



KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/JS/MGJ(Gen)/2023-24/59

Date: 04/09/2023

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2023-24ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಪದವಿಗಳಿಗೆ 5 ಮತ್ತು 6ನೇ ಸೆಮಿಸ್ಟರ್
NEP-2020 ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 104 ಯುಎನ್‌ಇ 2023, ದಿ: 20.07.2023.
2. ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 2 ರಿಂದ 7, ದಿ: 31.08.2023.
3. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 04/09/2023

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2023-24ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music) /BVA / BTTM / BSW/ B.Sc./B.Sc. Pulp &
Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P./ B.Com/ B.Com (CS) / BBA & BA ILRD ಸ್ನಾತಕ ಪದವಿಗಳ 5
ಮತ್ತು 6ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020ರ ಮುಂದುವರಿದ ಭಾಗವಾಗಿ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಕೋರ್ಸಿನ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ.
ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ
ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ
ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ


ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAK UNIVERSITY, DHARWAD

**B.Sc.in Industrial Fish and Fisheries
SYLLABUS**

With Effect from 2023-24

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM V & VI,
SKILL ENHANCEMENT COURSE (SEC) FOR V SEM**

AS PER NE P-2020

Karnatak University, Dharwad
B.Sc.in Industrial fish and fisheries
 Effective from 2023-24

Sem.	Type of Course	Theory/Practical	Course Code	Course Title	Instruction hour/week	Total hours /sem	Duration Of Exam	Marks			Credits
								Formative	Summative	Total	
V	DSCC-9	Theory	035IFF011	PRINCIPLES AND PRACTICE OF AQUACULTURE	04hrs	56	02hrs	40	60	100	04
	DSCC-10	Practical	035IFF012	STUDY OF WATER AND SOIL ANALYSIS, AND AQUATIC WEEDS, INSECT, WEED FISH AND PREDATORY FISH	04hrs	56	03hrs	25	25	50	02
	DSCC-11	Theory	035IFF013	COSTAL AQUACULTURE, FISH PATHOLOGY AND FISH HISTOLOGY	04hrs	56	02hrs	40	60	100	04
	DSCC-12	Practical	035IFF014	FISH PARASITES, FISH HISTOLOGY AND FISHERIES ECONOMICS	04hrs	56	03hrs	25	25	50	02
	SEC-3	Practical	035IFF061	FISH POND PREPARATION, CULTURE AND MANAGEMENT AND SEED PRODUCTION	04hrs	56	03hrs	25	25	50	02
Total											26
VI	DSCC-13	Theory	036IFF011	FISH GENETICS, SEED PRODUCTION AND ENVIRONMENTAL BIOLOGY	04hrs	56	02hrs	40	60	100	04
	DSCC-4	Practical	036IFF012	PRIMARY PRODUCTIVITY OF POND AND INDUCED BREEDING IN FISH	04hrs	56	03hrs	25	25	50	02
	DSCC-15	Theory	036IFF013	FISH BIOTECHNOLOGY, BIOCHEMISTRY AND FISH MICROBIOLOGY	04hrs	56	02hrs	40	60	100	04
	DSCC-16	Practical	036IFF014	FISH BIOCHEMISTRY AND FISH MICROBIOLOGY AND BIOTECHNOLOGY	04hrs	56	03hrs	25	25	50	02
	Internship-1		036 IFF 091					50	0	50	02
Total											26

B.Sc. Semester–V

Discipline Specific Course(DSC)-9

Course Title: Principles and practice of Aquaculture

Course Code:035 IFF 011

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-9	Theory	04	04	56hrs.	2hrs.	40	60	100

Course Outcomes (COs):At the end of the course students will be able to:

CO1:Define, comprehend, scope and significance of aquaculture

CO2:Examine the types and practices of Aquaculture systems

CO3:Describe the food, feeding, growth, digestion, and respiration in fishes

CO4:Culture practice of freshwater prawn and breeding practices

CO5:Culture of other fishes like air breathing fish and cold-water fishes.

Unit	Title: Principles and practice of Aquaculture	56.hrs/sem
UnitI	Definition and history of Aquaculture; Scope and importance of aquaculture. Principles of site selection, Kinds of fish farm, Productivity of water, Soil and soil characteristics and other parameters. Different systems of aquaculture, monoculture, polyculture, integrated fish farming, pond culture, cage culture, pen culture, raft culture, extensive, semi-intensive and intensive fish culture, raceway culture, sewage fed fish culture, bio flog, aquaponics. Factors for success of fish culture enterprises.	14 hrs
UnitII	Present status of Aquaculture, Preparation of culture pond, nursery pond preparation, and rearing pond preparation, Pre stocking management, Control of aquatic weeds, aquatic insects, weed fishes, predators fishes, algal blooms and their control, liming and fertilization, manuring of nursery and rearing ponds.	14 hrs
UnitIII	Criteria of selection of species for culture, seed procurement and stocking. Post stocking management, phased manuring, supplementary feeds and feeding. Breeding and culture of freshwater Prawns and their polyculture with finfish. Air breathing fish culture. Coldwater fishes and their culture.	14 hrs
UnitIV	Formulation of artificial diet of fishes. Storage of feeds, feeding techniques, natural feed and its importance in aquaculture. Aqua farm management, concepts and principles of aqua farm management. Major cultivable freshwater fishes of India.	14 hrs

References:

1. Jingaran, V.G. 1991. Fish and Fisheries of India. Hindustan Publ. Corporation (India)
2. Pillay, T.V.R., 1990. Aquaculture, Principles and practices. Fishing News books Ltd. Mpeda publication.
3. Santhanam, et.al. A Manual of Freshwater Aquaculture.
4. Sustainable Aquaculture- Bardach.
5. Aquaculture- The farming and husbandary of freshwater & Marine organisms- John E. Bardach John H. Ryther, William O. McLarney
6. Aquaculture and Fisheries : N Arumugam

Formative Assessment for Theory	
Assessment Occasion/type	Marks
InternalAssessmentTest1	10
InternalAssessmentTest2	10
Quiz/Assignment/Small Project	10
Seminar	10
Total	40Marks
<i>Formative Assessment as per guidelines.</i>	

B.Sc. Semester–V

Discipline Specific Course(DSC)-10

Course Title: Study of Water and soil analysis, and Aquatic weeds, insect, weed fish and predatory fish

Course Code:035 IFF 012

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-10	Practical	02	04	56hrs.	3hrs.	25	25	50

Course Outcomes (COs): At the end of the course students will be able to:

CO1:Students will get knowledge regarding the chemical compositions of natural waters, and explain how and why these compositions vary in different water samples.

CO 2: To enable students to understand the principles and the practical approaches and techniques required to effectively monitor in aquaculture pond

CO 3: Gained in depth knowledge on the pattern of soil cover in aquaculture ponds.

CO 4: Gained in depth knowledge on the how to control aquatic weed plants and aquatic insects in aquaculture ponds.

CO 5: Gained in depth knowledge on weed fishes and predatory fishes in aquaculture ponds.

Expt. No,	Title:Study of Water and soil analysis, and Aquatic weeds, insect, weed fish and predatory fish	56.hrs/sem
1	Estimation of dissolved oxygen in given water samples: Tap, Pond and Sewage water	04 hrs
3	Estimation of free carbon dioxide in given water samples: Tap, Pond and Sewage water	04 hrs
4	Estimation of salinity in given water samples: Tap, Pond and Sewage water	04 hrs
5	Estimation of hardness in given water samples: Tap, Pond and Sewage water	04 hrs
6	Estimation of alkalinity in given water samples: Tap, Pond and Sewage water	04 hrs
7	Study of pH, ammonia, and nitrates of water	04 hrs
8	Study of Collection and preservation of soil and Analysis of soil particle size	08 hrs
9	Study of water holding capacity of soil and organic matter of soil	08 hrs
10	Estimation of soil pH in given soil sample: Black, Red soil and Sand	04 hrs
11	Study of aquatic insects and aquatic weeds in aquaculture pond and its control measures	04 hrs
12	Study of Aquatic weed and predatory fishes in aquaculture pond and its control measures	04 hrs

Instruction to the Examiners

1. Give any one water parameter
2. compulsory estimation of soil pH
3. one identification from aquatic weed or aquatic insect
4. one identification from weed fishes or predatory fish
5. Journal and viva carry 03+02 marks

Formative Assessment for Practical Scheme for practical examination	
Assessment	Distribution of Marks
Water analysis –DO/Alkalinity/Hardness/Free CO ₂ /Salinity	10
Soil water pH.	06
Identifications (2x2)	04
Journal	03
Viva	02
Total	25Marks
<i>Formative Assessment as per guidelines.</i>	

The same shall be used for semester end Examination

B.Sc. Semester–V

Discipline Specific Course(DSC)-11

Course Title: COSTAL AQUACULTURE, FISH PATHOLOGY AND FISH HISTOLOGY

Course Code:035 IFF 013

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-11	Theory	04	04	56hrs.	2hrs.	40	60	100

Course Outcomes (COs): At the end of the course students will be able to:

CO1: To understand the techniques involved in aquaculture practices.

CO 2:To get a detailed information about marine aquaculture and hatchery management.

CO3:To provide a basic idea about the importance of disease in fishes.

CO4: To give basic idea for fish histology for better diagnostic in fish disease

CO5: To get detailed information mariculture of shell fishes

Unit	Title: COSTAL AQUACULTURE, FISH PATHOLOGY AND FISH HISTOLOGY	56.hrs/sem
UnitI	Marine fisheries resource of India, Brakishwater fisheries resource of India. Important species of Pennaeid prawns and life history of typical Prawn, hatchery production of seed, nursery rearing, transportation of Prawn seed, and hatchery management.	14 hrs
UnitII	Breeding and culture of brakishwater fish - Milk fish, Mulletts, Pearl spot, Sea bass etc. Mariculture of edible oysters, mussels, Clams, Sea urchin, Sea cucumber and culture of sea weeds.	14 hrs
UnitIII	Significance of fish disease in relation to aquaculture practices. Principles of disease diagnosis methods and fish health management. Disease caused by crustaceans, parasites (Ergasilosis, Lerniae, Argulus, Isopodeparasite).	14 hrs
UnitIV	Protozoan diseases, Fungal diseases, Viral diseases and Bacterial diseases of fishes, symptoms and their control methods Histological studies of most important internal organs of fish - gills, liver, Intestine, Kidney, Muscle. Fisheries Institutes of India.	14 hrs

References:

1. Recent Advances in Aquaculture: Volume 3" by James Muir and R J Roberts
2. Advances in Shrimp Aquaculture Management" by Felix
3. Advances in aquaculture hatchery technology: 5. Rotifers, Artemia and copepods as live feeds for fish larvae" by G Van Stappen and P Sorgeloos
4. Textbook of Freshwater Aquaculture" by B Ahilan
5. Textbook of Fish Diseases Volume 667 of TFH PS ; Author, Erwin Amlacher ; Translated by, D. A. Conroy, Roger L. Herman
6. Fish Histology: From Cells to Organs - 2nd Edition - Routledge

Formative Assessment for Theory	
Assessment Occasion/type	Marks
InternalAssessmentTest1	10
InternalAssessmentTest2	10
Quiz/Assignment/Small Project	10
Seminar	10
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

B.Sc. Semester–V

Discipline Specific Course(DSC)-12

Course Title: Fish parasites, fish histology and fisheries economics

Course Code:035 IFF 014

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-12	Practical	02	04	56hrs.	3hrs.	25	25	50

Course Outcomes (COs): At the end of the course students will be able to:

CO 1: Student will gain knowledge in identification parasites

CO 2: Identify commercially important fish species; acquire knowledge on pond culture

CO 3: Student will gain knowledge in histochemical techniques for fish pathology

CO4: Student will gain knowledge in fishery economics and managements techniques.

CO 5:To get knowledge in preparation fish histological slides to study tissue and cells

Expt. No,	Title: Fish parasites, fish histology and fisheries economics	56.hrs/sem
1	Study of different fish parasites	04 hrs
3	Study of different cultivable fishes of India	04 hrs
4	Study of techniques involved in the investigation of fish disease diagnostics	04 hrs
5	Study of histological and histochemical stains and techniques in fish histology	04 hrs
6	Study of stain preparation and staining technique for fish histology	08 hrs
7	Study of economics of composite fish culture	04 hrs
8	Study of economics of fish cum paddy culture	04 hrs
9	Study of economics of fish cum dairy farming	04 hrs
10	Study of economics of fish cum horticulture	04 hrs
11	Study of economics fresh water prawn culture and brackishwater milkfish culture	08 hrs
12	Compulsory Field visit to fish seed hatchery and fisheries Institutes	---

Instruction to the Examiners

1. identification from each one from pathogen and fish histology
2. any one economic problem given based on practical syllabus
3. compulsory filed visit report carry marks
4. journal and viva carry 03+02 marks

Formative Assessment for Practical Scheme for practical exam	
Assessment	Distribution of Marks
Identification of fish pathogen and fish histological slide (2X2)	04
Procedure for the permanent fish histological slide preparation	03
Fisheries economics	03
Field report	10
Journal	03
Viva	02
Total	25 Marks
<i>Formative Assessment as per guidelines.</i>	

The same shall be used for semester end Examination

B.Sc. Semester–V

Skill Enhancement Course: SEC-3

Course Title: Fish Pond preparation, culture and management and seed production

Course Code: 035 IFF 061

Type of Course	Theory /Practical	Credits	Instruction hour/week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
SEC-3	Practical	02	04	56hrs.	3hrs.	25	25	50

Course Outcomes (COs): At the end of the course students will be able to:

CO 1: Acquire knowledge on management of nursery and grow-out pond; 2. Access manuring and fertilization; 3.

CO 2: Identify the major live feed organisms in the fish culture pond

CO 3: Design and explain working of hatchery; apply farm laboratory equipment use

CO 4: Discuss the control of aquatic weeds, insects and predatory fishes

CO 5: Hydrobiology of pond and examine growth of finfish and shellfish

Expt. No	Title: Fish pond preparation, culture and management and seed production	56.hrs/sem
1	Study of Preparation and management of nursery, rearing and grow-out fish pond.	08 hrs
2	Study on effect of liming on hydrobiology of pond.	04 hrs
3	Study on effect of manuring and fertilization on hydrobiology of pond and growth of fin fish and shellfish.	04 hrs
4	Collection, identification, and control of aquatic weeds in fish pond	04 hrs
5	Study Hatchery and farm layout installation and operation of hatchery farm laboratory equipment.	04 hrs
6	Collection, identification and control of aquatic insects fish pond	04 hrs
7	Study of pre-stocking management and Post-stocking management nursery and rearing pond of fishes	04 hrs
8	Identification of major live feeds –Phytoplankton, Zooplankton, Green algae, diatoms, microalgae, Rotifers, Daphnia, Moina, Artemia and Copepods, Blood worm, Earthworm	08 hrs
9	Preparation of fishery fish feed and their formulation by locally available food stuff	04 hrs
10	Collection, identification and control of predatory fishes.	04 hrs
11	Induced breeding in Fish and shrimps (demonstration) (injection method and eye stalk ablation method)	08 hrs
12	Field visit to marine finfish, shrimp, fish culture ponds, feed mill, aquatic health laboratory and fish processing	

References:

1. Aquaculture Principles And Practices, 2Nd Edition by PILLAY, John Wiley
2. A Text Book of Aquaculture Hardcover – by M. S. Reddy (Author)
3. Aquaculture Paperback –by N Arumugam (Author)
4. Aquaculture: Farming Aquatic Animals And Plants, 2Ed by John S Lucas and Paul C Southgate, John Wiley
5. TEXTBOOK OF AQUACULTURE AUTHOR: A. PATEL, S. N. PATHAK
6. Freshwater Aquaculture Paperback – by R. K. Rath (Author)

Instruction to the Examiners

1. Identification have given from student collections specimens
2. Field visit report carry marks
3. Journal and viva carry 3+2 marks

Formative Assessment for Practical	
Assessment	Distribution of Marks
Identification (3X2)	06
Procedure for fish preparation	04
Field visit report	10
Journal	03
Viva	02
Total	25 Marks
<i>Formative Assessment as per guidelines.</i>	

The same shall be used for semester end Examination

B.Sc. in Industrial fish and fisheries

VI Semester

W. e. f.: 2023-24

B.Sc. Semester–VI

Discipline Specific Course(DSC)-13

Course Title: FISH GENETICS, SEED PRODUCTION AND ENVIRONMENTAL BIOLOGY

Course Code: 036 IFF 011

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-13	Theory	04	04	56hrs.	2hrs.	40	60	100

Course Outcomes (COs): At the end of the course students will be able to:

CO 1: Student will get knowledge in basic genetical principles in field of fishery

CO 2: To know different technic involved in fish breeding

CO 3: To gain knowledge molecular application fish breeding and aquaculture

CO 4: student will get knowledge regarding environmental biology related fisheries aspect.

CO 5: To gain the knowledge in field of pollution free environment for fishery production

Unit	Title:FISH GENETICS, SEED PRODUCTION AND ENVIRONMENTAL BIOLOGY	56.hrs/sem
Unit I	Principal of Mendelian genetics, multiple alleles, interactions, Linkage and crossing over. Introductions to cytogenetics and its application. Sex determination and control mechanism and Inheritance. Different methods of breeding-Inbreeding, out breeding, cross breeding, selective breeding, random breeding. Application of genetics in fish farming.	14 hrs
Unit II	Hybridization and transgenic fish. Cryopreservation of gametes, gynogenesis, androgenesis, polyploidy, production of monosex and sterile fish and their significance in aquaculture. Sex reversal techniques. Principal of biochemical and molecular genetics and its applications.	14 hrs
Unit III	Roll of gonadotrophin in fish breeding, Brood stock management, breeding of carps and other cultivable fishes, induced breeding. Ovulation agent used (fish pituitary glands, human chorionic gonadotrophin), pheromones and other new generation drugs. Hatchery technology, brood breeding, riverine seed collection, seed transportation, Different stages of fish seed (spawn, fry, fingerlings).	14 hrs
Unit IV	Definition, scope and importance of ecology. Ecological habitats, abiotic and biotic factors. Primary productivity of water mass and fish production, trophic levels of fish in the food chain, predatory prey relationship, ecology of freshwater ponds, ecology of river, ecology of estuaries, brackishwater and sea. Biogeochemical Cycles: Carbon cycle, Nitrogen cycle, oxygen cycle, Sulphur cycle and Phosphorous. Water and soil pollution, source and effects and control. Pesticide impact on aquatic organisms, thermal pollution, radioactivity, assessment and monitoring of water pollution.	14 hrs

References:

1. Fish Genetics and Breeding by T L S Samuel & S Felix Moses (Author)
2. Aquaculture: Introduction to Aquaculture For Small Farmers by Kenn Christenson (Author)
3. Hatchery Management and Induced Breeding of Carps and Cat Fishes" by MD Mustafizur Rahman
4. Breeding and Seed Production of Fin Fish and Shell Fish" by P C and Thomas
5. Environment And Ecology by Vaishali Anand (Author)
6. Deswal, S. and Deswal, A., 2003, Energy, ecology, Environment and Society, Dhanpat Rai&co ltd., Delhi.

Formative Assessment for Theory	
Assessment Occasion/type	Marks
InternalAssessmentTest1	10
InternalAssessmentTest2	10
Quiz/Assignment/SmallProject	10
Seminar	10
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

B.Sc. Semester–VI

Discipline Specific Course(DSC)-14

Course Title: Primary productivity of pond and induced breeding in fish

Course Code: 036 IFF 012

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-14	Practical	02	04	56hrs.	3hrs.	25	25	50

Course Outcomes (COs): At the end of the course students will be able to:

CO 1: Student will gain knowledge regarding collection, preservation and identification different planktons.

CO 2: To gain knowledge by doing primary productivity of fish pond in turn calculation net primary productivity

CO 3: Student will gain the knowledge in hypopysatation technique and induced breeding fishes.

CO 4: To gain knowledge in study different stages of life cycle of fish.

CO 5: Student will get knowledge regarding composite fish culture to increase productivity of fish pond.

Expt. No,	Title: Primary productivity of pond and induced breeding in fish	56.hrs/sem
1	Study of collection and preservation planktons	04 hrs
3	Study of different types of freshwater and marine planktons (05 from each)	04 hrs
4	Study of different maturity stages of fish gonads	04 hrs
5	Estimation of primary productivity (light and dark bottle) of given water sample: Pond water	04 hrs
6	Study of induced breeding in fishes and bund breeding in fish	08 hrs
7	Estimation the pituitary gland for set of brooder fishes (05 examples)	04 hrs
8	Study of composite fish culture	08 hrs
9	Study of different stages in fishes (spawn, fry, fingerlings)	04 hrs
10	Study of gonadosomatic index in fish	04 hrs
11	Study of pond as ecosystem with schematic diagram	04 hrs
12	Compulsory field visit to fisheries institutes, marine/brakishwatershrimp hatchery,sandy or rocky beaches, estuary, fish landing center and brackish water lakes, and back water	

Instruction to the Examiners

1. For primary productivity only estimation
2. one each from fresh and marine species
3. only one induced breeding problem
4. Compulsory field visit report carry marks
5. Journal and viva carry 3+2 marks

Formative Assessment for Practical Scheme for practical exam	
Assessment	Distribution of Marks
Estimation of primary productivity in given water sample	04
Identification of planktons (2X2)	04
Solving the induced breeding problems (01 problem)	02
Filed visit report	10
Journal	03
Viva	02
Total	25 Marks
<i>Formative Assessment as per guidelines.</i>	

The same shall be used for semester end Examination

B.Sc. Semester–VI

Discipline Specific Course(DSC)-15

Course Title: FISH BIOTECHNOLOGY, BIOCHEMISTRY AND FISH MICROBIOLOGY

Course Code: 036 IFF 013

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-15	Theory	04	04	56hrs.	2hrs.	40	60	100

Course Outcomes (COs): At the end of the course students will be able to:

- CO 1: Students will get knowledge in the field of application of biotechnology in fisheries
- CO 2: To gain knowledge biochemical assessment of fisheries products
- CO 3: To gain knowledge in microbial deterioration fishery product and prevention methods
- CO 4: To know the biochemical composition of fish from study of fish bio-chemistry
- CO 5: To gain knowledge in the field of microbiological application in fisheries

Unit	Title: FISH BIOTECHNOLOGY, BIOCHEMISTRY AND FISH MICROBIOLOGY	56.hrs/sem
UnitI	Biotechnology scope and its importance in fisheries, molecular techniques in stock characterization, Principles, and applications of HPLC, Principles and application of PCR, Principles and applications of SDS page, Electrophoresis. Pathogenic microorganisms in fishes, role of microorganisms in fisheries, Pathogenic organism encountered in fish products, fecal indicator organisms. Post mortem biochemical changes in fishes.	14 hrs
UnitII	General properties of organic and inorganic compounds. Role of herbal therapy in fish health management. Application of molecular engineering and nucleic acid manipulation in fisheries. Microbiology scope and its importance in fisheries. Special reference to fish moisture, fish protein, fats, ash, contents, fish enzymes and non-protein nitrogen compounds like- Tri-methylamine oxide, urea, free alpha amino acids, and volatile bases.	14 hrs
UnitIII	Carbohydrates: Classification, properties of important monosaccharide, disaccharides, polysaccharides and function, Lipid classification, properties and functions, Protein classification, properties and functions, Enzymes, classification and application and functions, Vitamins dietary sources and functions. Bioenergetics (Kreb's cycle, glycolysis, electron transport system)	14 hrs
UnitIV	Classification of microorganisms, Microbial taxonomy, bacteria, fungi, algae, protozoa, and virus. Nature of microbial cell surface, cell membrane, flagella, capsule, mucus sheet, gram negative and positive bacteria. Isolation and cultivation of microorganisms. Isolation of culture, enrichment technique, nature of growth, factor influencing growth, growth phases and methods of growth measurements. Sterilization methods principles and application, preservation, and maintenance of culture.	14 hrs

References:

1. Fish Biotechnology and Genetics by Nyan, N L, Agri Horti Press
2. FISH BIOTECHNOLOGY AUTHOR: SUNITA RAI
3. Microbiology of Fish and Fishery Products Softbound by Felix, S & F Parthiban, Daya Publishing House
4. Microbiology Handbook Of Fish And Seafood by Fernandes, Medtech
5. Fundamentals Of Biochemistry by J.L Jain (Author), Nitin Jain (Author), Sunjay Jain (Author)
6. Biochemistry Simplified. Sixth Edition 2023 Textbook of Biochemistry by Prasad Manjeshwar Paperback – 1 January 2022

Formative Assessment for Theory	
Assessment Occasion/type	Marks
InternalAssessmentTest1	10
InternalAssessmentTest2	10
Quiz/Assignment/SmallProject	10
Seminar	10
Total	40 Marks
<i>Formative Assessment as per guidelines.</i>	

B.Sc. Semester–VI

Discipline Specific Course(DSC)-16

Course Title: Fish biochemistry and fish microbiology and biotechnology

Course Code: 036 IFF 014

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-16	Practical	02	04	56hrs.	3hrs.	25	25	50

Course Outcomes (COs): At the end of the course students will be able to:

CO 1: Student will get knowledge regarding quantitative estimation of protein in fish

CO 2: Student will get knowledge regarding quantitative estimation of glycogen in fish

CO 3: To gain different working principles of microbiological and biotechnological instruments and their working principles in application fisheries

CO 4: To gain different staining techniques for microorganisms to identifications

CO 5: Student will gain knowledge in field of microorganism culture from fisheries products

Expt. No,	Title: Fish biochemistry and fish microbiology and biotechnology	56.hrs/sem
1	Study of preparation of percent, molarity, molality, and normality of solution	04 hrs
3	Study of assay of enzymatic activity of amylase	04 hrs
4	Estimation of quantitative analysis of protein (total, structural, soluble) in fish tissue by spectrophotometric method	04 hrs
5	Estimation of quantitative analysis of glucose and glycogen in fish tissue or blood by spectrophotometric method	08 hrs
6	Study of culture of microorganisms in soil and water (serial dilution method)	08 hrs
7	Study of preparation of media, nutrient agar, nutrient broth for microorganism culture	04 hrs
8	Study of different types of bacterial staining methods (simple and gram staining)	04 hrs
9	Study of different procedure for sterilization glassware	04 hrs
10	Study of working principle and application of Electrophoresis in fisheries (SDS page)	04 hrs
11	Study of working principle and application of PCR in fisheries (shrimp disease)	04 hrs
12	Study of different microbiological (05) and biotechnological (05) instruments and its working principles	04 hrs

Instruction to the Examiners

1. any one sample is given for estimation
2. microbiological and biotechnological instruments for identification
3. any one method of staining is given
4. Journal and viva carry 3+2 marks

Formative Assessment for Practical	
Assessment	Distribution of Marks
Estimation of glucose/glycogen/protein in fish tissue	10
Identification (4X2)	08
Write procedure for bacterial staining	02
Journal	02
Viva	02
Total	25 Marks
<i>Formative Assessment as per guidelines.</i>	

The same shall be used for semester end Examination

B.Sc. Semester–VI INTERNSHIP

Course Title: INTERNSHIP
Course Code:036 IFF 091

Type of Course	Theory /Practical	Credits	Instruction hour/week	Total No.of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
INTERNSHIP	Practical	02	04	56hrs.	3hrs.	50	0	50

Course Outcomes (COs): At the end of the course students will be able to:

CO 1:Learn basic concept of project designing and executing.

CO2: Understanding research methodology and concept.

CO 3: Handling instruments independently and understanding principles of instruments.

CO 4: Having insight into recent development in fisheries science.

CO 5: Having knowledge to writingproject report and skill development

Expt. No	Title: INTERNSHIP	56.hrs/sem
1	Minor project on fisheries aspects are involved	
2	Minor project on: fish market survey, fishing craft and gear, fish food processing, beach study, statistics of fisheries, fish landing center survey, visiting institute of other fisheries institute, local water body analysis, water parameter, study of planktons of pond, study of fish farm management, pre and posting stocking of fish in pond, study in Marine and freshwater finfish and shell fish hatchery	

Formative Assessment for Practical: INTERNSHIP	
Scheme of examination	
Assessment	Distribution of Marks
Submission project / survey/ field report	30
Presentation work	15
Viva	05
Total	50 Marks
<i>Formative Assessment as per guidelines.</i>	

Internship:

A course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an expert of the given external entity. A key aspect of the internship is induction into actual work situations for 2 credits. Internships involve working with local industry, local governments (such as panchayats, municipalities) or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning.

Note;

1. 1 credit internship is equal to 30hrs on field experience.
2. Internship shall be Discipline Specific of 45-60 hours (2 credits) with duration 1-2 weeks.
3. Internship may be full-time/part-time (full-time during last 1-2 weeks before closure of the semester or weekly 4 hrs in the academic session for 13-14 weeks). College shall decide the suitable method for programme wise but not subject wise.
4. Internship mentor/supervisor shall avail work allotment during 6th semester for a maximum of 20 hours.
5. The student should submit the final internship report (45-60 hours of Internship) to the mentor for completion of the internship.
6. Method of evaluation: Presentations/Report submission/Activity etc.

UG programme: 2023-24

GENERAL PATTERN OF THEORY QUESTION COURSE FOR DSCC/ OEC

(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10 marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks
(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

**Note: Proportionate weight age shall be given to each unit based on number of hours
Prescribed**