B.Sc. FISHERIES BIOLOGY SYLLABUS UNDER CBCS
(With effect from 2016-2017)
IV - SEMESTER
PAPER IV – FISH NUTRITION (Theory)

Max. Marks: 60

UNIT I – Nutrition and fish feed

1.1. Nutritional requirements of cultivable fish.
1.2. **Natural food:** Importance in aquaculture; Fish food organisms – acterioplankton, phytoplankton and zooplankton and their role in larval nutrition.
1.3. **Supplementary feeds:** Types of feeds - Wet feed, moist feed, dry feed, mashes, pelleted feeds - floating and sinking pellets, microencapsulated diets.
1.4. **Feed additives:** Binders, antioxidants, enzymes, pigments, growth promoters, feed stimulants; use of preservatives.

UNIT II - Nutritional biochemistry

2.1. Principles of fish nutrition and terminologies
2.2. Classification of nutrients - nutrient quality and evaluation of Proteins, lipids and carbohydrates.
2.3. Digestive enzymes and feed digestibility.
2.4. Factors affecting digestibility. Nutritional deficiency diseases.

UNIT III – Nutritional bioenergetics

3.1. Energy requirement of fishes, protein to energy ratio, digestible energy,
3.2. Nitrogen balance index, protein sparing effect, high energy feeds, isocaloric diets.
3.3. Metabolic rate - Energy budgets; Energy efficiency of fish production.
3.4. Protein efficiency ratio, net protein utilization and biological value.

UNIT IV – Feed manufacture, feeding strategies and feed evaluation

4.1. Forms of feeds: wet feeds, moist feeds, dry feeds, mashes, pelleted feeds, Floating and sinking pellets.
4.2. Feed additives: binders, antioxidants, enzymes, pigments, growth promoters, feed stimulants and shellfish. Feed formulation and manufacturing.
4.3. Feed storage, use of preservatives and antioxidants.
4.4 Feed evaluation - feed conversion ratio, feed efficiency ratio

REFERENCE BOOKS

1. ADCP(AquacultureDevelopment&Co-ordinationProgram).1980.*Fish Feed Technology*.ADCP/REP/80/11FAO
2. Cyrino EP, Bureau D & Kapoor BG. 2008. *Feeding and Digestive Functions in Fishes*. Science Publ.
3. D' Abramo LR, Conklin DE & Akiyama DM. 1977. *Crustacean Nutrition: Advances in Aquaculture*. Vol. VI. World Aquaculture Society, Baton Roughe.
4. De Silva SS & Anderson TA. 1995. *Fish Nutrition in Aquaculture*. Chapman & Hall Aquaculture Series.
5. Elena M. 2003. *Nutrition, Physiology and Metabolism in Crustaceans*. Science Publishers.
6. Guillame J, Kaushik S, Bergot P & Metallier R. 2001. *Nutrition and Feeding of Fish and Crustaceans*. Springer Praxis Publ.
7. Halver J & Hardy RW. 2002. *Fish Nutrition*. Academic Press.
8. Halver JE & Tiews KT. 1979. *Finfish Nutrition and Fish feed Technology*. Vols. I, II Heenemann, Berlin.
9. Hertrampf JW & Pascual FP. 2000. *Handbook on Ingredients for Aquaculture Feeds*. Kluwer.
10. Houlihan D, Boujard T & Jobling M. 2001. *Food Intake in Fish*. Blackwell.
11. Jobling M. 1994. *Fish Bioenergetics*. Chapman & Hall.
12. Lavens P & Sorgeloos P. 1996. *Manual on the Production and Use of Live Food for Aquaculture*. FAO Fisheries Tech. Paper 361, FAO.
13. Nelson DL & Cox MM. 2005. *Lehninger Principles of Biochemistry*. WH Freeman.
14. New MB. 1987. *Feed and Feeding of Fish and Shrimp. A Manual on the Preparation and Preservation of Compound Feeds for Shrimp and Fish in Aquaculture*. FAO – ADCP/REP/87/26
16. Ojha JS. 2005. *Aquaculture Nutrition and Biochemistry*. Daya Publ.

Practical-40 Marks

1. Proximate composition analysis of feed ingredients and feeds.
2. Preparation of artificial feeds using locally available feed ingredients.
3. Determination of sinking rate and stability of feeds.
4. Effect of storage on feed quality.
5. Identification of common feed ingredients.
6. Proximate analysis-: Moisture, Crude Protein, Crude Lipid, Ash, Acid insoluble ash, Nitrogen free extract of feed fish tissue, Fatty acid analysis, Calcium, Phosphorus content of feed.

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