

B.SC. SEMESTER-III
INDUSTRIAL FISH AND FISHERIES

Core Course No. : UFITC 301
Core Course Title: AQUACULTURE
CREDITS : 4

UNIVERSITY OF JAMMU
Syllabi and Course of Study in Industrial Fish & Fisheries
For the examination to be held in Dec. 2017, Dec. 2018 and Dec. 2019
UNDER CHOICE BASED CREDIT SYSTEM

| | | |
|----------------------------|---|-----------------------------|
| 1. Course /Paper Title | : | Aquaculture (Theory) |
| 2. Maximum Marks | : | 100 |
| i) External (Univ. Exam.) | : | 80 |
| ii) Internal Assessment | : | 20 |
| 4. Minimum Pass Marks | : | |
| i) External | : | 29 |
| ii) Internal | : | 07 |
| 5. Duration of Univ. Exam. | : | 2½ Hrs. |

Syllabus - Theory

Unit–I Basics of Aquaculture

- 1.1 Definition and History of aquaculture
- 1.2 Status and importance of aquaculture
- 1.3 Aquaculture practices
 - 1.3.1 Extensive, Semi-intensive and Intensive aquaculture
 - 1.3.2 Cage and Pen culture
 - 1.3.3 Composite culture
 - 1.3.4 Integrated fish farming
- 1.4 Criteria of selection of Cultivable Fish Species

Unit–II Preparation of Culture Ponds

- 2.1 Criteria of selection of suitable site for fish farms
- 2.2 Different types of ponds (Nursery, Rearing and Stocking ponds)
- 2.3 Preparation of Ponds
 - 2.3.1 Control of aquatic insects
 - 2.3.2 Control of aquatic weeds
 - 2.3.3 Fertilization of ponds
- 2.4 Procurement and stocking of Seeds

Unit-III Fish Feed and Breeding Technology

- 3.1 Artificial feeding and its importance in aquaculture
- 3.2 Manufacture and formulation of fish feed
- 3.3 Feeding techniques (manual and mechanical)
- 3.4 Induced breeding
- 3.5 Design and working of Circular Hatchery
- 3.6 Bundh breeding (Dry and Wet bundh)

Unit-IV Fish Biotechnology and Health Management

- 4.1 Cryopreservation of gametes
- 4.2 Transgenic fish
- 4.3 Fish diseases and diagnosis
 - 4.3.1 Bacterial diseases – Furunculosis, Columnaris
 - 4.3.2 Fungal diseases – Saprolegniasis, Branchimycosis
 - 4.3.3 Protozoan diseases – Ichthyophthiriasis, Costasis
- 4.4 Fish immunization and vaccination

Unit-V Aquaculture practices

- 5.1 Cultural practices of fresh water prawn (*Macrobrancium rosenbergii*)
- 5.2 Trout culture
- 5.3 Culture of mussels
- 5.4 Pearl oyster culture
- 5.5 Culture of seaweeds

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

Internal Assessment Test (20 marks)

The internal assessment under Choice Based Credit System shall be of 1 hour duration and shall comprise of two parts.

Part A: Total weightage of Part A will be 10 marks and shall comprise of 8 short questions selecting atleast from 2 to 3 units (50% of syllabus covered). A candidate will have to attend any 5 questions each carrying 2 marks.

Part-B: Total weightage of Part-B will be 10 marks and shall comprise of 2 long answer questions from first 2 to 3 units. A Candidate will have to attempt only 1 question of 10 marks.

Note 2: For paper setters :External End Semester University Examination

The External examinations in theory shall consist of the 3 sections.

Section A:Section-A shall be of 15 marks and will comprise of 5 short answer type questions, one from each of the units and carrying 3 marks each. Answers should be precise having 70 to 80 words only and without any detailed explanation (**All Compulsory**).

Section B:Section-B shall be of 35 marks and will comprise of 5 medium answer type questions, one from each of the units and carrying 7 marks each. Answers should be comprehensive having 250 to 300 words only and with detailed explanation (**All Compulsory**).

Section C:Total weightage of Section-C shall be 30 marks and will comprise of 5 long answer type questions, one from each of the units. A candidate will have to attempt only 2 questions from all the questions and will carry 15 marks each. Answers should be of 500 to 600 words with detailed analysis/explanation/critical evaluation to the question.

Books Recommended

1. Jhingran, V.G. (1985) Fish and Fisheries of India
2. Rath, R.K. (2000) Freshwater Aquaculture
3. Gupta, S.K and Gupta, P.C (2008) General and applied ichthyology (Fish and Fisheries)
4. Ayyappan, S (2010) Handbook of Fisheries and Aquaculture
5. Pillay, T.V.R (1993) Aquaculture Principles and Practicies
6. Srivastava, C.B.L (2006) Atextbook of fishery science and Indian fisheries
7. Paulraj, R (1997) Aquaculture feed

B.SC. SEMESTER-III

Core Course No. : UFIPC 302

Core Course Title: AQUACULTURE (PRACTICAL)

CREDITS : 2

1. Analysis of following parameters of water sample
 - (a) Dissolved oxygen
 - (b) P^H
 - (c) CO₂
 - (d) Alkalinity
 - (e) Hardness
2. Preparation of culture ponds
3. Morphological study of important culturable finfishes
4. Morphological study of important culturable shellfish species
5. Collection and identification of
 - (a) Aquatic insects
 - (b) Weeds
 - (c) Local fishes
6. Formulation of fish feed using locally available ingredients
7. Visit to different aquaculture systems
 - (a) Carp fish farm
 - (b) Trout fish farm
 - (c) Mahseer farm
8. Design and working of Hatcheries
9. Identification of fish seed
10. Packing of fish seed for stocking
11. Preparation of charts/models of different aquaculture systems
12. Visit to different hatcheries to observe breeding and hatching technology

Note: There will be practical papers of 50 marks.

Internal Practical Assessment: 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance, 20% (5 marks) for viva and 20% (5 marks) for internal test and 40% (10 marks) for day-to-day performance.

External Practical Assessment: 50% (25 marks) shall be reserved for external assessment including 20% (5 marks) for viva and 80% (20 marks) for practical paper.

B.SC SEM III (INDUSTRIAL FISH & FISHERIES)
SKILL ENHANCEMENT COURSE

CARP CULTURE

SEC Course No. : UFITS 303

SEC Course Title: Carp Culture

CREDITS : 4

UNIVERSITY OF JAMMU

Syllabi and Course of Study in Industrial Fish & Fisheries

For the examination to be held in Dec. 2017, Dec. 2018 and Dec. 2019

UNDER CHOICE BASED CREDIT SYSTEM

| | | |
|----------------------------|---|---------------------|
| 1. Course /Paper Title | : | Carp culture |
| 2. Maximum Marks | : | 100 |
| i) External (Univ. Exam.) | : | 80 |
| ii) Internal Assessment | : | 20 |
| 4. Minimum Pass Marks | : | |
| i) External | : | 29 |
| ii) Internal | : | 07 |
| 5. Duration of Univ. Exam. | : | 2½ Hrs. |

UNIT - I Introduction to Carps

13 hours

1.1 Characteristics and importance of carps

1.2 Morphological characters of important cultivable carps

 1.2.1 Indigenous carps – IMCs (Indian Major Carps)

 1.2.2 Exotic carps – Chinese carps (Silver carp, Grass carp, Common carp)

1.3 Breeding habits of Indian major carps

UNIT – II Pond preparation

13 hours

2.1 Types of ponds (Nursery, rearing and stocking ponds)

2.2 Preparation of ponds

 2.2.1 Removal of weeds

2.2.2 Control of predators

2.2.3 Liming and fertilization

Unit-III Stocking of Seed

13 hours

3.1 Different stages of carp seed (Spawn, Fry and Fingerlings)

3.2 Stocking of carp seed (stocking density, stocking time and acclimatization)

3.3 Nursery management

UNIT – IV Food and Feeding

13 hours

4.1 Nutritional requirement of carps

4.2 Formulation of fish feed

4.3 Feeding methods

4.3.1 Manual method

4.3.2 Mechanical method

Unit-V Maintenance of Stock

13 hours

5.1 Maintenance of water quality

5.2 Harvesting and Marketing

5.3 Transportation of live fish

5.3 Economics of carp culture

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

Internal Assessment Test (20 marks)

The internal assessment under Choice Based Credit System shall be of 1 hour duration and shall comprise of two parts.

Part A: Total weightage of Part A will be 10 marks and shall comprise of 8 short questions selecting at least from 2 to 3 units (50% of syllabus covered). A candidate will have to attend any 5 questions each carrying 2 marks.

Part-B: Total weightage of Part-B will be 10 marks and shall comprise of 2 long answer questions from first 2 to 3 units. A Candidate will have to attempt only 1 question of 10 marks.

Note 2: For paper setters :External End Semester University Examination

The External examinations in theory shall consist of the 3 sections.

Section A: Section-A shall be of 15 marks and will comprise of 5 short answer type questions, one from each of the units and carrying 3 marks each. Answers should be precise having 70 to 80 words only and without any detailed explanation (**All Compulsory**).

Section B: Section-B shall be of 35 marks and will comprise of 5 medium answer type questions, one from each of the units and carrying 7 marks each. Answers should be comprehensive having 250 to 300 words only and with detailed explanation (**All Compulsory**).

Section C: Total weightage of Section-C shall be 30 marks and will comprise of 5 long answer type questions, one from each of the units. A candidate will have to attempt only 2 questions from all the questions and will carry 15 marks each. Answers should be of 500 to 600 words with detailed analysis/explanation/critical evaluation to the question.

Books Recommended

8. Jhingran, V.G. (1985) Fish and Fisheries of India
9. Rath, R.K. (2000) Freshwater Aquaculture
10. Agarwal, S.C. (2007) A Handbook of Fish Farming
11. Gupta, S.K and Gupta, P.C (2008) General and applied ichthyology (Fish and Fisheries)
12. Ayyappan, S (2010) Handbook of Fisheries and Aquaculture
13. Pillay, T.V.R (1993) Aquaculture Principles and Practices

B.SC. SEMESTER-IV
INDUSTRIAL FISH AND FISHERIES

Core Course No. : UFITC 401

Core Course Title: Aquarium Management and Post Harvest Technology

CREDITS : 4

UNIVERSITY OF JAMMU
Syllabi and Course of Study in Industrial Fish & Fisheries
For the examination to be held in Apr. 2018, Apr. 2019 and Apr. 2020
UNDER CHOICE BASED CREDIT SYSTEM

| | | |
|----------------------------|---|---|
| 1. Course /Paper Title | : | Aquarium Management and Post Harvest Technology (Theory) |
| 2. Maximum Marks | : | 100 |
| i) External (Univ. Exam.) | : | 80 |
| ii) Internal Assessment | : | 20 |
| 4. Minimum Pass Marks | : | |
| i) External | : | 29 |
| ii) Internal | : | 07 |
| 5. Duration of Univ. Exam. | : | 2½ Hrs. |

Unit I Construction and setting of aquarium

- 1.1 Types of aquarium tanks
- 1.2 Construction of home aquarium
- 1.3 Setting up of home aquarium
- 1.4 Maintenance of aquarium (cleaning and water quality management)
- 1.5 Feeding of aquarium fishes

Unit II Ornamental fishes

- 2.1 Criteria of selection of suitable fish species for aquarium
- 2.2 External morphology of important fresh water aquarium fishes (egg layers and live bearers)
- 2.3 External morphology of important marine aquarium fishes
- 2.4 Other ornamental organisms (Sea anemone, lobsters, and star fish)

Unit III Fish Preservation

- 3.1 Principles and importance of fish preservation
- 3.2 Different methods of fish preservation
 - 3.2.1 Sun drying
 - 3.2.2 Salting
 - 3.2.3 Canning
 - 3.2.4 Chilling
- 3.2 Fish by-products
 - 3.2.1 Fish meal
 - 3.2.2 Fish oil

Unit-IV Fishery Economics

- 4.1 Definition of economics and its application in fisheries
- 4.2 Role of fisheries sector in Indian economy
- 4.3 Law of Supply and Demand
- 4.4 Law of Diminishing returns
- 4.5 Financing assistance in fisheries sector

Unit-V Fish Marketing, Extension and Legislation

- 5.1 Fish marketing in India
- 5.2 Status of export of Fish and Fishery products
- 5.3 Fisheries extension – methods and techniques
- 5.4 Overview of fisheries and aquaculture legislations in India
 - 5.4.1 Indian fisheries Act
 - 5.4.2 J&K fisheries Act

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

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Books Recommended

1. Zaidi, S.G.S (2002) Ornamental fish culture
2. Mahapatra, B.K., Dutta S., Pailan, G.H.(2015) Ornamental Fish Breeding, Culture and Trade
3. Ahilan, B., Felix, N., Santham, R., (2008) A text book of Aquariculture
4. Dholakia A.D. (2010)Ornamental Fish culture and Aquarium Management
5. Srivastava, C.B.L (2006) A textbook of fishery science and Indian fisheries
6. Balachandran, K.K. (2002) Post Harvest Technology of Fish and Fish Products
7. Saxena, A. (2011) Fisheries Economics
8. Saxena, A. (2011) Fisheries Extension
9. Sharma, O., (2010) Fisheries Extension and Administration

B.SC. SEMESTER-IV

Core Course No. : UFIPC 402

Core Course Title: Aquarium Management & Post Harvest Technology (PRACTICAL)

CREDITS : 2

1. Morphological Study of ornamental fishes
2. Morphological Study of ornamental organisms
 - (a) Sea anemone
 - (b) Lobster
 - (c) Shrimp
 - (d) Star fish
 - (e) Corals

3. Construction of all glass aquarium
4. Setting up of aquarium
5. Design and working Aquarium accessories and equipments
 - (a) Aerator
 - (b) Filter
 - (c) Heater and thermostat
 - (d) Hand net
6. Visit to Aquarium cum Awareness centre
7. Fish market survey – Detailed report on fish fauna available in local market
8. Extension work – preparation of charts, posters, flashcards displaying different aspects of fisheries
9. Study of socio-economic status of fishermen community

Note: There will be practical papers of 50 marks.

Internal Practical Assessment: 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance, 20% (5 marks) for viva and 20% (5 marks) for internal test and 40% (10 marks) for day-to-day performance.

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B.SC SEM IV (INDUSTRIAL FISH & FISHERIES) SKILL ENHANCEMENT COURSE

ORNAMENTAL FISH FARMING AND ENTREPRENEURSHIP DEVELOPMENT

SEC Course No. : UFITS 403

**SEC Course Title: ORNAMENTAL FISH FARMING AND ENTREPRENEURSHIP
DEVELOPMENT**

CREDITS : 4

**UNIVERSITY OF JAMMU
Syllabi and Course of Study in Industrial Fish & Fisheries
For the examination to be held in Dec. 2018, Dec. 2019 and Dec. 2020
UNDER CHOICE BASED CREDIT SYSTEM**

| | | |
|----------------------------|---|---|
| 1. Course /Paper Title | : | Ornamental Fish Farming and Entrepreneurship Development |
| 2. Maximum Marks | : | 100 |
| i) External (Univ. Exam.) | : | 80 |
| ii) Internal Assessment | : | 20 |
| 4. Minimum Pass Marks | : | |
| i) External | : | 29 |
| ii) Internal | : | 07 |
| 5. Duration of Univ. Exam. | : | 2½ Hrs. |

Unit – I Introduction to ornamental fish farming

- 1.1 Scope and importance of ornamental fish farming
- 1.2 Global and National status of ornamental fish farming
- 1.3 Important indigenous ornamental fishes – Rosy barb, Dwarf gourami Zebra fish, Glass fish
- 1.4 Important exotic ornamental fishes – Gold fish, Pearl gourami, Angel fish, Sword tail

UNIT-II Engineering Aspects of aquarium construction

- 2.1 Construction of fresh water aquarium
- 2.2 Introduction to aquarium accessories – Aerator, Filter, Thermostat
- 2.3 Settings up of aquarium
- 2.4 General account of public aquarium

UNIT- III Ornamental Fish Breeding

- 3.1 Brood stock maintenance
- 3.2 Breeding techniques of ornamental fishes
- 3.3 Nursery rearing of ornamental fishes
- 3.4 Transportation of ornamental fishes

UNIT – IV Ornamental Fish Farm Management

- 4.1 Construction of commercial ornamental fish farm
- 4.2 Feeding and maintenance of stock
- 4.3 Common ornamental fish diseases and their management
 - 4.3.1 Argulus,
 - 4.3.2 White spot,
 - 4.3.3 Fin rot
 - 4.3.4 Mouth fungus

UNIT – V Entrepreneurship Development

- 5.1 World trade of ornamental fish and export potential.
- 5.2 Starting an aquarium shop – a business opportunity
- 5.3 Small scale ornamental fish farming business

5.4 Training and promotion schemes for the entrepreneurs involved in ornamental fish farming

Note 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

Internal Assessment Test (20 marks)

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B.SC SEM V (INDUSTRIAL FISH AND FISHERIES)
DISCIPLINE SPECIFIC ELECTIVE
FISH BREEDING AND HATCHERY TECHNOLOGY

DSE Course No. : UFITE 501

DSE Course Title: FISH BREEDING AND HATCHERY TECHNOLOGY

CREDITS : 4

UNIVERSITY OF JAMMU
Syllabi and Course of Study in Industrial Fish & Fisheries
For the examination to be held in Dec. 2018, Dec. 2019 and Dec. 2020
UNDER CHOICE BASED CREDIT SYSTEM

| | | |
|----------------------------|---|--|
| 1. Course /Paper Title | : | Fish Breeding and Hatchery Technology |
| 2. Maximum Marks | : | 100 |
| i) External (Univ. Exam.) | : | 80 |
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| 5. Duration of Univ. Exam. | : | 2½ Hrs. |

UNIT-I Breeding Biology of fishes

- 1.1 Sexual maturity and maturity stages among fishes
- 1.2 Spawning and fecundity of fishes
- 1.3 Fertilization and embryonic development
- 1.4 Hatching and larval development

UNIT-II Natural collection of fish seed

- 2.1 Riverine seed resources of India
- 2.2 Selection of seed collection site
- 2.3 Methods of collection of fish seed
- 2.4 Transportation of fish seed

UNIT-III Induced Breeding

- 3.1 Brood stock maintenance
- 3.2 Induced breeding by hypophysation
 - 3.2.1 History of hypophysation
 - 3.2.2 Technique of removal of pituitary gland
 - 3.2.3 Preservation and storage of pituitary gland
 - 3.2.4 Preparation of gland suspension for injection and dosage.
- 3.3 Synthetic hormones and new generation drugs used in induced breeding.

UNIT-IV Bundh Breeding Technology

- 4.1 Bundh breeding
- 4.2 Types of bundhs
 - 4.2.1 Dry bundh
 - 4.2.2 Wet bundh
 - 4.2.3 Modern bundh
- 4.3 Breeding operation in bundhs
- 4.4 Collections of egg and spawn from bundhs

UNIT-V Hatchery Management

- 5.1 Introduction to fish hatcheries-
- 5.2 Traditional hatcheries
 - 5.1.1 Hatching pits
 - 5.1.2 Hatching happa
- 5.3 Chinese hatchery
- 5.4 Glass jar hatchery

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

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BOOKS RECOMMENDED

1. Purdom.C.E. (1993) Genetics and Fish Breeding
2. Chattopadhyay .N. (2016) Induced Fish Breeding
3. Shukla, A. N. (2014) Fish Breeding
4. Andrews, C. (2010) Guide to fish breeding
5. Wedemeyer, G.A (2002) Fish Hatchery Management

B.SC. SEMESTER-IV

Discipline Specific Elective Course No. : UFIPE 502
Discipline Specific Elective Course Title: Fish Breeding and Hatchery Technology
(PRACTICAL)
CREDITS : 2

1. Study of different maturity stages of fishes from slides / charts
2. Study of eggs of different species
3. Study of spawn, fry and fingerlings
4. Morphological study of culturable fishes
 - (a) *Labeo rohita*
 - (b) *Catla catla*
 - (c) *Cirrihinus mrigala*
 - (d) *Cyprinus carpio*
 - (e) Trout
5. Design and working of
 - (a) Seed collection nets
 - (b) Breeding happa
 - (c) Hatching happa
6. Design and working of hatcheries
 - (a) Chinese hatchery
 - (b) Trout/Mahseer hatchery
7. Field visits to different seed collection centres, bhunds and hatcheries

Note: There will be practical papers of 50 marks.

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**B.SC SEM V (INDUSTRIAL FISH & FISHERIES)
SKILL ENHANCEMENT COURSE**

AQUATIC ECOLOGY

SEC Course No. : UFITS 503

SEC Course Title: Aquatic Ecology

CREDITS : 4

UNIVERSITY OF JAMMU

Syllabi and Course of Study in Industrial Fish & Fisheries

For the examination to be held in Dec. 2018, Dec. 2019 and Dec. 2020

UNDER CHOICE BASED CREDIT SYSTEM

| | | |
|----------------------------|---|------------------------|
| 1. Course /Paper Title | : | Aquatic Ecology |
| 2. Maximum Marks | : | 100 |
| i) External (Univ. Exam.) | : | 80 |
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UNIT - I Introduction to Ecology

13 hours

1.1 Definition and meaning of ecology

1.2 Aquatic ecosystem

 1.2.1 Freshwater Ecosystem

 1.2.2 Marine Ecosystem

1.3 Ecological factors effecting aquatic ecosystem – Temperature, light, currents and food

1.4 Ecological classification of fishes - Stenohaline, Euryhaline, Stenothermal, Eurythermal and Rheophilic fishes

UNIT – II Ecological Communities

13 hours

- 2.1 Biological communities of aquatic ecosystem – plankton, nekton, neuston and benthos
- 2.2 Food chains operating in aquatic ecosystem
- 2.3 Productivity of aquatic ecosystem – primary, gross and net productivity
- 2.4 Energy flow in aquatic ecosystem

UNIT – III Freshwater Ecology

13 hours

- 3.1 Origin and Classification of lakes
- 3.2 Thermal stratification and Ecology of lakes
- 3.2 Ecology of rivers
- 3.3 Characteristics of hill streams
- 3.4 Adaptations of hill stream fishes

Unit-III Coastal Ecology

13 hours

- 4.1 Physico – chemical characteristics of marine environment
- 4.2 Zonation of sea
- 4.3 Adaptations of deep sea fishes
- 3.3 Ecology of estuaries
- 3.4 Adaptations of Brakishwater Fishes

Unit-V Conservation of aquatic ecosystem

13 hours

- 5.1 Destruction of aquatic ecosystems by anthropogenic activities
- 5.2 Overfishing and its impact on aquatic ecosystem
- 5.3 Fish wars
- 5.4 Conservation and management of aquatic ecosystem

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

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Note 2: For paper setters :External End Semester University Examination

The External examinations in theory shall consist of the 3 sections.

Section A: Section-A shall be of 15 marks and will comprise of 5 short answer type questions, one from each of the units and carrying 3 marks each. Answers should be precise having 70 to 80 words only and without any detailed explanation (**All Compulsory**).

Section B: Section-B shall be of 35 marks and will comprise of 5 medium answer type questions, one from each of the units and carrying 7 marks each. Answers should be comprehensive having 250 to 300 words only and with detailed explanation (**All Compulsory**).

Section C: Total weightage of Section-C shall be 30 marks and will comprise of 5 long answer type questions, one from each of the units. A candidate will have to attempt only 2 questions from all the questions and will carry 15 marks each. Answers should be of 500 to 600 words with detailed analysis/explanation/critical evaluation to the question.

Books Recommended

1. Odum, E.P, 1987 “ Basic Ecology”
2. Qasim, S.Z, 1999 “Indian Ocean – images and realities”
3. Asha, p and Selvaraja, A. “Aquatic Ecology : A Scientometric Analysis”
4. Closs,G., Downes,B. and Boulton, A. 2004 “Freshwater Ecology : A Scientific Introduction”
5. Day,S. and Nasrin,B. 2014“Ecology of Aquatic Systems”
6. Verma, P.S. and Agarwal,A.K 2000“Environmental Biology : Principal of Ecology”

B.SC SEM VI (INDUSTRIAL FISH AND FISHERIES)
DISCIPLINE SPECIFIC ELECTIVE
FISH NUTRITION AND FEED TECHNOLOGY

DSE Course No. : UFITE 601

DSE Course Title: FISH NUTRITION AND FEED TECHNOLOGY

CREDITS : 4

UNIVERSITY OF JAMMU
Syllabi and Course of Study in Industrial Fish & Fisheries
For the examination to be held in Apr. 2019, Apr. 2020 and Dec. 2021
UNDER CHOICE BASED CREDIT SYSTEM

| | | |
|----------------------------|---|---|
| 1. Course /Paper Title | : | Fish Nutrition and Feed Technology |
| 2. Maximum Marks | : | 100 |
| i) External (Univ. Exam.) | : | 80 |
| ii) Internal Assessment | : | 20 |
| 4. Minimum Pass Marks | : | |
| i) External | : | 29 |
| ii) Internal | : | 07 |
| 5. Duration of Univ. Exam. | : | 2½ Hrs. |

UNIT – I Food and Feeding Habits of Fishes

- 1.1 Categories of food – Basic food, Occasional food, Incidental food, Emergency food
- 1.2 Seasonal variation of fish food
- 1.3 Feeding habits – predators, grazers, strainers, suckers and parasites
- 1.4 Feeding intensity – Gastro somatic index

UNIT - II Live Fish Feed

- 2.1 Natural (Live) food and its importance in Aquaculture
- 2.2 Common fish food organisms
 - 2.2.1 Rotifers
 - 2.2.2 Cladocerans
 - 2.2.3 Copepods
- 2.3 Collection of live food from nature
- 2.4 Culture of fish food organisms
 - 2.4.1 Daphnia
 - 2.4.2 Cyclop
 - 2.4.3 Artemia

UNIT - III Artificial Fish Feed

- 3.1 Nutritional requirement of cultivable fishes
- 3.2 Artificial feeding and its importance in aquaculture
- 3.3 Preparation of fish feed
 - 3.3.1 Feed ingredients
 - 3.3.2 Formulation and preparation of feed
- 3.4 Use of additives, antibiotics and pigments in fish feed

UNIT – IV Feeding technology

- 4.1 Storage of fish feed
- 4.2 Use of preservative and antioxidants in storage of feed
- 4.3 Method of feeding
 - 4.3.1 Manual methods
 - 4.3.2 Mechanical methods
- 4.4 Feeding of fry and fingerling

UNIT - V Nutritional Diseases

- 5.1 Nutritional diseases among fishes : causes and preventive measures
 - 5.1.1 Protein deficiency disorders
 - 5.1.2 Carbohydrate deficiency disorders
 - 5.1.3 Vitamins deficiency disorders
 - 5.1.4 Nutritional anemia

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

Internal Assessment Test (20 marks)

The internal assessment under Choice Based Credit System shall be of 1 hour duration and shall comprise of two parts.

Part A: Total weightage of Part A will be 10 marks and shall comprise of 8 short questions selecting atleast from 2 to 3 units (50% of syllabus covered). A candidate will have to attend any 5 questions each carrying 2 marks.

Part-B: Total weightage of Part-B will be 10 marks and shall comprise of 2 long answer questions from first 2 to 3 units. A Candidate will have to attempt only 1 question of 10 marks.

Note 2: For paper setters :External End Semester University Examination

The External examinations in theory shall consist of the 3 sections.

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Section B:Section-B shall be of 35 marks and will comprise of 5 medium answer type questions, one from each of the units and carrying 7 marks each. Answers should be comprehensive having 250 to 300 words only and with detailed explanation (**All Compulsory**).

Section C:Total weightage of Section-C shall be 30 marks and will comprise of 5 long answer type questions, one from each of the units. A candidate will have to attempt only 2 questions from all the questions and will carry 15 marks each. Answers should be of 500 to 600 words with detailed analysis/explanation/critical evaluation to the question.

BOOKS RECOMMENDED

6. Vidya and Rao, D.B., A Text Book Of Nutrition
7. Chandrasekhar, Y. S., Fish Nutrition in Aquaculture book
8. Sena S., DeSilva and Anderson Trevor A. (1995) Fish Nutrition in Aquaculture,
9. Halver, John E. and Ronald, W. Hardy (2002) Fish Nutrition
10. Athithan, S., Felix, N. and Venkatasamy, M. (2016) Fish Nutrition and Feed Technology: A Teaching Manual

B.Sc SEMISTER VI

Discipline Specific Elective Course No. : UFIPE 602
Discipline Specific Elective Course Title: Fish Nutrition and Feed Technology
(PRACTICAL)
CREDITS : 2

1. Study of modification of fish mouth according to the feeding habits from fish specimen/charts
2. Gastrosomatic index
3. Analysis of gut content
4. Collection and study of fish food organisms
 - (a) Phytoplankton
 - (b) Zooplankton
 - (c) Insect larvae
5. Collection and study of artificial fish feed – Dry feed, Moist feed, Semi-moist feed, Pallet feed, Granular feed, Flake feed
6. Formulation and preparation of fish feed
7. Study of different types of feeders used in aquaculture from Charts/field visits
8. Identification and study of nutritional fish diseases from diseased fish specimen/charts
9. Field visit to fish farms to observe feeding of cultured fishes
 - (a) Type of feed used
 - (b) Amount of feed given
 - (c) Time of feeding
 - (d) Method of feeding

Note: There will be practical papers of 50 marks.

Internal Practical Assessment: 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance, 20% (5 marks) for viva and 20% (5 marks) for internal test and 40% (10 marks) for day-to-day performance.

External Practical Assessment: 50% (25 marks) shall be reserved for external assessment including 20% (5 marks) for viva and 80% (20 marks) for practical paper.

INDUSTRIAL FISH AND FISHERIES
SKILL ENHANCEMENT COURSE
FISHING TECHNOLOGY

SEC Course No. : UFITS 603
SEC Course Title: FISHING TECHNOLOGY
CREDITS : 4

UNIVERSITY OF JAMMU
Syllabi and Course of Study in Industrial Fish & Fisheries
For the examination to be held in Apr. 2019, Apr. 2020 and Dec. 2021
UNDER CHOICE BASED CREDIT SYSTEM

| | | |
|----------------------------|---|---------------------------|
| 1. Course /Paper Title | : | Fishing Technology |
| 2. Maximum Marks | : | 100 |
| i) External (Univ. Exam.) | : | 80 |
| ii) Internal Assessment | : | 20 |
| 4. Minimum Pass Marks | | |
| i) External | : | 29 |
| ii) Internal | : | 07 |
| 5. Duration of Univ. Exam. | : | 2½ Hrs. |

UNIT - I Fishing Gear Technology

- 1.1 Types of gear – Active and Passive gears
- 1.2 Traditional fishing gears –Design and Working
 - 1.2.1 Gill net
 - 1.2.2 Cast net
 - 1.2.3 Drag net
 - 1.2.4 Line fishing

UNIT – II Modern Fishing Technology

- 2.1 Design and working of Trawlers
- 2.2 Design and working of Purse seiners
- 2.3 Design and working of Long Liners
- 2.4 Design and working of Squid jigging

UNIT –III Craft Materials and Equipments

- 3.1 Fishing craft materials
 - 3.1.1 Wood.
 - 3.1.2 Fiberglass Reinforced Plastic.
 - 3.1.3 Ferro cement.
- 3.2 Boat designing and construction
- 3.3 Care and maintenance of fishing craft

UNIT - IV Traditional Fishing craft Technology

- 4.1 Traditional crafts of Indian inland waters.-
 - 4.1.1 Rafts
 - 4.1.2 Canoe
 - 4.1.3 Dinghi

4.2 Traditional crafts of Indian coasts -

4.2.1 Catamaran

4.2.2 Masula boat

4.2.3 Tuticorin boat

UNIT - V Navigation and Fish Finding Technology

5.1 Basic principles of navigation

5.2 Remote sensing in fisheries sector

5.3 Fish finding equipments – Acoustics, SONAR, Ecosounder

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

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BOOKS RECOMMENDED

1. Jhingran, V.K. 1984 "Fish and Fisheries of India"
2. Parihar, R.K, 1994 "Fish Biology and Indian Fisheries"
3. Gupta,S.K. and Gupta, P.C. 2008 "General and Applied Ichthyology"
4. Sreekrishna, Y. and Shenoy,L. 2001 "Fishing Gear and Craft Technology"
5. Badapanda,K.C. 2013"Fishing Craft and Gear Technology"