॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरणा नुसार पदव्युत्तर द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २७ मे २०२५ रोजी संपन्न झालेल्या मा.विद्यापरिषद बैठकीतील विषय क्रमांक ४२/६१–२०२५ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण–२०२० नुसारचे पदव्युत्तर द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यास मा.विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील एम.एस्सी द्वितीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यात येत आहेत.

M. Sc. II year Fishery Science (Affiliated college)

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या www.srtmun.ac.in या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

सहा.कुलसचिव

शैक्षणिक (१–अभ्यासमंडळ) विभाग

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी/पीजीद्वितीयवर्षअभ्यासक्रम/२०२५–२६/215
दिनांक ०२.०९.२०२५

प्रत : १) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मुंल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
३) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) मा. संचालक, सर्व संकुले परिसर व उपपरिसर, प्रस्तुत विद्यापीठ
५) मा. प्राचार्य, न्यू मॉडल डिग्री कॉलेज हिंगोली.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, सदर परिपत्रक संकेतस्थळावर प्रसिध्द करण्यात यावे.

SWAMI RAM SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED - 431 606

TWO YEAR MASTERS PROGRAMME

IN SCIENCE

(As per NEP-2020)

Syllabus for
Subject
M.Sc. Fishery Science
(Semester - I & II)

(Affiliated Colleges)
Under the Faculty of

Science and Technology

Effective from Academic year 2024-2025

स्वामी रामानंद तीर्थ
मराठवाडा विद्यापीठ, नांदेड

Details of the Board of Studies Members in the subject Fishery Science under the faculty of Science & Technology of S.R.T.M. University, Nanded

01.	**Dr. Sunil DeoramAhirrao** Department of Fishery Science Shri. Shivaji College, Parbhani	**Chairman**
02.	**Dr. K. S. Shillewar** Department of Fishery Science Science College, Nanded	**Member**
03.	**Dr. Seema Shesherao Korde,** Department of Fishery Science Azad Mahavidyalaya, Ausa, Dist. Latur.	**Member**
04.	**Dr. Shivaji Prabhakar Chavan** School of Life Sciences, SRTM University Nanded	**Member**
05	**Dr. Guiab D. Khedkar** Dr. Babasaheb Ambedkar Marathwada University, Sambhaji Nagar	**Member**
06.	**Dr. Madhuri Shrikant Pathak** ICAR- Central Institute of Fisheries Education (ICAR-CIFE) Panch Marg. Off Yari Road Mumbai	**Member**
07.	**Dr. Manoj M. Sharma** F/ 17-18, Raj Green Heights, Behind ICICI bank, Rander Road, Jahangirpura, Surat- 395005	**Member**
08.	**Dr. Dhanaji Waman Patil** Department of Fishery Science, Toshniwal Arts Commerce and Science College, Sengaon, Dist. Hingoli	**Invitee Member**
09.	**Dr. Sandip Surendra Markad** Department of Fishery Science Toshniwal Arts Commerce and Science College, Sengaon, Dist. Hingoli	**Invitee Member**

Guidelines for Course Assessment

A. Continuous Assessment (CA) (20% of the Maximum Marks):

This will form 20% of the Maximum Marks and will be carried out throughout the semester. It may be done by conducting **Two Tests** (Test I on 40% curriculum) and **Test II** (remaining 40%syllabus). Average of the marks scored by a student in these two tests of the theory paper will makehis **CA** score(col 6).

B. End Semester Assessment (80% of the Maximum Marks):

(For illustration we have considered a paper of 04 credits, 100 marks and need to be modified depending upon credits of an individual paper)

1. **ESAQuestion paper will consists of 6 questions, each of 20 marks.**
2. **Students are required to solve a total of 4 Questions.**
3. **Question No.1 will be compulsory and shall be based on entire syllabus.**
4. Students need to solve **ANY THREE** of the remaining Five Questions (Q.2 to Q.6) and shall be based on entire syllabus.

Note: Number of lectures required to cover syllabus of a course depends on the number of credits assigned to a particular course. One credit of theory corresponds to 15 Hours lecturing and for practical course one credit corresponds to 30 Hours. For example, for a course of two credits 30 lectures of one hour duration are assigned, while that for a three credit course 45 lectures.

****

Abbreviations:

1. **DSC:** Department/Discipline Specific Core (Major)
2. **DSE:** Department/Discipline Specific Elective (Major)
3. **DSM:** Discipline Specific Minor
4. **GE/OE:** Generic/Open Elective
5. **VSC:** Vocational Skill Course
6. **SEC:** Skill Enhancement Course
7. **AEC:** Ability Enhancement course
8. **ENG:** English Compulsory
9. **MIL:** Modern Indian languages
10. **IKS:** Indian Knowledge System
11. **VEC:** Value Education Course
12. **OJT:** On Job Training (Internship/Apprenticeship)
13. **FP:** Field Projects
14. **CEC:** Community Engagement and Service Courses
15. **CC:**Co-Curricular Courses
16. **RM:** Research Methodology
17. **RP:** Research Project/ Dissertation

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Credit Framework for Two Year PG Program

Subject: **Fishery Science**

Year	Sem	Major subject		RM	OJT/FP	Research Project	Practical	Credits	Total Credits
		Major	DSE						
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	I	SFISCT401 (4 Cr) SFISCT402 (4 Cr) SFISCT403 (4 Cr)	SFISET401 (3 Cr)	SFISRM401 (3 Cr)	--	--	SFISCP401 (1 Cr) SFISCP402 (1 Cr) SFISCP403 (1 Cr) SFISEP401 (1 Cr)	22	44
	II	SFISCT451 (4 Cr) SFISCT452 (4 Cr) SFISCT453 (4 Cr)	SFISET451 (3 Cr)	--	SFISOJ451/ SFISFP451/ SFISCS451 (3 Cr)	--	SFISCP451 (1 Cr) SFISCP452 (1 Cr) SFISCP453 (1 Cr) SFISEP451 (1 Cr)	22	
2	III	SFISCT501 (4 Cr) SFISCT502 (4 Cr) SFISCT503 (3 Cr)	SFISET501 (3 Cr)	--	--	SFISRP501 (4 Cr)	SFISCP501 (1 Cr) SFISCP502 (1 Cr) SFISCP503 (1 Cr) SFISET501 (1 Cr)	22	44
	IV	SFISCT551 (4 Cr) SFISCT552 (4 Cr)	SFISET551 (3 Cr)	SFISPE551 (2 Cr)	--	SFISRP551 (6 Cr)	SFISCP551 (1 Cr) SFISCP552 (1 Cr) SFISEP551 (1 Cr)	22	
		43	**12**	**05**	**03**	**10**	**15**	**88**	**88**

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Credit Framework for Two Year PG Program

Subject: **Fishery Science**

M.Sc. Fishery Science: Second Year Semester III

Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
1	2	3	4	5	6	7	8
Major	SFISCT501	Fish Nutrition and Feed Technology	04	--	04	04	--
	SFISCT502	Coastal Aquaculture & Mariculture	04	--	04	04	--
	SFISCT503	Fish Processing & Product Development	03	--	03	03	--
Elective (DSE)	SFISET501	A. Value Added Fishery Products, Byproducts and Waste Utilization B. Fisheries Economics, Marketing, Cooperative and Extension Education	03	--	03	03	--
Research project	SFISRP501	Research Project	--	04	04	--	08
DSC Practical	SFISCP501	Lab Course 1 Based on Theory paper SFISCT501	--	01	01	--	02
	SFISCP502	Lab Course 2 Based on Theory paper SFISCT502	--	01	01	--	02
	SFISCP503	Lab Course 3 Based on Theory paper SFISCT503	--	01	01	--	02
DSE Practical	SFISEP501	Lab Course 4-A Based on Theory paper SFISET501 (A) Lab Course 4-B Based on Theory paper SFISET501 (B)	--	01	01	--	02
		Total	**14**	**08**	**22**	**14**	**16**

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Credit Framework for Two Year PG Program

Subject: **Fishery Science**

M.Sc. Fishery Science: Second Year Semester III

Examination Scheme

Subject	Course Code	Course Name	Continuous assessment (CA)			*ESA*	*Practical*		*Total*
			Test 1	Test 2	Average (T1+ T2)/2		CA	ESA	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Major	SFISCT501	Fish Nutrition and Feed Technology	20	20	20	80	--	--	100
	SFISCT502	Coastal Aquaculture & Mariculture	20	20	20	80	--	--	100
	SFISCT503	Fish Processing &Product Development	15	15	15	60	--	--	75
Elective (DSE)	SFISET501	A. Value Added Fishery Products, Byproducts and Waste Utilization B. Fisheries Economics, Marketing, Cooperative and Extension Education	15	15	15	60	--	--	75
Research project	SFISRP501	Research Project	--	--	--	--	20	80	100
DSC Practical	SFISCP501	Lab Course 1 Based on Theory paper SFISCT501	--	--	--	--	05	20	25
	SFISCP502	Lab Course 2 Based on Theory paper SFISCT502	--	--	--	--	05	20	25
	SFISCP503	Lab Course 3 Based on Theory paper SFISCT503	--	--	--	--	05	20	25
DSE Practical	SFISEP501	Lab Course 4-A Based on Theory paper SFISET501 (A) Lab Course 4-B Based on Theory paper SFISET501 (B)	--	--	--	--	05	20	25

[20% Continuous Assessment (CA) and 80% End Semester Assessment (ESA)]

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Credit Framework for Two Year PG Program

Subject: **Fishery Science**

M.Sc. Fishery Science: Second Year Semester IV

Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
1	2	3	4	5	6	7	8
Major	SFISCT551	Capture Fisheries	04	--	04	04	--
	SFISCT552	Aquatic Ecology	04	--	04	04	--
Elective (DSE)	SFISET551	A. Fish Genetics & biotechnology	03	--	03	03	--
		B. Sustainable Fisheries Management					
Publication Ethics	SFISPE551	Publication Ethics	02	--	02	02	
Research project	SFISRP551	Research Project	--	06	06		12
DSC Practical	SFISCP551	Lab Course 1 Based on Theory paper SFISCT551	--	01	01	--	02
	SFISCP552	Lab Course 2 Based on Theory paper SFISCT552	--	01	01	--	02
DSE Practical	SFISEP551	Lab Course 3-A Based on Theory paper SFISET551 (A)	--	01	01	--	02
		Lab Course 3-B Based on Theory paper SFISET551 (B)					
		Total	**13**	**09**	**22**	**13**	**18**

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Credit Framework for Two Year PG Program

Subject: **Fishery Science**

M.Sc. Fishery Science: Second Year Semester IV

Examination Scheme

Subject	Course Code	Course Name	Continuous assessment (CA)			*ESA*	*Practical*		*Total*
			Test 1	Test 2	Average (T1+ T2)/2		CA	ESA	
1	2	3	4	5	6				
Major	SFISCT551	Capture Fisheries	20	20	20	80	--	--	100
	SFISCT552	Aquatic Ecology	20	20	20	80	--	--	100
Elective (DSE)	SFISET551	A. Fish Genetics & biotechnology	15	15	15	60	--	--	75
		B. Sustainable Fisheries Management							
Publication Ethics	SFISPE551	Publication Ethics	10	10	10	40	--	--	50
Research project	SFISRP551	Research Project	--	--	--	--	30	120	160
DSC Practical	SFISCP551	Lab Course 1 Based on Theory paper SFISCT551	--	--	--	--	05	20	25
	SFISCP552	Lab Course 2 Based on Theory paper SFISCT552	--	--	--	--	05	20	25
DSE Practical	SFISEP551	Lab Course 3-A Based on Theory paper SFISET551 (A)	--	--	--	--	05	20	25
		Lab Course 3-B Based on Theory paper SFISET551 (B)							

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-III

Discipline Specific Core Course

SFISCT501: Fish Nutrition and Feed Technology

Periods: 60	**No. of Credits: 04**	**Marks: 100**

Course pre-requisite:

- Basic information about fishes, fish biology and nutrition

Course objectives:

1. To give synoptic understanding about nutrition and nutritional requirements of fishes.
2. To impartskills of formulating feeds as per the nutritional requirements.
3. To impart technical knowhow and skills regarding manufacture of feed
4. To give through understanding of analysis of feed and ingredients

Course outcomes:

1. The learner will be able to identify and classify different feed ingredients
2. The learner will gain detailed knowledge and skills about formulation of feed as per nutritional requirements and available ingredients
3. The learner will be technically sound in proximate analysis of feed as well as different feed ingredients.

CURRICULUM DETAILS

Module No	Unit No	Topics	Hrs required to cover the content
1		**Unit I**	**15**
	1.1	Introduction: Fundamentals of fish nutrition	
	1.2	Nutritional requirements of cultivable fishes and shellfishes	
	1.3	Methods to study the nutritional requirements.	
	1.4	Types of fish feeds	
	1.5	Feed ingredients used in Fish feeds: Commonly used, additives, Non-conventional, Qualitiesof that determine feed quality, Selection	
2		**Unit II**	**15**
	2.1	Fish feed formulation	
	2.2	Feed processing and manufacture technology	
	2.3	Common processes in feed manufacture: Grinding,Dosing, Homogenization; Extrusion cooking;	
	2.4	Complimentary processes: Drying,crumbling, coating; Use of binders;	
	2.5	Equipments used in feed manufacture: Pulveriser,grinder, mixer, pelletizer, crumbler, drier, Extruder/Expander, Vacuum coater, fatSprayer	
3		**Unit III**	**15**
	3.1	Feed qualitydetermination and feed making	

	3.2	Evaluation of efficiency of fish feeds	
	3.3	Feed economics andevaluation criteria: FCR, AFCR, SGR, PRE, ERE, PER, NPU.	
	3.4	Quality control in fish feed manufacturing	
	3.5	Nutrient leeching in feeds	
4		**Unit IV**	
	4.1	Advanced feeds:High energy feeds, Maturation diets to enhance breeding efficiency, Larval feeds, Live feed	
	4.2	Nutrient enrichment of feed, Bio-routing of nutrients, Chemo-therapeutants, Other growth promotingagents through live feeds.	**15**
	4.3	Nutritional deficiency disorders, symptoms and diseases in fishes	
	4.4	Probiotics in fish nutrition and aquaculture: Introduction, Selection criteria for probiotics, Composition and dosages, Potential of probiotics, Overall significance of probiotics in aquaculture.	

Reference:

1. ADCP (Aquaculture Development and Co-ordination Programme), 1980.*Fish Feed Technology*. ADCP/REP/80/11. FAO.
2. Ali SA. 2018. *Nutritional feeding of fish and shrimps in India*. MJP Publ.
3. Cyrino EP and Bureau D and Kapoor BG. 2008. *Feeding and Digestive Functions in Fishes.* Science Publ.
4. D' Abramo LR, Conklin DE and Akiyama DM. 1977. *Crustacean Nutrition: Advances in Aquaculture*. Vol. VI. World Aquaculture Society, Baton Roughe.
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9. Halver J and Hardy RW. 2002. *Fish Nutrition*. Academic Press.
10. Halver JE and Tiews KT. 1979. *Finfish Nutrition and Fish feed Technology*.Vols. I, II Heenemann, Berlin.
11. Hertrampf JW and Pascual FP. 2000. *Handbook on Ingredients for Aquaculture Feeds*. Kluwer.
12. Houlihan D, Boujard T and Jobling M. 2001. *Food Intake in Fish*. Blackwell.
13. Lavens P and Sorgeloos P. 1996. *Manual on the Production and Use of Live Food for Aquaculture*. FAO Fisheries Tech. Paper 361, FAO.
14. Lovell RT. 1998. *Nutrition and Feeding of Fishes*. Chapman and Hall.
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16. Merrifield D and Ringo E. 2014. *Aquaculture Nutrition: gut health, probiotics and prebiotics*.
17. Nates SF, 2016. Aquafeed formulation. Academic Press
18. 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.
19. Ninawe AS and Khedkar GD. 2009. *Nutrition in aquaculture*. NarendraPubl
20. Strasbourg LK. 2013. *Fish feeding in integrated fish farming*. Random Exports. Wiley Blackwell

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-III

Discipline Specific Core Course

SFISCP501: Lab course 1

(Based on SFISCT501: Fish Nutrition and Feed Technology)

Periods: 30	**No. of Credits: 01**	**Marks: 25**

CURRICULUM DETAILS

1. Study of nutritional requirements of cultivable fishes and shellfishes
2. Estimation of protein content of feed/ feed ingredient
3. Estimation of fat/lipid content of feed/ feed ingredient
4. Estimation of Moisture content of feed/ feed ingredient
5. Study of feed quality (water stability, sinking/floating capacity)
6. Study of feed type (Starter, grower, finisher)
7. Formulation of feed using different ingredients
8. Preparation of fish feed
9. Study of feed enrichment
10. Decapsulation/hatching of artemia cyst
11. Submission of locally available fish feed ingredient/ fish feed

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science and Technology

NEP-2020 Pattern (w.e.f. 2025)

Practical Examination: M.Sc. Second Year Semester-III

Subject: Fishery Science

Discipline Specific Core Course Practical

SFISCP501: Lab course 1

(Based on SFISCT501: Fish Nutrition and Feed Technology)

Centre:

Date: **Time:** **Batch No.:**

Credits: 01 **Marks: 20**

Q.1	Estimation of ……content of given sample. (Protein/ Lipid/ Moisture)	07
Q. 2	Formulate the feed …… % protein and …….% fat content as per the given inputs.	06
Q. 3	Estimate the …… of given fish feed. (water stability, sinking/floating capacity) OR Prepare the setup for Decapsulation/hatching of artemia cyst.	05
Q. 4	Viva-voce	02

Examiner 1 **Examiner 2**

Name &Signature Name &Signature

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-III

Discipline Specific Core Course

SFISCT502: Coastal aquaculture & Mariculture

Periods: 60	**No. of Credits: 04**	**Marks: 100**

Course pre-requisite:

-

Course objectives:

1.

Course outcomes:

1.

CURRICULUM DETAILS

Module No	Unit No	Topics	Hrs required to cover the content
1		**Unit I: Introduction to Coastal Aquaculture and Mariculture**	**15**
	1.1	Overview: importance, production Resources and trends of aquaculture in India	
	1.2	Development of coastal aquaculture in India	
	1.3	Difference between coastal aquaculture and mariculture	
	1.4	Commercial important cultivable species :a) Finfishes b) Shellfishes c) Mussel and clams d) Edible oyster and pearl oyster e) Seaweeds	
	1.5	Traditional shore-based aquaculture systems in India: Bheries, Gheries, Pokali fields, Gaznis and khazans	
2		**Unit II: Site Selection and Methods**	**15**
	2.1	Site selection for coastal aquaculture	
	2.2	Site selection for mariculture	
	2.3	Methods of aquaculture: Land based: Pond, RAS, Integrated Multi-Trophic Aquaculture (IMTA)	
	2.4	Methods of aquaculture: Open water: Cages, Rafts, Racks, Poles and Line, Long lines	
3		**Unit III: Aquaculture practices of commercially important Fish and Shrimp species**	**15**
	3.1	Culture of Sea bass	
	3.2	Culture of Mullet	
	3.3	Culture of Milk fish	
	3.4	Culture of shrimp	
	3.5	Culture of Mud crab	
4		**Unit IV: Aquaculture practices of commercially important**	**15**

		Bivalves and seaweed species	
	4.1	Culture of clam	
	4.2	Culture of mussel	
	4.3	Culture of oyster	
	4.4	Culture of pearl oyster	
	4.5	Culture of seaweed	

Reference:

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Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-III

Discipline Specific Core Course

SFISCP502: Lab course 2

(Based on SFISCT502: Coastal aquaculture & Mariculture)

Periods: 30	**No. of Credits: 01**	**Marks: 25**

CURRICULUM DETAILS

Practical

1. Identification of commercial important costal/marine fin fish species and their larvae.
2. Identification of commercial important costal/marine shrimp species and their larvae
3. Identification of commercial important costal/marine bivalve species and their larvae
4. Identification of commercial important costal/marine plant species
5. Estimation of salinity in aquaculture ponds/cages.
6. Estimation of temperature in aquaculture ponds/cages.
7. Estimation of pH aquaculture ponds/cages
8. Estimation of dissolved oxygen in aquaculture ponds/cages.
9. Measurement of turbidity in aquaculture ponds/ cages.
10. Preparation of cage models for fish culture / longlines model for seaweed or mussel culture
11. Study of coastal ponds, pens and cages
12. Disease diagnosis demonstration
13. Field visits to coastal farms, cage units or Project/report on mariculture development/ allied activity in India

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science and Technology

NEP-2020 Pattern (w.e.f. 2025)

Practical Examination: M.Sc. Second Year Semester-III

Subject: Fishery Science

Discipline Specific Core Course Practical

SFISCP502: Lab course 2

(Based on SFISCT502: Coastal aquaculture & Mariculture)

Centre:

Date: **Time:** **Batch No.:**

Credits: 01 **Marks: 20**

Q. 1	Estimate the ……of given water sample (Dissolved oxygen/Turbidity/salinity)	06
Q. 2	Identify, classify and comment on fish species (Any 04)	08
Q. 3	Identify and comment on disease of given specimen (Any 02)	04
Q. 4	Viva-voce	02

Examiner 1 **Examiner 2**

Name & Signature Name & Signature

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-III

Discipline Specific Core Course

SFISCT503: Fish processing & product development

Periods: 45	**No. of Credits: 03**	**Marks: 75**

Course pre-requisite:

- .

Course objectives:

1. To
2. .

Course outcomes:

1. The
2. .

CURRICULUM DETAILS

Module No	Unit No	Topics	Hrs required to cover the content
1		**Unit I: Principles of spoilage and preservation**	**15**
	1.1	Introduction	
	1.2	Composition of fish: Proximate composition of fish Structure and function of fish muscle	
	1.3	Postmortem changes in fish: Changes in raw fresh fish, Autolytic changes, microbial changes, Spoilage of fish	
	1.4	Water activity	
	1.5	Principles and methods of Fish preservation:Chilling, Curing (drying, salting and smoking), Freezing, Freeze-drying, Rising the temperature, Boiling, Marinating, Fermentation, Irradiation, Hurdle technology, MAP (Modified Atmospheric Packaging), Canning and Retort pouch packaging	
2		**Traditional methods of fish processing and preservation**	**15**
	2.1	Salting: Theory of salting, Sources of salting, Factors of salt to be considered before using for salting, Types of salting, Microbial spoilage in salted fish	
	2.2	Drying: Factors effecting drying, Falling rate period,Methods of drying	
	2.3	Marinating: Fish Marinades, Types of fish marinades	
	2.4	Fermented fishery products: Types fermentation, Preparation of fermented products, Types of fermented fish products	

	2.5	Pickel: Introduction, Preparation of pickleof Fishes	
	2.6	Smoking of fish: Preservation by smoking, Types of smoking, Materials used to produce the smoke, Components of smoke	
3		**Unit III: Icing and chilling**	**15**
	3.1	**1. Icing:** Introduction to Icing,Different types of Ice (Block Ice, Flake Ice, Plate Ice, Tube Ice), Advantages of chilling of fish with ice, Chilled storage, Storage method, Calculation of the ice requirement for cooling and storage of fish	
	3.2	**2. Chilling (Super Chilling 0 to -4°C):** Introduction, Refrigerated Sea Water (RSW), Chilled sea water (CSW), Slurry Ice in Fish Preservation, Cooling and Storage Tests	
	3.3	**3. Application of ozone/chlorine in seafood processing:** Application of ozone in seafood processing, Use of Chlorine in Fish Processing, Concentration of chlorine used in Fish processing, Marginal Chlorination, Super Chlorination, Break-point chlorination, In-plant Chlorination.	
4		**Unit IV (Refrigeration and Freezing)**	**15**
	4.1	**Freezing: Principle of freezing (**Specific heat, Thermal conductivity, Latent heat, Principles of freezing), **Types of freezers (**Air blast freezers, Plate freezers, Liquid nitrogen freezer, Carbon dioxide freezer, Immersion freezers); **Methods of protective treatments (**Brining, Advantages of brine treatment, Use of Polyphosphate in freezing of fish, Methods of using antioxidants); **Calculation of freezer refrigeration load**, Freezing time	
	4.2	**Freeze drying fish:** Theory of freeze drying, Principle of the equipment, Freeze drying process	
	4.3	**Thawing of fish: Introduction, Methods of fish thawing (**1. Thawing in air, 2. Water thawing, 3. Thawing between heated plates, 4. Choice of method)	
	4.4	**Prevention of quality loss during frozen storage:** Treatments prior to freezing,Antioxidants,Cryoprotectants and other additives, Theories of cryoprotection,Glazing- importance and methods.	

Reference:

1. Fghfg
2. dfgdf

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-III

Discipline Specific Core Course

SFISCP503: Lab course 3

(Based on SFISCT503: Fish processing & product development)

Periods: 30	**No. of Credits: 01**	**Marks: 25**

CURRICULUM DETAILS

1. Study of

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science and Technology

NEP-2020 Pattern (w.e.f. 2025)

Practical Examination: M.Sc. Second Year Semester-III

Subject: Fishery Science

Discipline Specific Core Course Practical

SFISCP503: Lab course 3

(Based on SFISCT503: Fish processing & product development)

Centre:

Date: **Time:** **Batch No.:**

Credits: 01 **Marks: 20**

Q. 1 06

Q. 2 06

Q. 3 06

Q. 4 02

Examiner 1 **Examiner 2**

Name &Signature Name &Signature

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-III

Discipline Specific Elective Course

SFISET501: A. Value Added Fishery Products, Byproducts and Waste Utilization

Periods: 45	**No. of Credits: 03**	**Marks: 75**

Course pre-requisite:

- .

Course objectives:

1. .

Course outcomes:

1. .

CURRICULUM DETAILS

Module No	**Unit No**	**Topics**	**Hrs required to cover the content**
1		**Unit I:**	**11**
	1.1	Significance of value addition: Protein deficiency and need for fortification of food, Digestibility and nutritive value of fish meat,	
	1.2	Overview of value-added products	
	1.3	Current market trends	
	1.4	Scope of value addition in fishery	
	1.5	Types of value addition	
2		**Unit II**	**11**
	2.1	**Minced fish meat:** Equipment for mince preparation, Effect of mincing on physical and chemical properties; Different types of mince-based products,	
	2.2	**Surimi:** Basic concepts, Different unit operations, Cryoprotectants in surimi-hypothesis and mechanisms, Packaging, freezing and storage, Quality evaluation of surimi,	
3		**Unit III Value added fish products**	**12**
	3.1	Value addition	
	3.2	**Different value added fish Products:** 1. Pickles 2. Fermented fish products 3. Battered and breaded products: 4. Fish finger and Fish cutlet	

		5. Extruded fish products: 6. Fish marinades 7. Kamaboko and analogue products. 8. Ready-to-eat and ready-to-cook products: 9. Fishfinger, fish cutlet, fish wafer, and fish soup powder. 10. Other value added fish products	
4		**Unit IV :Fish wastes and utilization**	**11**
	4.1	**Overview of fish processing wastes, bycatches**	
	4.2	Fish byproducts: 1. Fish meal 2. Fish body oil & Fish liver oil 3. Chitin-chitosan. 4. Fish protein concentrate, Fish hydrolysate 5. Fish silage, Fish maws & isinglass, 6. Fish glue, fish gelatin, pearl essence 7. Shark leather, sharkfin rays 8. Beach-de-mer. 9. Biochemical and pharmaceutical products. 10. Seaweed byproducts: agar agar, algin, carrageenan	

Reference:

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Faculty of Science and Technology,

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M.Sc. SY Semester-III

Discipline Specific Elective Course

SFISEP501: Lab course 4-A

(Based on SFISET501: A. Value Added Fishery Products, Byproducts and Waste Utilization)

Periods: 30	**No. of Credits: 01**	**Marks: 25**

CURRICULUM DETAILS

1. Preparation of Surimi from low value fish;
2. Evaluation of Surimi gel strength;
3. Evaluation of ATPase activity of actomyosin based products;
4. Preparation of analog products from surimi, battered and breaded products, extruded products, cook-chill products and seaweed-based product
5. Extraction of collagen from fish waste,
6. Gelatin from fish waste and
7. Enzymes fromfish waste.
8. Preparation of hydrolysates from fish and shellfish wastes.
9. Extractionof chitosan and glucosamine from shrimp shell waste,
10. Recovery of fish oil from fishwaste

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NEP-2020 Pattern (w.e.f. 2025)

Practical Examination: M.Sc. Second Year Semester-III

Subject: Fishery Science

Discipline Specific ElectiveCourse Practical

SFISEP501: Lab course 4-A

(Based on SFISET501: A. Value Added Fishery Products, Byproducts and Waste Utilization)

Centre:

Date: **Time:** **Batch No.:**

Credits: 01 **Marks: 20**

Q. 1 Dissect given fish specimen to remove pituitary gland. 06

OR

Prepare the extract of given pituitary glands

Q. 2 Identify the developmental stage of given specimen (Any 03) 06

Q. 3 Count the given fish seed and pack using given packaging material 06

OR

Carryout the eye-ablation of given specimen

Q. 4 Viva-voce 02

Examiner 1 **Examiner 2**

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Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-III

Discipline Specific Elective Course

SFISET401: B. Fisheries Economics, Marketing, Cooperative and Extension Education

Periods: 45	**No. of Credits: 03**	**Marks: 75**

Course pre-requisite:

- .

Course objectives:

1. .

Course outcomes:

1. .

CURRICULUM DETAILS

Module No	**Unit No**	**Topics**	**Hrs required to cover the content**
1		**Unit- I: Fishery Economics**	**12**
	1.1	Definitions and principles of economics, Fisheries economics	
	1.2	Terms in economics.	
	1.3	Microeconomics- Demand, Supply & Price	
	1.4	Costs & Returns, Break-even analysis and Profit maximisation fish production system	
	1.5	Macroeconomics- National income: Introduction, accounting, measurement and determinants	
2		**Unit II: Fishery MARKETING**	**11**
	2.1	Core concepts of marketing	
	2.2	Markets: Markets, Approaches, Marketing and Marketers	
	2.3	Marketing Management: Introduction, Demand States and Marketing Tasks	
	2.4	Market Structure and Types: Different types of market structure; Pure competition; Pure monopoly; Monopsony; Monopolistic competition; Oligopoly, Oligopsony, Price Discrimination	
	2.5	Approaches for studying the problems in marketing	
	2.6	Marketing Channels and Supply Chain; Marketing Channel Functions and Flows	
	2.7	Marketing functions: a) Functions of exchange, b) Functions of physical supply, c) Facilitating functions.	
3	3.1	**Unit - III: Cooperatives in fisheries**	**11**
	3.2	Evolution of co-operative movement in India	
	3.3	Fishery cooperatives in India	
	3.4	Objectives and Principles of cooperatives; Need for co-operation;	

	3.5	Benefits and Weakness of the cooperative movement	
	3.6	Formation of a Co-operative Society	
	3.7	Organizational Structure of Co-operative Societies	
	3.8	Status and problems of fisheries co-operatives	
	3.9	Function of fishermen co-operative society	
4		**Unit – IV: Extension Education**	**11**
	4.1	Introduction:	
	4.2	Education: Purpose, types	
	4.3	Extension education: Characteristics, Need, process/cycle	
	4.4	Objectives and Principles of extension	
	4.5	Teaching and learning process	
	4.6	Development pf Extension programme process	
	4.7	Extension system in India	

Reference:

1.

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Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-III

Discipline Specific Elective Course

SFISEP501: Lab course 4-B

(Based on SFISET401: B. Fisheries Economics, Marketing, Cooperative and Extension Education)

Periods: 30	**No. of Credits: 01**	**Marks: 25**

CURRICULUM DETAILS

1.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science and Technology

NEP-2020 Pattern (w.e.f. 2025)

Practical Examination: M.Sc. Second Year Semester-III

Subject: Fishery Science

Discipline Specific ElectiveCourse Practical

SFISEP501: Lab course 4-B

(Based on SFISET401: B. Fisheries Economics, Marketing, Cooperative and Extension Education)

Centre:

Date: **Time:** **Batch No.:**

Credits: 01 **Marks: 20**

Q. 1	06
Q. 2	06
Q. 3	06
Q. 4 Viva-voce	02

Examiner 1 **Examiner 2**

Name &Signature Name &Signature

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-III

SFISRP501: Research Project

Periods: 60	No. of Credits: 04	Marks: 100

Course pre-requisite:

Students should have minimum, expected background of knowledge in Biology, Mathematics, Statistics andcomputer Science

Course objectives:

1. The students will know how to access new facts using systematic thinking, analyzing phenomena, problems and seeking solutions based on reliable facts. The analysis of a phenomenon and trace its basics and refute its cause.
2. The prediction based on scientific evidence, documented methodology and consecutive logical steps. Provide logical solution to the problem. To reach new and innovative results based on the latest factsand research.

Course outcomes: The students will get following ideas, skills and techniques-

1. Understand basic concepts of research and its methodologies
2. Identify appropriate research topics
3. Select and define appropriate research problem and parameters
4. Present a research report and paper
5. Write a research proposal for grant

CURRICULUM DETAILS

Module No	Unit No	Topics	Hours required to cover the content
1			**10**
	1.1		
	1.2		
	1.3		
	1.4		
2			**12**
	2.1		
	2.2		
	2.3		
	2.4		
3			**12**
	3.1		
	3.2		
	3.3		
	3.4		
4			**11**
	4.1		
	4.2		
	4.3		

	4.4		

References:

1. Hall, Englewood Cliffs, New Jersey

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-IV

Discipline Specific Core Course

SFISCT551:Capture Fisheries

Periods: 60	**No. of Credits: 04**	**Marks: 100**

Course pre-requisite:

- Basic knowledge about fishes, waterbodies, fishing.

Course objectives:

1. To study fishery resources of India and their potential.
2. To study role of different fishery resources in total fishery production
3. To study andunderstand the methods of fisheries in India.
4. To study impact of fisheries on natural resources and methods of conservation

Course outcomes:

1. The learner will have thorough knowledge about commercially important fisheries.
2. The students will have expertise in different fishery resources of India
3. The student will be well aware about the exploitation as well as conservation of different fishery resources.

CURRICULUM DETAILS

Module No	**Unit No**	**Topics**	**Hrs required to cover the content**
1		**Introduction to Capture Fisheries**	**15**
	1.1	Introduction: Definition, scope and significance, Development and status of capture fishery in India	
	1.2	Status of fish production	
	1.3	Inland and marine fishery resources of India	
	1.4	Fishing crafts of India: Introduction, Types of fishing crafts, Fishing crafts used in inland and marine fisheries (Rafts, Coracle, Catamaran, Dug-out canoes, Plank built boat, Large fishing boats, Mechanised boats,etc)	
	1.5	**Fishing gears** – Introduction, types of fishing gear, Fishing gears used in inland and marine fisheries: Drag Net, Gill Net**,** Trammel Net, Cast Net, Dip Net or Lift Net, Purse Net, Bag set net**,** Hooks and lines**,** Dredges, Traps, etc	
2		**Unit II: Inland Capture Fisheries**	**15**
	2.1	**Riverine Fisheries of India**	
		Introduction, Classification of rivers of India	
		Major riverine systems and their fisheries: Ganga river system, Brahmaputra river system, East coast river system, West coast river system	
	2.2	**Reservoirs Fisheries:** Introduction, Classification of Reservoirs, Reservoir ecosystem,	
		Fish and fisheries of major reservoirs in India	
		Recent advances in reservoir management	

	2.3	Impact of reservoir/damsformation on the native Ichthyofauna and riverine fisheries	
3		**Unit III:**	15
	3.1	**Estuarine fisheries:** Introduction**,** classification and fish production potential	
	3.2	Fish and fisheries of major estuaries of India	
	3.3	**Fish and fisheries of major brackish water lakes in India:** Chilka lake, Pulicat lake	
	3.4	Floodplain wetland (Beel) fisheries in India	
	3.5	Impacts of exotic fish species in India	
4		**Marine Capture Fisheries**	**15**
	4.1	Introduction; structure of marine environment	
	4.2	**Important pelagic fisheries**: Oil sardine and lesser sardines, pomfret, anchovies, mackerel, ribbon fishes and cephalopods	
	4.3	**Demersal Finfish Fisheries:** Elasmobranchs; Bombay duck, silver bellies, threadfins and perches; flat fishes	
	4.4	**Demersal Shellfish fisheries:** shrimps, crabs, oysters and clams	
	4.5	Conservation of marine resources	

References:

1. dfgdfgdfgfd

Periods: 30	**No. of Credits: 01**	**Marks: 25**

CURRICULUM DETAILS

1. Study of different inland fishery resources of India
2. Study and preparation of map of river systems in India
3. Study of marine fishery resources of India
4. Study of fishery production statistics of India
5. Study of important fishing crafts used in India (Rafts, Coracle, Catamaran, Dug-out canoes, Plank built boat, Large fishing boats, Mechanised boats,etc)
6. Study of important fishing gears used in India (Drag Net, Gill Net,Trammel Net, Cast Net, Dip Net or Lift Net, Purse Net, Bag set net, Hooks and lines,Dredges, Traps, etc)
7. Identification and study of marine species: Oil sardine and lesser sardines, pomfret, anchovies, mackerel, ribbon fishes and cephalopods, Bombay duck, silver bellies, threadfins and perches; flat fishes, shrimps, crabs, oysters and clams
8. Identification and study of Inland species: Catla, Rohu, Mrigal, common carp, grass carp, Singhi, Murrel, Tilapia, Magur, Freshwater prawn, etc
9. Visit to fishing centre/reservoir/landing centre.
10. Preparation and submission of model (related to fishery activity)

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Faculty of Science and Technology

NEP-2020 Pattern (w.e.f. 2025)

Practical Examination: M.Sc. Second Year Semester-IV

Subject: Fishery Science

Discipline Specific Core Course Practical

SFISCP551: Lab course 1

(Based on SFISCT551: Capture Fisheries)

Centre:

Date: **Time:** **Batch No.:**

Credits: 01 **Marks: 20**

Q. 1	Draw the map of ……..river system. (Ganga/Brahmaputra/East-coast/ West-coast)	05
Q. 2	Identify and comment on given specimen (One Fishing craft, one fishing gear)	04
Q. 3	Identify, classify and comment on given specimen (Any three fishery species)	09
Q. 4	Viva-voce	02

Examiner 1 **Examiner 2**

Name &Signature Name &Signature

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-IV

Discipline Specific Core Course

SFISCT552 Aquatic Ecology

Periods: 60	**No. of Credits: 04**	**Marks: 100**

Course pre-requisite:

- General information about waterbodies, fishes and ecology.

Course objectives:

1. To provide knowledge about ecology of different aquatic environments.
2. To impart knowledge & technical knowhow regarding physico-chemical characteristics of different waterbodies.
3. To study pollution and biomonitoring.

Course outcomes:

1. The students will be thoroughly informed about the ecologies of different aquatic environments.
2. Learners will gain detailed knowledge on characteristics of water bodies.
3. The student will have expertise in water quality assessment and monitoringSSS.

CURRICULUM DETAILS

Module No	Unit No	Topics	Hrs required to cover the content
1		**Introduction to Aquatic Ecology**	**15**
	1.1	General concept, definition, scope and significance of aquatic ecology in fisheries	
	1.2	Types of aquatic ecosystems: lentic (lakes, ponds), lotic (rivers, streams), estuarine and marine	
	1.3	Ecosystem structure: biotic and abiotic components	
	1.4	Ecological niches, energy flow (Pyramid) in aquatic systems	
2		**Fresh water Ecology**	**15**
	2.1	**Biotic and Abiotic Characteristics of Water:** **A. Physical and Chemical Characteristics of Water:** Light penetration, temperature and thermal stratification Dissolved gases (O_2, CO_2, NH_3, H_2S). Salinity, pH, alkalinity, hardness, conductivity. Nutrient cycles (C, N, P) and eutrophication **B. Biotic Communities:** Aquatic primary producers: phytoplankton, macrophytes, periphyton. Consumers: zooplankton, benthos, nekton. Decomposers and detritus food chain.	
	2.2	River ecology: a) Physico-chemical characters of river waters, b)	

		Biotic factors- Producers, consumers and decomposers, c) Zonation of river-Rhithron and potamon zone, d) Flora and fauna of river	
	2.3	Ecology of Reservoir: a) Introduction to reservoirs, b) Classification of reservoirs, c) Physico-chemical characters of reservoirs waters, e) Biotic Community: -Flora and fauna of reservoirs	
3		**Estuarine and Marine Ecology**	**15**
	3.1	**Ecology of Estuaries** a) Types of estuaries: i. Salt wedge estuaries ii. Partially mixed estuaries iii. Fjords estuaries iv. Bar-built estuaries b) Physico-chemical characteristic of estuaries. c) Biota of estuaries: Oligohaline organism, true estuarine organism, Stenohaline organism, marine organism and migrants	
	3.2	**Marine Ecology:** a) Physico-chemical characters of Sea water. b) Horizontal & Vertical Zonation of Sea water c) Flora & Fauna.	
4		**Applied aquatic ecology**	**15**
	4.1	Aquatic pollution: Introduction, types, sources/pollutants and impacts on fisheries	
	4.2	Bioindicators and biomonitoring	
	4.3	Treatment of sewage waste	

References:

1. asdsadasd

Periods: 30	**No. of Credits: 01**	**Marks: 25**

CURRICULUM DETAILS

1. Collection, identification of planktons
   a. Fresh water phytoplankton & Zooplankton.
   b. Marine Phytoplankton & Zooplankton
2. Preparation of permanent slides
3. Measurement of physical parameters: temperature, turbidity, transparency (Secchi disc).
4. Estimation of chemical parameters: dissolved oxygen (DO), free CO_2, alkalinity, hardness, pH, salinity
5. Measurement of primary production
6. Study of benthic organisms
7. Study of natural pond habitat and organisms
8. Study of estuarine habitat and organisms
9. Study of river habitat and organisms
10. Study of endangered species and protection
11. Field visits: rivers / lakes /Estuaries / mangroves / wetlands

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Practical Examination: M.Sc. Second Year Semester-IV

Subject: Fishery Science

Discipline Specific Core Course Practical

SFISCP552: Lab course 2

(Based on SFISCT552 Aquatic Ecology)

Centre:

Date: **Time:** **Batch No.:**

Credits: 01 **Marks: 20**

Q. 1 Estimate …….. for given water sample. 06

(Dissolved oxygen/ Free CO_2/ alkalinity/ transparency)

Q. 2 Preparation of permanent slide and identification of given plankton sample. 06

Q. 3 Identify and comment on given spot (Any three organisms) 06

Q. 4 Viva-voce 02

Examiner 1 **Examiner 2**

Name &Signature Name &Signature

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-IV

Discipline Specific Elective Course

SFISET551: A. Fish Genetics & Biotechnology

Periods: 45	**No. of Credits: 03**	**Marks: 75**

Course pre-requisite:

- General information regarding fish, cell structure and genetics.

Course objectives:

1. To provide detailed knowledge about genetics.
2. To study different concepts and applications of genetics in fisheries
3. To study various molecular techniques
4. To studydifferent biotechnological concepts for applications in fisheries

Course outcomes:

1. The students will have thorough knowledge regarding fishery genetics
2. The learners will be able to perform various molecular procedures.
3. The students will be able to undertake steps for application of biotechnology in fisheries and aquaculture.

CURRICULUM DETAILS

Module No	Unit No	Topics	Hrs required to cover the content
1		**Unit I Genetics**	**10**
	1.1	Introduction	
	1.2	Nucleic acids -structure, function and types	
	1.3	Concepts of gene and genetic code,	
	1.4	Replication, transcription and translation,	
	1.5	Mutations and its implications	
2		**Unit II Genetics and fish breeding**	**11**
	2.1	Principles ofgenetics and breeding.	
	2.2	Mendel's law of inheritance – complete and incomplete dominance, monohybrid and dihybrid ratios.	
	2.3	Gene interactions – dominant and recessive epistasis.	
	2.4	Linkage and crossing over.	
	2.5	Sex determination, Sex - linked genes	
	2.6	Hardy- Weinberg law and its significance.	
3		**Unit III Biotechnology**	**12**
	3.1	Chromosome manipulation techniques- androgenesis, gynogenesis and polyploidy and identification of ploidy.	
	3.2	Cross breeding (hybridization) – types of cross breeding, heterosis and design of cross breeding programmes, hybridization in different fishes.	
	3.3	Quantitative genetics – quantitative traits, polygenic traits, heritability	
	3.4	Selective breeding: History and present status in aquaculture, Selection methods and mating designs, Design of selective breeding for	

		Qualitativeand Quantitative traits	
	3.5	Cryopreservation of gametes	
	3.6	Inbreeding and its consequences	
4		**Unit IV Genetic Engineering**	**12**
	4.1	**Genetic engineering:**Restriction enzymes; Gene isolation; Cloning vectors; Recombinant DNA Technology, Transgenic Fish Production, Hybridoma Technology, Animal Cell Culture	
	4.2	**Molecular And Immunological Techniques Applied In Fisheries**: PCR, Electrophoresis, DNA Fingerprinting, Dot and slot blotting of DNA, Gene chip or DNA microarray , Gene therapy, Nucleus transplantation, Cloning, DNA – based diagnostics	
	4.3	**Immunological Techniques Applied**: Enzyme immunoassays, Dot immunobinding assay, Western blotting, Latex agglutination test	
	4.4	**Vaccination**: Introduction, mode of preparation of Fish vaccine, types of vaccines, development of vaccines, Vaccine delivery,	

References:

1. Attwood TK and Smith DJP. 1999. *Introduction to Bioinformatics.* Addison Wesley Longman.
2. Brown SM. 2000. *Bioinformatics: A Biologist's Guide to Biocomputing and the Internet*. Eaton Publ.
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4. Cameron ND. 1997. *Selection Indices and Prediction of Genetic Merit in Animal Breeding*. CABI.
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7. Gjedrem Trygve *et al*. 2005. *Selection and Breeding Programs in Aquaculture* Springer
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15. Littell RC, Milliken GA, Stroup WW and Wolfinger RD. 1996. *SAS System for Mixed Models*. SAS Institute.
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27. Saxton AM. 2004. *Genetic Analysis of Complex Traits Using SAS*. SAS Publ.
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29. Stansfield WD. 1991. *Theory and Problems of Genetics*. McGraw-Hill.
30. Tave D. 1993. *Genetics for Fish Hatchery Managers*. 2nd Ed. Chapman and Hall.
31. Thomas PC, Rath SC and Mohapatra KD. 2003. *Breeding & Seed Production of Finfish & Shellfish*. Daya P. House.
32. Turner HN and Young SSY. 1969. *Quantitative Genetics in Sheep Breeding*. Cornell university Press.
33. Weatherely AH and Gill HS. 1988. *The Biology of Fish Growth*. Blackwell Synergy.

Suggested Journals: *Aquaculture, Aquaculture Reports, Aquaculture Research, Genetics, Indian Journal of Fisheries, Journal of Fish Biology, The Journal of Heredity*

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M.Sc. SY Semester-IV

Discipline Specific Elective Course

SFISEP551: Lab course 3-A

(Based on SFISET551: A. Fish Genetics & Biotechnology)

Periods: 30	**No. of Credits: 01**	**Marks: 25**

CURRICULUM DETAILS

1. Calculations related to Mendelian inheritance (qualitative genetics) - monohybrid and dihybrid ratios and epistasis.
2. Calculations related to quantitative traits, response to selection and heritability.
3. Estimation of rate of inbreeding, heterosis.
4. Demonstration of protocol of androgenesis, gynogenesis and polyploidy.
5. Calculations related to gene and genotypic frequency.
6. Cryopreservation of gametes
7. Study of models of Cell Culture Technology
8. Study of Gel Electrophoresis
9. Study of Restriction enzymes
10. Study of models of rDNA Technology

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science and Technology

NEP-2020 Pattern (w.e.f. 2024)

Practical Examination: M.Sc. Second Year Semester-IV

Subject: Fishery Science

Discipline Specific Elective Course Practical

SFISEP551: Lab course 3-A

(Based on SFISET551: A. Fish Genetics & Biotechnology)

Centre:

Date: **Time:** **Batch No.:**

Credits: 01 **Marks: 20**

Q. 1	Calculate the …… for given data. Genotype/ ratios/ rate of inbreeding/ frequency/etc	06
Q. 2	Perform Gel electrophoresis	06
Q. 3	Protocol for cryopreservation of gametes OR Protocol for cell culture	06
Q. 4	Viva-voce	02

Examiner 1 **Examiner 2**

Name &Signature Name &Signature

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology,

Two Year PG Program, Fishery Science (w.e.f. 2025)

M.Sc. SY Semester-IV

Discipline Specific Elective Course

SFISET551:B. Sustainable Fisheries Management

Periods: 45	**No. of Credits: 03**	**Marks: 75**

Course pre-requisite:

- Basic information regarding fisheries resources, exploitation and general management

Course objectives:

1. To provide detailed information regarding fishery resources and exploitation.
2. To study different approaches for sustainable fishery management
3. To study responsible fishing practices.

Course outcomes:

1. The learners will have detailed knowledge of sustainable fish management.
2. The students will have thorough understanding of fishery resources and their exploitation levels
3. The students will be well worse with different methods and strategies for fishery management

CURRICULUM DETAILS

Module No	Unit No	Topics	Hrs required to cover the content
1		**Unit I**	**11**
	1.1	**Introduction**	
	1.2	**Inland fisheries:** Major inland fisheries resource, Overview- State of the fisheries, Fishing gears-and crafts, Catch composition	
	1.3	**Marine fisheries:** Major marine fisheries resources, Overview- State of the fisheries, Fishing gears and crafts, Catch composition-pelagic, Demersal, Oceanic, Deep sea	
2		**Unit II: Sustainability issues in fisheries**	**10**
	2.1	Ghost fishing, Overexploitation, Overcapacity, pollution, Habitat degradation/ biodiversity loss, Damming of rivers, Interlinking of rivers , Environmental flows;	
	2.2	Fishing conflicts-Exotics; Trans-boundary issues, IUU fishing, Interlinking of rivers-Climate change, By catch and discards.	
	2.3	**Sustainable fishing:** Components of sustainability, Indicators and goals of sustainability, Eco-friendly fishing, Ecosystem Based Fisheries Management-resilient fishery system	
3		**Unit III: Principle of fisheries management:**	**13**

		Management approaches	
	3.1	By catch reduction, Rebuilding fishery, Rebuilding stock, Co-management, right based fishing	
	3.2	Input control: fishing efforts, mesh regulations, fishing ban, licensing, capital investments, etc	
	3.3	Output control: catch quotas, minimum legal size, etc	
	3.4	Fishery reserve-technical measures, Spawning aggregates	
	3.5	Trade agreement- Market-based instruments	
	3.6	Access right- Catch sharing-balanced fishing-Subsidy-certification and traceability	
	3.7	Sustainable management approach in lake, Reservoir and bheels.	
4		**Unit IV: Responsible fishing practices**	**11**
	4.1	Precautionary management	
	4.2	Fisheries Co- management	
	4.3	Right based fishing- Catch sharing access right	
	4.4	Balanced fishing	
	4.5	Technical Guidelines of CCRF for responsible fishing	
	4.6	National and Internationaltreaties	

VI. Practical

1. Capture fisheries observation at landing centres (lakes, reservoirs, river stretches, and marine)
2. Species landings analysis
3. Study of production trends of different resources
4. Study of Bycatch reduction devices
5. Fleet capacity assessment,
6. Study of different Trade agreements
7. Visit to fishery reserves to understand management,
8. Field survey and observation of fisheries issues,
9. Development of management plan

References:

1. Bal DV and Rao KV. 1990. *Marine Fishes of India*. 1st Revised Ed. Tata McGraw Hill.

2. Blaber JM. 1997. *Fish and Fisheries in Tropical Estuaries* Chapman and Hall.
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(Based on SFISET551: B. Sustainable Fisheries Management)

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CURRICULUM DETAILS

1. Capture fisheries observation at landing centres (lakes, reservoirs, river stretches, and marine)
2. Species landings analysis
3. Study of production trends of different resources
4. Study of Bycatch reduction devices
5. Fleet capacity assessment,
6. Study of different Trade agreements
7. Visit to fishery reserves to understand management,
8. Field survey and observation of fisheries issues,
9. Development of management plan
10. Preparation and submission of report of field visit/ management plan/landing analysis

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NEP-2020 Pattern (w.e.f. 2025)

Practical Examination: M.Sc. Second Year Semester-IV

Subject: Fishery Science

Discipline Specific Elective Course Practical

SFISEP551: Lab course 3-B

(Based on SFISET551: B. Sustainable Fisheries Management)

Centre:

Date: **Time:** **Batch No.:**

Credits: 01 **Marks: 20**

Q. 1	Estimation of catch composition analysis from given details	06
Q. 2	Carryout fleet capacity assessment from given data	06
Q. 3	Develop and Suggest appropriate management plan in given scenario	06
Q. 4	Viva-voce	02

Examiner 1 **Examiner 2**

Name &Signature Name &Signature