying capacity. Practices on pre-stocking and post stocking management. Growth studies in aquaculture system. Study on waste accumulation in aquaculture system (NH₃, Organic matter, CO₂). Analysis of manure.

References

1. Aquaculture principles and practices ----TVR Pillay and MN Kutty
2. Encyclopedia of aquaculture ----RR Stickney
3. Hand book fisheries and aquaculture----ICAR New Delhi 2006
4. Sustainable aquaculture ---- BB Jena and Carl D. Webster
5. Hand book of fisheries and aquaculture ---- NIR Board of Consultants (Asia Pacific press)

2. Taxonomy of Finfish

[FSRM 1101]

3(1+2)

Theory

Principles of taxonomy. Nomenclature, types. Classification and interrelationships. Criteria for generic and specific identification. Morphological, morphometric and meristic characteristics of taxonomic significance. Major taxa of inland and marine fishes up to family level. Commercially important freshwater and marine fishes of India and their morphological characteristics. Introduction to modern taxonomic tools: karyotaxonomy, DNA barcoding, protein analysis and DNA polymorphism.

Practical

Collection and identification of commercially important inland and marine fishes. Study of their external morphology and diagnostic features. Modern taxonomic tools - Protein analysis and electrophoretic studies; Karyotaxonomy - chromosome preparation and identification. DNA barcoding, DNA polymorphism; Visit to fish landing centres to study commercially important fishes and catch composition.

References

1. Commercial Sea fishes of India – Talwar and Kicker
2. Inland fishes (Vol 1) ----Jhingram and Talwar
3. Inland fishes (Vol 2) ----Jhingram and Talwar
4. Fresh water inland fishes of India--- K.C. Jayaraman

3. Taxonomy of Shellfish

[FSRM 1102]

2(1+1)

Theory

Study of external morphology and meristic characteristics of crustacea and mollusca. Classification of crustacea and mollusca up to the level of species with examples of commercially important species.

Practical

Study of external morphology. Collection, preservation and identification of commercially important prawns, shrimps, crabs, lobsters, bivalves, gastropods, cephalopods from natural habitats. Field visits for collection and study of commercially important shellfishes.

References

1. Identification of shell fishes ----FAO
2. Prawn and prawn fisheries of India ----Kurne and Sabastian

3. Identification of shell fishes and Molluscs --- CMRI Special publication

4. Meteorology, Climatology and Geography

[FSEM 1101]

2(1+1)

Theory

Nature of Atmosphere: weather and climate; composition of atmosphere; structure of atmosphere. Heat energy of atmosphere: process of heat transmission; heating of atmosphere; disposal of insulation; irregular heating of atmosphere. Temperature: Temperature instruments; periodic, horizontal and vertical temperature variations; effects of vertical air motion on temperature. Humidity and water vapour: relationship between temperature and humidity; distribution of water vapour in atmosphere; evaporation, humidity instruments and measurements. Condensation and precipitation: process of conditions of condensation, forms of condensation; precipitation; forms of precipitation, measurement of precipitation; rainfall in India. Clouds and thunderstorms: amount of cloudiness; ceiling; classification of clouds; conditions of cloud formation; reporting and identification of clouds; thunderstorms. Atmospheric pressure: meaning of atmospheric pressure; the laws of Gases; pressure units; pressure instruments; vertical, horizontal and periodic variations; isobars and pressure gradients. Wind: characteristics of wind motion; wind observation and measurement; wind representation; factors affecting wind motion. Terrestrial or planetary winds: ideal planetary wind system; planetary pressure belts. Planetary wind system; secondary winds; monsoon winds; land and sea breeze. Tropical cyclones: storm divisions; pressure and winds; vertical structure of storm centre; hurricane, sea, swell and surge; hurricane warning. Weather forecasting: forecasting process; forecasting from local indications; role of satellite in weather forecasting; synoptic weather charts. Effects of climate change on fisheries sector. Introduction to Geography: shape, size and structure of the earth; concepts of latitude, longitude and great circles; model globe, maps and different types of projections; cartography; landscape.

Practical

Graphic representation of structure of atmosphere; physical layering and compositional layering. Temperature instruments: simple thermometers; Six's Max-Min Thermometer; thermograph. Isotherms: world mean temperatures-January to July. India mean temperatures - January to July. Humidity measurement: hygrometer; psychrometer; relative humidity; dew point. Condensation: observation and identification of various types of clouds. Depicting sky picture. Precipitation: measurement of rainfall using rain gauge. Mapping Indian monsoons: south-west monsoon and rainfall in June, North-east monsoon and rainfall in December; isohyets. Atmospheric pressure measurement: Fortin's mercurial barometer; Aneroid barometer. Isobars: India mean pressure - Jan to July. Wind observation and measurement: wind vane; cup anemometer. Ideal terrestrial/planetary pressure and wind systems: diagrammatic representation. Geography: The Earth: diagrammatic representation of shape, size, structure, zones, latitudes, longitudes and great circles. Typical landscape mapping; map reading. Geographical terms used in landscape.

References

1. Meteorology -- Dr S.R. Ghadekar
2. Physical geography ---- Indra Singh
3. Meteorology ---- Dr Jaman Joseph (CIFNET)
4. Tropical meteorology ---- H. Rahil
5. Physical geography (Oceanography) --- K. Bharadwaj

5. Statistical Methods

[FSEE 1101]

3(2+1)

Theory

Definition of statistics, Concepts of population, sample, Census and sample surveys, Classification of data, frequency and cumulative frequency table. Diagrammatic and graphical representation of data - bar diagrams, pie-diagram, histogram, frequency polygon, frequency curve and Ogives. Important measures of central tendency - arithmetic mean median and mode. Relative merits and demerits of these measures. Important measures of dispersion, Range, Mean Deviation, Variance and Standard Deviation. Relative merits and demerits of these measures. Coefficient of variation; Normal Curve, Concepts of Skewness and kurtosis.

Definitions of probability, mutually exclusive and independent events, conditional probability, addition and multiplication theorems. Random variable, concepts of theoretical distribution; Binomial, Poisson and Normal distributions and their use in fisheries. Basic concept of sampling distribution; standard error and central limit theorem. Introduction to statistical inference, general principles of testing of hypothesis, types of errors. Tests of significance based on Normal, t, and Chi-square distributions. Bivariate data, scatter diagram, simple linear correlation, measure and properties, linear regression, equation and fitting; relation between correlation and regression, Length weight relationship in fishes; applications of linear regression in fisheries. Methodology for estimation of marine fish landings in India, Estimation of inland fish production in India and problems encountered.

Practicals

Construction of questionnaires and schedules. Diagrams and frequency graphs. Calculation of arithmetic mean, median, mode, range, mean deviation, variance, standard deviation. Exercises on probability, Binomial and Poisson distributions, Area of normal curve, confidence interval for population mean, Test of hypothesis based on normal, t, and chi-square. Computation of Simple correlation and regression. Fitting of length - weight relationship in fishes.

References

1. Sampling theory of surveys with applications –P.V. Sukhatme and B.V. Sukhatme
2. Statistics, a introducing –D.A.S. Fraser
3. Statistics for biologists --- R.C. Compbell
4. A first courses in statistics with application ---A.K.P.C. Swain
5. Economics of bio statistics --- S.Prassad
6. Fundamental of mathematics statistics ---S.C.Gupta / V.K.Kapoor
7. Fisheries statistics ----R.C.Biradar

6. Fundamentals of Biochemistry

[FSAQ 1112]

3(2+1)

Theory

A brief introduction to developments in biochemistry and its transformation to molecular biology. Cell structure, water and major molecules of life. Carbohydrate chemistry: Structure, classification, functions (mono, di and polysaccharides) isomerism and mutarotation. Metabolism of carbohydrates: glycolysis, gluconeogenesis, glycogenolysis, glycogenesis, TCA cycle, central role of TCA cycle in metabolism. Protein chemistry: classifications and functions. Classification, structure, function and properties of amino acids. Essential and non essential amino acids. Primary, secondary, tertiary and

quaternary structure of proteins. Amphoteric property. Biuret reaction and xanthoproteic reaction. Digestion and absorption of proteins. Classification, structure, functions and properties of lipids. Essential fatty acids and phospholipids. Digestion and absorption of lipids. Lipid autooxidation. Significance of Omega-3 and Omega-6 fatty acids. Enzymes: nomenclature; classification; specificity; mechanism of enzyme action; kinetics and regulation of enzyme activity. Steroid and peptide hormones- chemistry and function. Structure and functions of fat and water soluble vitamins. Vitamins – classification- functions. Minerals– classification – functions. Nucleic acids: Structure function and importance genetic code. Transcription and translation. Protein synthesis. Energy changes in chemical reactions, reversible and irreversible reactions in metabolism.

Practical

Preparation of normal solution of acid and base, buffers and reagents. Qualitative determination of carbohydrates, proteins and lipids. Estimation of total nitrogen and crude protein of fish tissue. Estimation of carbohydrates in foods. Determination of specific gravity of oil. Extraction and estimation of total lipids in fish tissue. Determination of saponification value, iodine value and free fatty acid value.

References

1. Biochemistry—A.L. Lehninger
2. Biochemistry -L. Stryer
3. Harper's Biochemistry --- R.K. Murray and others
4. Biochemistry ---D. Voet and J.G. Voet
5. Elements of Bio chemistry--- H.S. Srivastava
6. Howks physiological chemistry B.L. Oser

7. Fundamentals of Microbiology

[FSHM 1107]

3(2+1)

Theory

Milestones in microbiology. Contributions of Leeuwenhoek, Louis Pasteur, Robert Koch, Alexander Flemming, Joseph Lister, Winogradsky. Microscopy- Principle and construction of Brightfield, dark field, phase contrast, stereo, SEM and TEM. Microbial taxonomy –Bergey's and molecular taxonomy. Types of Microorganisms: Prokaryotes– Morphology and ultrastructure of bacterial cell. General features, types and importance of viruses, cyanobacteria, actinomycetes, archae, mycoplasma, rickettsiae. Eukaryotes – Diagnostic features and importance of fungi and protozoa. Microbial Techniques - Types of media, types of sterilization - physical and chemical agents, cultivation of microorganisms, staining techniques – simple, differential, structural staining; enumeration of microorganisms, culture preservation methods. Bacterial metabolism: Nutrient requirements, nutritional types, bacterial photosynthesis and their ecological significance. Microbial growth: Growth phases, measurement of cell growth, factors affecting growth- influence of physico-chemical factors - pH, temperature, moisture, light, osmotic pressure, fermentation- types and significance. Microbial genetics- general principles, genetic recombination, transformation, transduction and conjugation. Plasmids- types and their importance. Mutation–types and significance. Microbial ecology: Introduction and types of interaction, extremophiles and their significance.

Aquatic Microbiology: Introduction and scope of aquatic microbiology, aquatic environments as habitat for microorganisms - bacteria, cyanobacteria, fungi, algae, parasites and viruses; distribution of microorganisms and their biomass in rivers, lakes, sea and sediment. Influence of physical, chemical and biological factors on aquatic microbes. Microbial biofilms. Role of microbes in the production and breakdown of organic matter. Role of microbes in sedimentation and mineralization process. Nutrient cycles - carbon, nitrogen, sulphur, phosphorus, iron, and manganese cycles. Sewage microbiology, self purification in natural waters, sewage treatment, drinking water microbiology, sanitary quality of water for aquaculture, bioremediators. Economic significance of aquatic microbes.

Practical

Handling of microscopes, Wet mount, smear and hanging drop preparations. Micrometry - Determination of size of micro organisms (ocular, stage micrometers). Tools and techniques in sterilization methods: Filtration, dry heat, moist heat, chemical agents. Cultivation technique: Media preparation, Isolation - pure culture, subculture. Observation of fungi, blue-green algae, and protozoans. Staining techniques for bacteria - simple, differential, structural and Biochemical tests: Indole, methyl red, Voges-Proskauer, citrate test, oxidase test, catalase tests. Collection of water and sediment samples for microbiological analysis, Winogradsky cylinder, Isolation, identification and enumeration of various groups of microorganisms from different water bodies including aquaculture systems.

Study of bacteria involved in nutrient cycles. Biofilms, water testing for potability, enumeration of coliform. Antibiotic sensitivity of bacteria - antibiotic sensitivity test - disc diffusion method.

References

1. Brock Biology of Micro organisms - Michael T. Madigan, John M. Martinko, Jack Parker
2. Microbiology --- Lancing M. Prescott, John P Harley, Donald A. Klein
3. Microbiology - Michel J Pleczar / Jr. E. C. S. Chan, Noel R. Krieg
4. Microbiology essentials and applications --- Larry Mc Kane / Judy Kandel
5. Fundamentals, principles of bacteriology --- A. J. S. Salle
6. General Microbiology -- Hans G. Schlegel
7. Microbiology - A laboratory manual ----- James G. Cappuccine, Netelie Sherman

7. Soil and Water Chemistry

[FSEM 1102]

3(2+1)

Theory

Analytical chemistry: principles, applications and types. Classical methods of analytical chemistry, volumetry and gravimetry. Solutions: Standard solutions, titration, indicators, dilute solutions, units of concentration: standard curve; nomograph.

Chemistry of water: the water molecule, properties of pure water, fresh water and sea water. Composition of waters: surface water, ground water and sea water. Dissolved gases: Factors affecting natural waters. Acid, base, salts: Hydrogen ions, modern concept of pH and buffer.

Water analysis: collection and preservation of water samples. Measurement of temperature, transparency, turbidity, determination of pH, electrical conductivity, salinity, chlorinity, total solids (TDS, TSS, TVS, TVDS), dissolved oxygen, free carbon dioxide, total alkalinity, total hardness, Calcium, Magnesium, Inorganic Nitrogen (Ammonium and Nitrate) and phosphorus. Water quality criteria/ requirements for Aquaculture.

Soil Chemistry: origin and nature of soils. Physical properties of soil; soil colour, texture, structure, pore size, bulk density, water holding capacity. Soil types and their distribution. Soil chemistry: soil colloids, cation exchange, organic carbon, Carbon - Nitrogen ratio, soil fertility. Soil reaction: acidity, alkalinity, conductivity, redox - potential. Submersed soils: wet lands, peat soils, fluxes between mud and water, methane and hydrogen sulphide formation. Saline soils, Alkali soils, acid sulphate soils, iron pyrites, soil reclamation. Soil analysis: collection and preparation of soil samples. Determination of soil texture, water holding capacity, pH, conductivity, organic carbon, nitrogen, phosphorus, lime requirement. Soil and water amendments: lime manures, fertilizers, micronutrients, zeolites, alum, gypsum. Environmental ameliorative: chlorination, deodorizers, bacterial formulation. Soil quality criteria/ requirements for aquaculture.

Practical

Principles of Titrimetry, Gravimetry, Potentiometry, Conductometry, Refractometry, Colourimetry, Turbidimetry, Spectrophotometry (UV, Visible, Flame, AAS), computerized instrument system. Demonstration: demonstration of laboratory glass wares and equipment used in water and soil analysis. Water analysis: measurement of temperature, turbidity, determination of pH and EC. Determination of salinity, Chlorinity, Total solids, Redox potential, DO, Free CO₂. Determination of total alkalinity, hardness. Determination of inorganic nitrogen, and phosphorus. Soil analysis: Determination of soil texture, soil pH, conductivity, soil available nitrogen, available phosphorus, and organic carbon.

References

1. Bottom soil, sediment and pond aquaculture --- Claude E. Body
2. Fundamentals of Soil --- V.N. Sahai
3. Text book of Soil science --- R.K. Mehra
4. Soil ---- FAO training series
5. Water quality in ponds for aquaculture -- Claude E. Body
6. Fresh water fish culture --- V.R.P. Sinha and V. Ramachandran
7. A hand book of soil, fertilizer and manure – P.K. Gupta

8. Fish in Nutrition

[FSPT 1101]

1(1+0)

Theory

Composition of fish with emphasis on nutritional value. Concept of Biological value, Protein Efficiency ratio, Net protein utilization. Amino acids of fish and shellfishes and importance of essential amino acids. Fish lipids: fatty acids, nutritional quality. Role of fish lipids in human nutrition. Non-protein nitrogen substances in fishes. Vitamins in fish: water soluble, fat soluble, significance in human nutrition. Minerals in fish: micro- and macro-elements, trace elements, significance in human nutrition. Other functional bio-molecules in fish – peptides, collagen and squalene. Effect of different kinds of cooking fish i.e. curry, frying, steaming, smoking, fermentation on nutrition value.

References

7. Biochemistry—A.L.Lehninger
8. Biochemistry -L.Stryer
9. Harper's Biochemistry --- R.K.Murray and others
10. Biochemistry ---D.Voet and J.G.Voet
11. Elements of Bio chemistry--- H.S. Srivastava
12. Howks physiological chemistry B.L.Oser

9. Swimming

[FSCC 1101]

1(0+1)

Practical

History, hazards in water and safety precautions; pool maintenance and water quality control. Learning swimming, understanding and practice of ducking the head, kicking action, holding breath under water and various strokes (free style, breast stroke, butterfly, back stroke); competitive swimming-relays and medleys, lap time practice, swimming and floating aids and their uses; diving-styles of diving, rules, regulations and precautions. Methods of life saving in water; Boating, canoeing and sailing: types, maintenance, skill development, rules and regulations and practice