



UNIVERSITY OF CALICUT

Abstract

General and Academic – Faculty of Science - Scheme and Syllabus of B.Voc Fish Processing Technology Programme, in tune with the CUFYVP Regulations 2025, with effect from 2025 Admission onwards - Approved - Subject to ratification by the Academic Council - Implemented - Orders Issued

G & A - I - F

U.O.No. 15242/2025/Admn

Dated, Calicut University.P.O, 03.11.2025

*Read:-*1. U.O.No. 14335/2025/Admn dated 14.10.2025.

2. Minutes of the meeting of the Board of Studies in Aquaculture held on 18.10.2025.
3. Remarks of the Dean, Faculty of Science dated 30.10.2025.
4. Orders of the Vice Chancellor in the file of even No and dated 02.11.2025.

ORDER

1. The Regulations of the B.Voc Programmes (CUFYVP Regulations 2025), was implemented with effect from 2025 admission onwards, vide paper read as (1) above.
2. The meeting of the Board of Studies in Aquaculture held on 18.10.2025, vide paper read as (2) above, approved the scheme and syllabus of the B.Voc Fish Processing Technology programme in tune with CUFYVP Regulations 2025 with effect from 2025 Admission onwards.
3. The Dean, Faculty of Science vide paper read as (3) above, approved the minutes of the meeting of the Board of Studies in Aquaculture held on 18.10.2025.
4. Considering the urgency, the Vice Chancellor has approved the minutes of the meeting of the Board of Studies in Aquaculture and accorded sanction to implement the scheme and syllabus of the B.Voc Fish Processing Technology programme in tune with CUFYVP Regulations 2025 with effect from 2025 Admission onwards, subject to ratification by the Academic Council.
5. The scheme and syllabus of the B.Voc Fish Processing Technology programme in tune with CUFYVP Regulations 2025 is therefore implemented with effect from 2025 Admission onwards.
6. Orders are issued accordingly. (Syllabus appended)

Ajayakumar T.K

Assistant Registrar

To

The Colleges concerned.

Copy to: PS to VC/PA to PVC/PA to Registrar/PA to CE/JCE I/JCE III /EX and EG Sections/EPR VIII/SF/DF/FC.

Forwarded / By Order

Section Officer

UNIVERSITY OF CALICUT



B. Voc. Fish Processing Technology

FOUR YEAR B. VOC. PROGRAMME STRUCTURE AND SYLLABUS

2025 - '26 ADMISSION ONWARDS

(CUFYVP Regulations 2025)

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1. REGULATIONS

The existing regulations of Choice-Based Credit Semester System (UO No. 8018/ 2025/ Admn. Dated 29-05-2025) which are applicable for CUFYVP Regulations 2025 are applicable for this programme with the following exceptions.

1.1 Objectives

- i. To impart comprehensive knowledge of fish biology, harvesting, handling, preservation, processing techniques, and quality control measures – ensuring students understand the science behind spoilage, processing technologies, and post-harvest fish management.
- ii. To develop practical skills and industry-specific competencies – through hands-on training, internships, and laboratory work in areas such as seafood processing, packaging, cold chain logistics, HACCP, and food safety standards.
- iii. To foster entrepreneurship, innovation, and self-employment in the fisheries and seafood value chain – by equipping students with business skills, value-added product development techniques, and knowledge of fisheries economics and marketing.
- iv. To enable graduates to meet national and global seafood industry standards – by aligning the curriculum with NSQF levels, industry-relevant qualifications, and international norms such as ISO, FSSAI, EU, and USFDA regulations.
- v. To encourage research aptitude and promote sustainable and eco-friendly fish processing practices – by introducing students to emerging technologies, waste utilization, circular economy concepts, and the environmental impact of seafood industries.
- vi. To ensure employability and readiness for diverse career paths – including positions in seafood industries, export houses, quality assurance labs, government agencies, and academic or research institutions, while also offering vertical mobility for higher education.

1.2 Rules and regulations applicable only to the B. Voc. Fish Processing Technology programme.

- i. Mandatory internships, industrial training, and hands-on exposure in seafood processing units, quality control labs, or export facilities shall form an essential part of the curriculum each academic year to ensure skill-based learning and industry readiness.
- ii. Safety gear, lab coats, and hygiene protocols are compulsory during all practical sessions, lab work, and industrial visits, in accordance with food safety and processing industry norms.
- iii. Students are required to actively participate in fish landing centre visits, seafood industry tours, exhibitions, and outreach activities as part of their course engagement and learning outcomes.

- iv. Attendance in practical classes, processing labs, and field-based components must be at least 80%, failing which students may be disqualified from appearing in final skill assessments and practical examinations.
- v. If any of the online courses outlined in List 11 are not available on Swayam, students can choose other relevant online courses related to the subject topics from Swayam or any university-recognised platform with the approval of the BoS
- vi. Course teacher can select the Rubrics activities, open ended activities from the options given in the detailed syllabus and must be related to the course.
- vii. Course teacher can select any one practical activities from the options given in the detailed syllabus and must be related to the course.

2. PROGRAMME OUTCOMES (PO)

At the end of the graduate Programme at Calicut University, a student would:

PO No.	Graduate Attributes	PO Statement
PO 1	Knowledge Acquisition	Demonstrate a profound understanding of knowledge trends and their impact on the chosen discipline of study
PO 2	Communication, Collaboration, Inclusiveness, and Leadership	Become a team player who drives positive change through effective communication, collaborative acumen, transformative leadership, and a dedication to inclusivity
PO 3	Professional Skills	Demonstrate professional skills to navigate diverse career paths with confidence and adaptability.
PO 4	Digital Intelligence	Demonstrate proficiency in varied digital and technological tools to understand and interact with the digital world, thus effectively processing complex information
PO 5	Scientific Awareness and Critical Thinking	Emerge as an innovative problem-solver and impactful mediator, applying scientific understanding and critical thinking to address challenges and advance sustainable solutions.
PO 6	Human Values, Professional Ethics, and Societal and Environmental Responsibility	Become a responsible leader, characterized by an unwavering commitment to human values, ethical conduct, and a fervent dedication to the wellbeing of society and the environment.

PO7	Research, Innovation, and Entrepreneurship	Emerge as a researcher and entrepreneurial leader, forging collaborative partnerships with industry, academia, and communities to contribute enduring solutions for local, regional, and global development.
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3. PROGRAMME SPECIFIC OUTCOMES

PSO No.	PSO Statement
PSO1	Integration of Vocational and General Education: Integrate vocational skills with general education by applying knowledge from communication, industrial psychology, environmental studies, entrepreneurship, and health and safety to promote holistic development and industry-relevant competence in the fisheries and seafood processing sector.
PSO2	Sector-Specific Employability and Opportunities: Demonstrate the ability to explore and utilize employment and entrepreneurial opportunities in the fisheries and food processing sectors, especially at the graduate level, through a strong foundation in technical and applied knowledge.
PSO3	Multi-Level Work Readiness: Exhibit work-readiness and core technical competence at all exit points of the program through structured skill development, hands-on training, and practical exposure suitable for immediate integration into the workforce.
PSO4	National and Global Workforce Alignment: Prepare to meet the demands of both the national and international fisheries industries by developing sector-specific skills, adaptability, and cultural competency to become part of a globally mobile and effective workforce.
PSO5	Communication, Language, and Soft Skills: Strengthen communication, presentation, and language skills—including multilingual capabilities—to improve workplace efficiency, cross-regional employability, and active participation in multidisciplinary teams.
PSO6	Digital Literacy and Industry Awareness: Gain computer literacy and network awareness to access digital tools, industry databases, and current innovations in the fisheries sector, thereby ensuring continuous learning and professional growth in a technology-driven environment.

4. ELIGIBILITY FOR ADMISSION

Candidates who have passed (Eligible for Higher Studies) the HSE of the Kerala State Board of Higher Secondary Examination or any other examination recognised as equivalent thereto with a minimum 45% of the total for the subjects Biology, Physics & Chemistry are eligible

for admission (U.O.No.GAI/J1/4040/1999 dated 12.11.2001). Relaxation in the minimum qualification for backward communities and reservation for SC and ST students as per the government of Kerala norms are applicable. A concession of (5%) will be given to OBC/OEC candidates. The SC/ST candidates need to get only a pass (Eligible for Higher Studies). Those awaiting results of their qualifying examination also can apply. But such candidate will be admitted provided they produce the mark sheets of the qualifying examination on or before the date prescribed for admission.

5. QUALIFICATION PACKS (QPs)

Sl. No.	Semester	Sector Skill Council (SSC)	QP Code	Job Role
Under graduate Certificate (NSQF level 4.5)				
QP1	1	FICSI	FIC/Q7606	Hygiene Coordinator
QP2	2	FICSI	FIC/Q9001	Processed Food Entrepreneur
Under Graduate Diploma (NSQF level 5.0)				
QP3	3	FICSI	FIC/Q9301	Food Product Developer
QP4	4	FICSI	FIC/Q7604	Food Safety Team Leader
B. Voc. Degree (NSQF level 5.5)				
QP5	5	FICSI	FIC/Q9009	Supervisor – Food Processing Industries
QP6	6	FICSI	FIC/Q7602	Quality Assurance Manager (Processed Food Industry)
PG Diploma (NSQF level 6.0)				
QP7	7 & 8	FICSI	FIC/Q7602	Quality Assurance Manager

6. PROGRAMME STRUCTURE

The B.Voc. curriculum comprises two key components: General Education Components (GEC) and Skill Development Components (SDC). Each academic year integrates both to ensure a well-rounded learning experience. SDC constitutes a minimum of 60% of the total credits, while GEC makes up the remaining portion. Students shall earn a minimum of 140 credits over three years to graduate with a B.Voc. degree. Additionally, they can complete a one-year apprenticeship or internship or project work along with three (3) online courses of four (4) credit each to earn 40 more credits, leading to a Post Graduate Diploma.

6.1. General Education Components

Title	Course Type	Credit	No. of Courses	Total Credits
Foundation Courses	Ability Enhancement Course (AEC)	3	3	9
	Multi-Disciplinary Course (MDC)	3	3	9
Discipline Specific Courses	Minor Pathway Courses (DSC)	4	6 + 3*	24 + 12*
Total Credit for GEC				42 + 12*

6.2. Skill Development Components

Title	Course Type	Credit	No. of Courses	Total Credits
Foundation Courses	Value Added Course (VAC)	3	3	9
	Skill Enhancement Course (SEC)	3	3	9
Discipline Specific Courses	Major pathway Courses (DSE)	4	17 + 3*	68 + 12*
	Internship / Apprenticeship / Project Work	-	-	12 + 28
	On Job Training (OJT)	60 Hours Mandatory		
Total Credit for SDC				126 + 12*

*Three online Discipline-Specific Courses (DSC), approved by the Board of Studies, may be studied in either the major or minor discipline.

Students may choose a minor pathway from the discipline-specific options listed below showing example of B.Voc. Fish Processing Technology Programme. The degree awarded will correspond to the selected minor pathway.

- Major with Minor – All six (6) minor courses from same discipline
Eg. B. Voc. Fish Processing Technology with minor in Applied Marketing
- Major with Vocational Minor – All six (6) minor course from same vocational discipline
Eg. B. Voc. Fish Processing Technology with Vocation Minor in Multimedia
- Major with Multiple discipline – Out of Six (6) minor courses, two groups of three (3) courses from two (2) different disciplines
Eg. B. Voc. Fish Processing Technology with Aviation Management and Digital Content & Communication
- Single Major – Any six (6) minor courses from different disciplines
Eg. B. Voc. Fish Processing Technology

7. MINIMUM CREDIT REQUIREMENTS

Duration	General Education Components (GEC)						Skill Development Component (SDC)				Total Credits
	MDC	AEC	VAC	SEC	Minor	Total GEC	SEC	VAC	Major	Total SDC	
Undergraduate Certificate (1 Years)	6	9	-	-	8	23	3	-	24	27	Total GEC + SDC 50
Exit with Undergraduate Certificate (requires two additional 4-credit SDC online courses and 30 hours of mandatory on-the-job training (OJT)).											

Duration	General Education Components (GEC)						Skill Development Component (SDC)				Total Credits
	MDC	AEC	VAC	SEC	Minor	Total GEC	SEC	VAC	Major	Total SDC	
Undergraduate Diploma (2 Years)	9	9	-	-	20	38	6	6	52	64	Total GEC + SDC 102
Exit with Undergraduate Diploma (60 hours of mandatory on-the-job training (OJT))											
B. Voc. Degree (3 Years)	9	9	-	-	24	42	9	9	68 +12*	98	Total GEC + SDC 140
Exit with a B. Voc. Degree (60 hours on-the-job training (OJT)) or proceed to the PG Diploma.											

* Internship/ Apprenticeship/ Project Work

Duration	Major (SDC) / Minor (GEC) Components	Internship/ Apprenticeship/ Project (SDC)	Total
PG Diploma (4th Year)	3 Online Courses of 4 Credits each (12 Credits)	28	40
Exit with B. Voc. Degree + PG Diploma (60 hours of mandatory on-the-job training (OJT))			

8. SEMESTER WISE COURSE DISTRIBUTION

Semester	Course Type	Credits	Theory Hours	Practical Hours	Internal	External	Total Marks	Total Credits	Total Hours / Week or Semester	Total Marks
1	Major 1	4	3	2	40	60	100	25	27/29	625
	Major 2	4	3	2	40	60	100			
	Major 3	4	4		40	60	100			
	Minor 1	4	3 / 4	2/0	30	70	100			
	AEC 1	3	2	2	25	50	75			
	SEC 1	3	3		25	50	75			
	MDC 1	3	3		25	50	75			
2	Major 4	4	3	2	40	60	100	25	27/29	625
	Major 5	4	3	2	40	60	100			
	Major 6	4	4		40	60	100			
	Minor 2	4	3 / 4	2/0	30	70	100			
	AEC 2	3	3		25	50	75			
	AEC 3	3	2	2	25	50	75			
	MDC 2	3	3		25	50	75			
	OJT	-	-	30*	-	-	-			
3	Major 7	4	3	2	40	60	100	26	26/28/30	650
	Major 8	4	3	2	40	60	100			
	Major 9	4	4		40	60	100			
	Minor 3	4	3 / 4	2/0	30	70	100			
	Minor 4	4	3 / 4	2/0	30	70	100			
	VAC 1	3	3		25	50	75			
	MDC 3	3	3		25	50	75			
4	Major 10	4	3	2	40	60	100	26	28/30	650
	Major 11	4	3	2	40	60	100			
	Major 12	4	4		40	60	100			
	Elective 1	4	4		40	60	100			
	Minor 5	4	3 / 4	2/0	30	70	100			
	VAC 2	3	3		25	50	75			
	SEC 2	3	3		25	50	75			
	OJT	-	-	30*	-					
5	Major 13	4	3	2	40	60	100	26	27/29	650
	Major 14	4	3	2	40	60	100			
	Major 15	4	4		40	60	100			
	Elective 2	4	4		40	60	100			
	Minor 6	4	3 / 4	2/0	30	70	100			
	VAC 3	3	3		25	50	75			
	SEC 3	3	3		25	50	75			
6	I/A/P	12			120	180	300	12	500	300
7 & 8	Online 1	4					100	40	1000	1000
	Online 2	4					100			
	Online 3	4					100			
	I/A/P	28			280	420	700			

* Number of learning hours per semester

9. LIST OF MAJOR COURSES OFFERED

Semester	Course Type	Course Code	Course Title	Credits	Theory Hours	Practical Hours	Internal	External	Total Marks
1	Major 1	FPY1CJ101	HARVESTING AND ONBOARD HANDLING OF FISH	4	3	2	40	60	100
	Major 2	FPY1CJ102	INTRODUCTION TO FISH PROCESSING TECHNOLOGY	4	3	2	40	60	100
	Major 3	FPY1CJ103	FUNDAMENTALS OF SEAFOOD MICROBIOLOGY	4	4		40	60	100
2	Major 4	FPY2CJ101	QUALITY CONTROL AND FOOD SAFETY IN SEAFOOD INDUSTRY	4	3	2	40	60	100
	Major 5	FPY2CJ102	FISH BIOCHEMISTRY AND SPOILAGE MECHANISMS	4	3	2	40	60	100
	Major 6	FPY2CJ103	DESIGN AND MAINTENANCE OF FISH PROCESSING PLANT	4	4		40	60	100
	Audit	FPY2CJ149	OJT	-	-	30#	-	-	-
3	Major 7	FPY3CJ201	FREEZING TECHNOLOGY IN SEAFOOD PLANTS	4	3	2	40	60	100
	Major 8	FPY3CJ202	THERMAL PROCESSING OF FISHERY PRODUCTS	4	3	2	40	60	100
	Major 9	FPY3CJ203	CURING AND SMOKING TECHNIQUES IN FISH PRESERVATION	4	4		40	60	100
4	Major 10	FPY4CJ201	APPLIED SEAFOOD MICROBIOLOGY AND QUALITY ASSURANCE	4	3	2	40	60	100
	Major 11	FPY4CJ202	STORAGE AND TRANSPORTATION OF FISHERY PRODUCTS	4	3	2	40	60	100
	Major 12	FPY4CJ203	PACKING AND LABELLING OF FISH AND FISHERY PRODUCTS	4	4		40	60	100
	Elective 1		ELECTIVE COURSE 1 IN MAJOR	4	4		40	60	100
	Audit	FPY4CJ249	OJT	-	-	30#	-	-	-
5	Major 13	FPY5CJ301	BIOSTATISTICS AND BIOINFORMATICS IN FISH PROCESSING	4	3	2	40	60	100
	Major 14	FPY5CJ302	INSTRUMENTATION IN FISH PROCESSING ANALYSIS	4	3	2	40	60	100
	Major 15	FPY5CJ303	ECONOMICS AND MARKETING IN SEAFOOD TRADE	4	4		40	60	100

	Elective 2		ELECTIVE COURSE 2 IN MAJOR	4	4		40	60	100
6	I/A/P	FPY6CJ349	Internship/ Apprenticeship/ Project Work	12			120	180	300
7 & 8	Online 1	FPY8CJ401	ONLINE COURSE	4*					100*
	Online 2	FPY8CJ402	ONLINE COURSE	4*					100*
	Online 3	FPY8CJ403	ONLINE COURSE	4*					100*
	I/A/P	FPY8CJ449	Internship/ Apprenticeship/ Project Work	28			280	420	700
TOTAL				108 120*	/		2700 / 3000*		
* Credits and Total Marks depend on the course chosen from the major or minor pathway in the fourth year. # Number of learning hours per semester									

10.LIST OF ELECTIVE COURSES OFFERED

Semester	Course Type	Course Code	Course Title	Credits	Theory Hours	Internal	External	Total Marks
4	Elective 1 (Any one)	FPY4EJ211	NUTRITIONAL BIOCHEMISTRY OF FISH AND SEAFOOD	4	4	40	60	100
		FPY4EJ212	FISH BY-PRODUCTS AND VALUE-ADDED PRODUCTS DEVELOPMENT	4	4	40	60	100
		FPY4EJ213	ADVANCED FISH PROCESSING TECHNIQUES	4	4	40	60	100
5	Elective 2 (Any one)	FPY5EJ311	MARKETING AND EXPORT PROMOTION OF FISHERY PRODUCTS	4	4	40	60	100
		FPY5EJ312	GLOBAL SEAFOOD TRADE AND MARKET TRENDS	4	4	40	60	100
		FPY5EJ313	FISHERY PRODUCT EXPORT DOCUMENTATION AND COMPLIANCE	4	4	40	60	100

11.LIST OF ONLINE COURSES OFFERED

Semester	Course Title	Platform	Course details	Mark
7 & 8	FOOD PRESERVATION TECHNOLOGY	Swayam	4 CREDITS, 12 WEEKS, UG, Department of Microbiology at Government Women's College, Kolar, Bengaluru North University.	100
	FOOD MICROBIOLOGY AND FOOD SAFETY	Swayam	4 CREDITS,15 WEEKS, PG, Central University of Haryana	100
	FOOD LAWS AND STANDARDS	Swayam	4 CREDITS,16 WEEKS, PG, IGNOU	100
	E - COMMERCE	Swayam	4 CREDITS,12 WEEKS, PG, IGNOU	100
	SUSTAINABILITY SCIENCE	Swayam	4 CREDITS,12 WEEKS, PG, IGNOU	100
	ECONOMICS OF FOOD	Swayam	4 CREDITS,12 WEEKS, PG, IGNOU	100

12.LIST OF FOUNDATION COURSES OFFERED

Semester	Course Type	Course Code	Course Title	Credits	Theory Hours	Internal	External	Total Marks
1	SEC 1 - SDC	FPY1FS111	VALUE ADDITION AND PRODUCT DIVERSIFICATION IN SEAFOOD	3	3	25	50	75
	MDC 1-GEC (Other Dept)	FPY1FM105	VALUE ADDITION IN SEAFOOD	3	3	25	50	75
2	MDC 2 -GEC (Other Dept)	FPY2FM106	ENTREPRENEURSHIP IN FISH PROCESSING	3	3	25	50	75
3	VAC 1 - SDC	FPY3FV108	SUSTAINABLE PRACTICES IN COASTAL AND MARINE INDUSTRIES	3	3	25	50	75
4	VAC 2-SDC	FPY4FV109	STARTUP ESSENTIALS FOR FISH PROCESSING ENTREPRENEURS	3	3	25	50	75
	SEC 2-SDC	FPY4FS112	VISUAL BRANDING OF COASTAL ENTERPRISE	3	3	25	50	75
5	VAC 3- SDC	FPY5FV110	SEAFOOD CULINARY SKILLS FOR TOURISM MARKETS	3	3	25	50	75
	SEC 3- SDC	FPY5FS113	E-COMMERCE AND DIGITAL MARKETING OF FISHERY PRODUCTS	3	3	25	50	75

13. FOUNDATION COURSES FROM OTHER DEPARTMENTS

Sem.	Course Code	Code	Department
1	AEC1	ENG1FA101(2)	English
	MDC1	XXX1FM105	Other than Major department
2	AEC2	XXX2FA104(2)	Additional language
	AEC3	ENG2FA103(2)	English
	MDC2	XXX2FM106	Other than Major department
3	MDC3(KS)	XXX3FM107(2)	Additional language

14. GROUPING OF MINOR COURSES

Minor Title: AQUATIC ENTERPRISE DEVELOPMENT

Group 1 may be offered to all students, whereas 2 is reserved for students enrolled in the vocational discipline

Group 1 Title – AQUATIC ENTERPRISE DEVELOPMENT									
Semester	Course Type	Course Code	Course Title	Credits	Theory Hours	Practical	Internal	External	Total Marks
1	Minor 1	FPY1MN101	INTRODUCTION TO AQUATIC VENTURE OPPORTUNITIES	4	4	0	30	70	100
2	Minor 2	FPY2MN101	ORNAMENTAL FISH CULTURE: TECHNIQUES AND TRADE	4	4	0	30	70	100
3	Minor 3	FPY3MN201	EDIBLE FISH CULTURE SYSTEMS AND MANAGEMENT	4	4	0	30	70	100

Group 2 Title - AQUATIC ENTERPRISE DEVELOPMENT									
Semester	Course Type	Course Code	Course Title	Credits	Theory Hours	Practical	Internal	External	Total Marks
3	Minor 4	FPY3MN202	INTEGRATED AQUATIC FARMING SYSTEMS AND PRACTICES	4	4	0	30	70	100
4	Minor 5	FPY4MN201	AQUAFEED TECHNOLOGY AND MANAGEMENT FOR STARTUPS	4	4	0	30	70	100
5	Minor 6	FPY5MN301	MARKETING AND INSTITUTIONAL SUPPORT FOR AQUATIC VENTURES	4	4	0	30	70	100

15. SCHEME OF EVALUATION

General Foundation Courses						
3 Credit Course with Open Ended Module (50 ESE + 25 CCA)						
External (50)	Theory Internal (20)			Open Module Internal (5)		
End Semester Examination	Mid Semester Examination	Rubrics 1	Rubrics 2	Test	Rubrics 1	Rubrics 2
50	10	6	4	2	2	1
3 Credit Course with Practical / Practicum (50 ESE + 25 CCA)						
External (50)	Theory Internal I (10)			Practical / Practicum Internal (15)		
End Semester Examination	Mid Semester Examination	Rubrics 1	Rubrics 2	Practical / Exercise	Exam / Viva	Record
50	5	3	2	8	5	2

Minor Pathway Courses						
4 Credit Courses with Open Ended Module (70 ESE + 30 CCA)						
External (70)	Theory - Internal (20)			Open Ended Module - Internal (10)		
End Semester Examination	Mid Semester Examination	Rubrics 1	Rubrics 2	Test	Rubrics 1	Rubrics 2
70	10	6	4	4	4	2
4 Credit paper with Practical / Practicum (70 ESE + 30 CCA)						
External (70)	Theory Internal (10)			Practical / Practicum Internal (20)		
End Semester Examination	Mid Semester Examination	Rubrics 1	Rubrics 2	Practical / Exercise	Exam / Viva	Record
70	5	3	2	10	7	3

Major Pathway Courses (Vocational)						
4 Credit paper with Open Ended Module (60ESE+ 40 CCA)						
External (60)	Theory Internal (30)			Open Ended Module Internal (10)		
End Semester Examination	Mid Semester Examination	Rubrics1	Rubrics2	Test	Rubrics1	Rubrics 2
60	20	5	5	5	3	2
4 Credit paper with Practical /Practicum (60 ESE+40 CCA)						
External (60)	Theory Internal (10)			Practical/Practicum Internal (30)		
End Semester Examination	Mid Semester Examination	Rubrics1	Rubrics2	Practical/ Exercise	Exam/Viva	Record
60	5	3	2	15	10	5

16. GUIDELINES FOR OJT / INTERNSHIP / APPRENTICESHIP / PROJECT WORK

16.1. On Job Training (OJT)

Students shall undertake mandatory On-the-Job Training (OJT) for a minimum duration of thirty (30) hours in both Semester II and Semester IV. These skill development components shall be designated as audit courses.

To be eligible for a 'Pass' in an audit course, students are required to achieve a minimum of seventy-five percent (75%) attendance. Students who fulfil this attendance requirement are exempt from participation in continuous assessment for the audit course. Notwithstanding the foregoing, a student who does not meet the attendance requirement shall be required to undergo a prescribed evaluation to satisfy the course requirements.

Successful completion of an audit course, evidenced by meeting the attendance requirement or, where applicable, by successfully passing the prescribed evaluation, shall result in a 'Pass' grade with zero (0) academic credits.

16.2. Internship / Apprenticeship / Project Work (I/A/P)

Internship, Apprenticeship, or Project work constitute a critical capstone component of the B.Voc. programme. This component provide students with structured opportunities to apply theoretical knowledge in real-world settings, develop domain-specific competencies, promote workplace readiness, and align learning outcomes with industry standards and expectations.

I/A/P may be completed in any recognised industry, organisation, startup, research laboratory, or field site. Each student shall be assigned a faculty supervisor by the parent department and, where applicable, shall be supported by an industrial mentor. A learning agreement shall be signed by the student, faculty supervisor, and the host institution / industry prior to the commencement of the I/A/P.

I/A/P Report

Upon successful completion of the I/A/P, each student shall prepare a comprehensive report detailing the observations made and knowledge gained during the training period. Students are advised to consult their industrial mentor or faculty supervisor for the assignment of specific topics or problems upon which the final report shall be based. Maintaining a daily diary throughout the I/A/P is mandatory, as it shall serve as a valuable resource for compiling the final report by systematically incorporating daily learning and experiences. The final report must be duly signed by both the industrial mentor and faculty supervisor to be considered valid.

The evaluation of the report shall be based on the following criteria:

Sl.	Criteria	Description
1	Originality	Uniqueness and independent thought demonstrated in the report.
2	Content Adequacy and Relevance	Thoroughness, coherence, and purposefulness of the write-up
3	Presentation Quality	Organisation, adherence to specified format, clarity of visual aids (drawings, sketches), writing style, and language
4	Learning Experience	Breadth, depth, and relevance of the practical learning acquired during the I/A/P
	Application and Theory Linkage	Demonstration of practical applications and the clear connection to basic theoretical concepts taught in the academic curriculum

Evaluation Process

A minimum of three (3) internal reviews shall be conducted to evaluate progress during the I/A/P. Internal evaluation shall be conducted jointly by the faculty supervisor and the industrial mentor, while the final evaluation shall be carried out by an evaluation panel comprising: one (1) external examiner from the University-approved panel, one (1) internal faculty member from the college, and one (1) industry representative.

Students shall be required to submit the following documents at the time of the evaluation: an internship completion certificate, an attendance statement and an I/A/P report. Each student shall present their work and participate in a viva voce before the evaluation panel. To be eligible for a 'Pass', students must obtain a minimum of fifty percent (50%) marks in the I/A/P.

Internship - Evaluation Components

Sl. No.	Components of Evaluation of Internship / Apprentice	Type	Marks of Evaluation (300)	Marks of Evaluation (700)
1.	Attendance	Internal	20	40
2.	Team work evaluation	Evaluation (120 / 280)	20	40
3.	Log book		20	50
4.	Reviews (3)		60	150
5.	Internship Report		External	60
6.	Presentation	Evaluation (180 / 420)	60	140
7.	Viva Voce		60	140
	Total			300

Apprenticeship - Evaluation Components

Sl. No.	Components of Evaluation of Apprenticeship	Type	Marks of Evaluation (300)	Marks of Evaluation (700)
1.	Attendance	Internal	20	40
2.	Skill proficiency evaluation	Evaluation (120 / 280)	20	40
3.	Log book		20	50
4.	Reviews (3)		60	150
5.	Work Report	External	60	140
6.	Presentation	Evaluation (180 / 420)	60	140
7.	Viva Voce		60	140
	Total		300	700

Project Work - Evaluation Components

Sl. No	Component of External Evaluation	Type	Marks of External Evaluation (300)	Marks of External Evaluation (700)
1	Project Proposal and Planning	Internal	15	25
	Objectives and Problem Definition	Evaluation (120 / 280)	15	25
	Literature Review / Background Work		15	80
	Methodology / System Design		15	30
2	Reviews (3)		60	120
4	Project Report	External	60	120
5	Project Demonstration	Evaluation (180 / 420)	60	150
6	Viva Voce		60	150
Total Marks			300	700

17. LETTER GRADES AND GRADE POINTS

Letter Grade	Grade Point	Percentage of Marks (Internal & External Put Together)	Class
O (Outstanding)	10	95 % and above	First Class with Distinction
A+ (Excellent)	9	Above 85% and below 95%	
A (Very Good)	8	75 % to below 85%	
B+ (Good)	7	65 % to below 75%	First
B (Above Average)	6	55 % to below 65%	
C (Average)	5	45 % to below 55%	Second
P (Pass)	4	35 % to below 45% aggregate (Internal + External) with a minimum of 30 % in the external valuation	Third
F (Fail)	0	Below an aggregate of 35% or below 30% in external evaluation	Fail
Ab (Absent)	0	-	Fail

$$SGPA = \frac{\sum \text{of the credit points of all the courses } \in \text{ a semester}}{\text{Total credits } \in \text{ that semester}}$$

$$CGPA = \frac{\sum \text{of the credit points of all the courses } \in \text{ all the semesters}}{\text{Total credits } \in \text{ all semesters}}$$

18.DETAILED SYLLABUS OF MAJOR COURSES

1ST SEMESTER MAJOR COURSES

Course Code & Title	FPY1CJ101	HARVESTING AND ONBOARD HANDLING OF FISH			
Type of Course	MAJOR	Semester	I	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	--	2	75
Pre-requisites	<ul style="list-style-type: none"> ▪ Fundamental knowledge in science disciplines ▪ Basic understanding of importance of fisheries ▪ Familiarity with general hygienic practices 				
Course Summary	This course provides fundamental knowledge and practical skills in fish harvesting methods and onboard handling practices. It covers fishing gears, vessel operations, hygienic handling, preservation techniques like chilling and freezing, and adherence to safety and regulatory standards. Emphasis is placed on maintaining fish quality from capture to landing, preparing students for roles in fisheries, seafood logistics, and post-harvest operations.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Identify and differentiate between various fish harvesting methods and fishing gears used in marine and inland fisheries.	U	C	Written test, MCQs, Quiz
CO2	Explain the operational procedures of fish harvesting and evaluate their impact on catch quality and sustainability.	U	C	Written test, Field study report
CO3	Demonstrate hygienic onboard handling techniques including sorting, bleeding, washing, and gutting of fish.	Ap	P	Practical test, Demonstration, Viva
CO4	Apply appropriate onboard preservation methods such as chilling and freezing to maintain fish freshness.	Ap	P	Practical test, Fieldwork report
CO5	Recognize and adhere to hygiene, sanitation, and safety standards required for onboard fish handling as per national regulations.	Ap	C	Quiz, MCQs Presentation
CO6	Conduct basic quality assessment and maintain onboard handling protocols for different types of aquatic species.	An	P	Practical assessment, Presentation
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	PRINCIPLES OF FISH HARVESTING		10	15
	1	Classification of fishing methods: active and passive	2	
	2	Overview of major fishing gears: trawl, gill net, longline, purse seine, traps	2	
	3	Mechanized vs. traditional fishing vessels	2	
	4	Introduction to sustainable fishing practices	2	
	5	Bycatch issues and reduction technologies	2	
II	FISH HARVESTING OPERATIONS		10	15
	6	Harvesting techniques in marine and inland sectors	2	
	7	Species-specific methods (e.g., shrimp, sardine, tuna)	2	
	8	Fish behaviour and capture techniques	2	
	9	Stress and mortality during capture	2	
	10	Time–temperature effect on harvested fish quality	2	
III	ONBOARD HANDLING AND PRESERVATION		15	15
	11	Onboard handling workflow: sorting, bleeding, washing, gutting	2	
	12	Use of potable water and equipment sanitation	2	
	13	Chilling with ice: types, techniques, ratios	3	
	14	Onboard freezing methods and insulated fish holds	3	
	15	Initial signs of spoilage and quality deterioration	2	
	16	Handling of low-value fish products	1	
	17	Waste and effluent management on vessels	2	
IV	HYGIENE, SAFETY AND REGULATORY COMPLIANCE		10	15
	18	Sanitation procedures on fishing vessels	2	
	19	HACCP and onboard hygiene best practices	2	
	20	Crew hygiene and food safety standards	2	
	21	FSSAI, MPEDA, and EIA guidelines for fish handling	2	
	22	Occupational safety and equipment standards	2	

V	PRACTICAL MODULE		30	
	1	Identification of common fishing gears and vessel types		
	2	Field demo/visit: harvesting operation or virtual simulation		
	3	Sorting, washing, bleeding, and gutting techniques		
	4	Chilling and temperature monitoring methods		
	5	Visit to a fish landing center / fishing harbor		
	6	Water quality assessment for cleaning and chilling		

References:

1. Balachandran, K.K, Post-Harvest Technology of fish and fish products.
2. Shahul Hameed, M, Boopendranath M. R, Modern fishing gear technology.
3. Jhingran V.G., Fish and Fisheries of India.
4. Santhanam S., Fisheries Science.
5. Connell,J.J, Control of fish quality.
6. Fennema, K, Powrie, W.D & Marth, E.H., Low Temperature Preservation of Foods and Living Matter.
7. Gopakumar K., Text Book of Fish Processing Technology.
8. Sustainable Fishing Practices and Gear" by Pedro Barros and Lucía Campos-Domínguez
9. "FAO Training Series: Responsible Fish Capture Techniques" by the Food and Agriculture Organization

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	3	3	2	1	1	3	2	2	1	2	1	2
CO 2	2	3	3	3	2	2	3	2	3	2	3	2	2
CO 3	3	3	3	2	2	2	2	2	3	1	2	3	2
CO 4	3	3	3	2	1	2	2	1	3	2	3	2	2
CO 5	3	3	3	2	2	2	2	2	3	1	3	3	2
CO 6	3	3	3	2	2	2	3	2	3	2	3	2	2

Correlation Levels:

Level	Correlation
0	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	✓	✓

Course Code & Title	FPY1CJ102	INTRODUCTION TO FISH PROCESSING TECHNOLOGY			
Type of Course	MAJOR	Semester	I	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	--	2	75
Pre-requisites	<ul style="list-style-type: none"> ▪ Fundamental knowledge in science disciplines ▪ Basic understanding of importance of fisheries ▪ Familiarity with general hygienic practices 				
Course Summary	<p>This course provides a comprehensive introduction to fish processing technology, covering the fundamentals of the global and Indian seafood industry, principles of spoilage and preservation, and conventional techniques like chilling, freezing, drying, canning, and smoking. It emphasizes value addition through the production of RTE/RTC items, fish pickles, and utilization of by-products, along with hygienic practices, GMP, and HACCP protocols. The course also explores advanced methods such as food irradiation, HPP, and digital innovations. Hands-on practical sessions and field exposure ensure students gain work-ready skills in fish preservation and processing.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe the structure and importance of the global and Indian fish processing industry.	R	F	Written test, Quiz
CO2	Explain the principles of spoilage and conventional fish preservation techniques.	U	C	Short answers, MCQs, practical viva
CO3	Apply suitable preservation and processing methods to different fish products.	Ap	P	Practical records, lab demonstrations
CO4	Analyze value-added product development processes and by-product utilization.	An	P	Group project, presentation, case study
CO5	Evaluate hygiene, GMP, and HACCP protocols in fish processing operations.	E	M	Case study, report writing, checklist-based assessment
CO6	Assess the application of emerging and advanced fish preservation technologies.	E	C	Assignment, seminar, group discussion
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FUNDAMENTALS OF FISH PROCESSING		8	15
	1	Overview of the global and Indian fish and seafood industry	1	
	2	Importance and scope of fish processing	1	
	3	Composition and nutritional value of fish	2	
	4	Post-harvest losses and methods of reduction	2	
	5	Principles of fish spoilage and preservation	2	
II	CONVENTIONAL FISH PRESERVATION TECHNIQUES		12	15
	6	Chilling and freezing: principles, methods, and equipment	2	
	7	Canning: steps, equipment, spoilage issues	2	
	8	Drying and dehydration: sun drying, mechanical drying, freeze drying	2	
	9	Salting and curing methods	2	
	10	Smoking: traditional and modern approaches	2	
	11	Cold chain management and temperature control	2	
III	VALUE ADDITION AND BY PRODUCT UTILIZATION		15	15
	12	Fish filleting, mincing, and surimi production	2	
	13	Ready-to-eat (RTE) and ready-to-cook (RTC) products	2	
	14	Fish pickles, sausages, fish burgers, fish fingers, fish cutlets, and fish nuggets	3	
	15	By-product utilization: fish meal, fish oil, chitosan, silage, hydrolysates	3	
	16	Hygienic handling and sanitation in value-added product preparation	2	
	17	GMP and HACCP practices in fish value addition	3	
IV	ADVANCED AND EMERGING FISH PRESERVATION METHODS		10	15
	18	Food irradiation: types, mechanisms, and applications in seafood	2	

	19	High Pressure Processing (HPP) and other emerging technologies	2	
	20	MAP and vacuum packaging	2	
	21	Cold sterilization and novel preservation concepts	2	
	22	Introduction to automation and digital technologies in fish processing	2	
V	PRACTICAL MODULE		30	
	1	Chilling and ice storage of fresh fish	20	
	2	Freezing and thawing experiments		
	3	Sun drying and Salt curing		
	4	Canning demonstration and thermal processing parameters		
	5	Smoking of fish: traditional and modern methods		
	6	Packaging methods and shelf life studies		
	7	Field visit to a fish processing facility OR	10	
	8	Group project on conventional fish preservation /value-added product development		

References:

1. Fish Processing Technology by K. Gopakumar, ICAR, New Delhi
2. Fish Processing Technology by T.K. Govindan, Oxford & IBH Publication Co.
3. Fish Canning: Principles & Practices by K.K. Balachandran
4. Fish as Food by Borgstrom, G.
5. Postharvest Technology in Fish and Fishery Products by K.K. Balachandran
6. Fish Processing in India by Moorjani, M.V.
7. Advances in Fishery Science and Technology by Connell, J.J.
8. Manual of Quality Control in Fish and Fishery Products by CIFT
9. Fish Packaging Technology by Gopakumar, K.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	3	2	3	1	2	3	2	2	1	2	1	2
CO 2	2	3	3	2	1	2	3	1	3	2	3	2	2
CO 3	3	3	3	2	1	2	2	2	3	2	2	2	2
CO 4	3	3	3	3	2	2	2	2	3	2	3	2	3
CO 5	3	3	3	2	2	2	3	2	3	2	3	3	2
CO 6	2	3	3	2	1	3	3	1	3	3	3	2	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	✓	✓

Course Code & Title	FPY1CJ103	FUNDAMENTALS OF SEAFOOD MICROBIOLOGY			
Type of Course	MAJOR	Semester	I	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> ▪ Fundamental knowledge in science disciplines ▪ Basic understanding of microorganisms ▪ Familiarity with food safety and hygiene concepts 				
Course Summary	This course introduces the microbial ecology associated with marine and freshwater seafood, focusing on spoilage mechanisms, pathogenic microorganisms, and their impact on seafood safety and quality. It covers microbial growth factors, contamination sources, quality control techniques, and modern detection and preservation methods. Through both theoretical and practical components, students gain hands-on experience in microbial analysis, spoilage assessment, and food safety evaluation aligned with regulatory standards.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Identify and describe the types and sources of microorganisms found in seafood environments.	R	F	Written test, MCQs,
CO2	Explain the mechanisms of microbial spoilage and factors affecting seafood shelf life.	U	C	Assignment, Descriptive test, Oral discussion
CO3	Recognize and assess seafood-borne pathogens, toxins, and illness risks.	Ap	P	Case studies, MCQs, Risk analysis exercises
CO4	Demonstrate knowledge of microbiological quality control techniques and rapid detection methods.	Ap	P	Practical exams, viva
CO5	Apply hygienic and preservation practices to enhance seafood safety and longevity.	Ap	P	Lab observation, MCQ
CO6	Interpret and evaluate microbial test results in line with national and international food safety standards.	An/ E	P	Data interpretation tasks, viva
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO SEAFOOD MICROBIOLOGY		12	15
	1	Microflora of Marine and Freshwater Environments	2	
	2	Types of Microorganisms in Seafood	2	
	3	Intrinsic and Extrinsic Factors Affecting Microbial Growth	2	
	4	Microbial Ecology of Fish and Shellfish	2	
	5	Importance of Microbiology in Seafood Safety and Quality	2	
	6	Sources of Microbial Contamination in Seafood	2	
II	SPOILAGE OF SEAFOOD		12	15
	7	Mechanisms of Microbial Spoilage in Seafood	2	
	8	Common Spoilage Organisms in Fish	2	
	9	Biochemical Indicators of Spoilage	2	
	10	Temperature and Storage Effects on Spoilage	2	
	11	Spoilage in Shellfish and Crustaceans	2	
	12	Shelf-life Assessment of Chilled and Frozen Seafood	2	
III	PATHOGENIC MICROORGANISMS IN SEAFOOD		14	15
	13	Bacterial Pathogens in Seafood	3	
	14	Parasitic and Viral Hazards in Seafood	2	
	15	Seafood-borne Illnesses and Outbreaks	2	
	16	Histamine Formation and Scombroid Poisoning	2	
	17	Marine Biotoxins: PSP, DSP, ASP	2	
	18	Seafood Safety Standards and Risk Assessment	3	
IV	MICROBIOLOGICAL QUALITY CONTROL AND PRESERVATION		10	15
	19	Microbiological Sampling and Analysis Techniques	3	
	20	Rapid Detection Methods: PCR, ELISA, Biosensors	3	
	21	Preservation Methods: Chilling, Freezing, MAP, Irradiation	2	
	22	Good Hygienic Practices in Seafood Handling and	2	

		Processing		
V	OPEN ENDED MODULE		12	
	1	Laboratory safety and aseptic techniques		
	2	Spoilage Rate Comparison: Raw and Chilled seafood		
	3	Interpretation of Microbial Limits Based on Regulatory Standards (FSSAI, FDA)		

References:

1. Microbiology by Pelzar, Reid & Chan
2. Microbiology by Prescott, Harley & Klein
3. Introduction to Microbial World by Adelogerg, Ingra & Wheates
4. Huss, H. H. (1993). Assurance of Seafood Quality. FAO Fisheries Technical Paper.
5. Gram, L., & Dalgaard, P. (2002). Fish Spoilage Bacteria - Problems and Solutions.
6. ICMSF. (2005). Microorganisms in Foods 6 – Microbial Ecology of Food Commodities.
7. Jay, J. M., Loessner, M. J., & Golden, D. A. (2005). Modern Food Microbiology.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	3	2	2	1	1	3	1	2	1	3	1	2
CO 2	2	3	2	2	1	2	3	1	2	1	3	2	2
CO 3	2	3	3	2	1	2	3	1	3	2	3	2	3
CO 4	3	3	3	2	2	3	2	2	3	3	3	2	3
CO 5	3	3	3	2	2	3	2	2	3	2	3	3	2
CO 6	3	3	3	3	2	3	3	2	3	3	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment co:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	--	✓	✓
CO 3	--	✓	✓	✓
CO 4	✓	--	✓	✓
CO 5	✓	✓	✓	✓
CO 6	--	--	✓	✓

IIND SEMESTER MAJOR COURSES

Course Code & Title	FPY2CJ101	QUALITY CONTROL AND FOOD SAFETY IN SEAFOOD INDUSTRY			
Type of Course	MAJOR	Semester	II	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	--	2	75
Pre-requisites	<ul style="list-style-type: none"> ▪ Fundamental knowledge in science disciplines ▪ Basic understanding of fish biology and post-harvest handling ▪ Fundamentals of food processing and preservation 				
Course Summary	This course introduces the principles and practices of quality control and food safety in the seafood industry. It covers quality fundamentals, food safety hazards, microbiological analysis, regulatory frameworks, and hygiene practices. Emphasis is placed on analytical methods, standards compliance, and implementation of safety systems such as HACCP to ensure the safety and marketability of seafood products.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Explain the concepts of seafood quality and food safety fundamentals	U	C	Written exam, class discussions
CO2	Identify and assess biological, chemical, and physical hazards in seafood	An	C	Case study analysis, quiz, Assignments
CO3	Conduct microbiological and chemical quality analyses in seafood products	Ap	P	Laboratory practicals, observation checklist, lab reports
CO4	Interpret and apply national and international food safety standards	Ap	C	Short answer questions, Quiz
CO5	Design and evaluate food safety management systems, including HACCP	C/ E	P	Project report, HACCP plan development, peer review
CO6	Monitor hygiene practices and assess shelf-life and compliance in seafood processing	E	P	Practical exam, shelf-life data analysis
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	QUALITY CONTROL AND FOOD SAFETY FUNDAMENTALS		10	15
	1	Definition of quality and safety in seafood	2	
	2	Importance of quality control in seafood industry	2	
	3	Causes of quality deterioration – microbial, enzymatic, and oxidative spoilage	2	
	4	Factors affecting seafood quality – pre- and post-harvest handling, cold chain	2	
	5	Principles of food safety management – overview of GMP, GHP, SSOP, HACCP	2	
II	FOOD SAFETY HAZARDS AND RISK ASSESSMENT		10	15
	6	Biological hazards – bacterial (e.g., <i>Vibrio</i> , <i>Listeria</i> , <i>Salmonella</i>), viral, parasitic	1	
	7	Chemical hazards – biotoxins, drug residues, heavy metals, allergens	1	
	8	Physical hazards – foreign objects, packaging material contamination	1	
	9	Seafood-borne illnesses and outbreak case studies	2	
	10	Risk analysis – hazard identification, exposure assessment, risk characterization	3	
	11	Preventive and corrective measures – CCPs, sanitation practices	2	
III	MICROBIOLOGICAL QUALITY CONTROL ANALYSIS IN SEAFOOD INDUSTRY		15	15
	12	Microbial flora of fresh and processed seafood – spoilage and pathogenic organisms	2	
	13	Microbiological quality indicators – Total Plate Count (TPC), Staphylococcus, coliforms, <i>E. coli</i> , <i>Salmonella</i> , <i>Listeria</i> , <i>Vibrio</i> spp.	3	
	14	Sampling methods and microbiological testing procedures – conventional and rapid detection techniques	3	
	15	National and international microbiological standards – FSSAI, EIC, Codex, ICMSF, EU, USFDA	2	
	16	Hygiene monitoring techniques – swab tests, air	3	

		sampling, sanitation audits		
	17	Microbial limits, shelf-life evaluation, and quality correlation in seafood products	2	
IV	REGULATORY FRAMEWORK, PROCESSING HYGIENE AND CERTIFICATIONS		10	15
	18	National regulations: FSSAI, EIC, MPEDA, BIS	2	
	19	International standards and regulations – Codex Alimentarius, EU norms, USFDA	2	
	20	HACCP system: principles, documentation, verification	2	
	21	Hygiene in seafood processing plants – facility design, equipment, personnel hygiene	2	
	22	Certification and quality assurance systems – ISO 22000, BRC, IFS, MSC, Global G.A.P.	2	
V	PRACTICAL MODULE		30	
	1	Sensory evaluation of raw and processed seafood		
	2	Evaluation of total microbial load from a seafood sample		
	3	Microbiological analysis of Hygiene indicating bacteria- E.coli, Coliforms, Staphylococcus		
	4	Detection of seafood pathogenic microorganisms- Salmonella, Listeria, Vibrio spp.		
	5	Hygiene monitoring – swab test and air quality assessment		
	6	Water Quality Testing in Seafood Processing Plants – microbial and chemical parameters		
	7	Shelf-life Study and Quality grading of seafood products		

References:

1. Balachandran, K.K, Post-Harvest Technology of fish and fish products.
2. Chincheste, C.O and Graham, H.D, Microbial safety of Fishery products.
3. Frasier, W.C and Westhoff, D.C, Food Microbiology.
4. Jay, J.M. Van Nostrand. D., Modern Food Microbiology.
5. Amerine, M.A, Pangborn, R.M, Principles of sensory evaluation of food.
6. Connell. J.J, Control of fish Quality.
7. Sali A.J., Fundamental Principles of Bacteriology.
8. Schlegel, General Microbiology.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	2	2	1	2	3	1	2	2	3	2	1
CO 2	2	3	3	2	1	2	3	1	2	2	3	2	2
CO 3	2	3	3	2	1	3	2	1	3	3	3	2	3
CO 4	2	3	2	3	2	2	2	2	2	2	2	3	2
CO 5	2	3	3	3	1	2	2	2	3	2	3	3	3
CO 6	2	3	3	2	1	2	2	1	2	2	3	3	2

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	--	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	✓	✓

Course Code & Title	FPY2CJ102	FISH BIOCHEMISTRY AND SPOILAGE MECHANISMS			
Type of Course	MAJOR	Semester	II	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	--	2	75
Pre-requisites	<ul style="list-style-type: none"> ▪ Fundamental knowledge in science disciplines ▪ Foundational knowledge on fish biochemical composition ▪ Fundamental knowledge on food spoilage concepts 				
Course Summary	<p>This course introduces the biochemical composition of fish and shellfish, including proteins, lipids, carbohydrates, and nucleic acids, and examines how these components change during processing and storage. It emphasizes the chemical and microbial mechanisms underlying spoilage and discusses methods to evaluate and control degradation. The practical component focuses on core biochemical analyses and spoilage assessment techniques relevant to fish quality and safety.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe the biochemical constituents of finfish, crustaceans, and molluscs.	U	F	Quiz, MCQ, Assignment
CO2	Classify fish proteins and explain their structure, properties, and functional roles.	U	C	Assignment, Topic Presentation
CO3	Analyze lipid composition and oxidative spoilage mechanisms in fish oils.	An	P	Practical Assessment,
CO4	Identify the role of carbohydrates, nucleic acids, pigments, and flavor compounds in fish quality.	U	C	MCQ, Assignment, Discussion
CO5	Explain the biochemical and microbial Mechanisms involved in fish spoilage.	An	P	Quiz, Topic Presentation,
CO6	Perform standard biochemical analyses to assess fish quality and spoilage status.	E	P	Practical Assessment

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P)

Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	BIOCHEMICAL CONSTITUENTS OF FISH		10	15
	1	Biochemical composition of finfish, crustaceans, and molluscs	2	
	2	Classification and properties of fish proteins – sarcoplasmic, myofibrillar, and stroma proteins	2	
	3	Structure of fish muscle and functional roles of proteins	2	
	4	Non-protein nitrogenous compounds – TMAO, creatine, urea, etc.	2	
	5	Effects of processing (freezing, drying, heating) on fish proteins	2	
II	LIPID CHEMISTRY IN FISH		10	15
	6	Fatty acid composition of fish body and liver oils – nutritional and functional aspects	2	
	7	Mechanisms of lipid oxidation – auto-oxidation, rancidity, hydrolytic vs oxidative	2	
	8	Role of lipases, phospholipases, and lipid-protein interactions in quality degradation	2	
	9	Pro-oxidants and antioxidants in fish – biochemical functions and quality impact	2	
	10	Oxidation indices – peroxide value, TBARS, free fatty acids, and their interpretation	2	
III	CARBOHYDRATES, NUCLEIC ACIDS, PIGMENTS, AND FLAVOUR		10	15
	11	Classification, structure, and function of carbohydrates in fish; mutarotation and stereoisomerism	2	
	12	Nucleic acids – DNA, RNA structures and biological functions in fish muscle	2	
	13	Purines, pyrimidines and their role in spoilage indicators	2	
	14	Flavour compounds – biogenic amines, volatile fatty acids, carbonyls, sulphur compounds	2	
	15	Pigments in fish – carotenoids, isoprenoids, their biochemical role and effect on quality	2	

IV	SPOILAGE MECHANISMS IN FISH		15	15
	16	Post-mortem biochemical changes – ATP degradation, pH changes, rigor mortis	2	
	17	Autolytic, enzymatic, and microbial spoilage – mechanisms and indicators	2	
	18	Common spoilage bacteria – Shewanella, Pseudomonas, Vibrio, etc.	2	
	19	Environmental factors affecting spoilage – temperature, pH, oxygen, salinity	2	
	20	Chemical and microbial spoilage indicators – TMA, TVB-N, H ₂ S, bacterial counts	2	
	21	Physical spoilage signs – belly burst, textural and sensory deterioration	2	
	22	Spoilage prevention and control methods – chilling, freezing, MAP, sanitation	3	
V	PRACTICAL MODULE		30	
	1	Proximate Composition Analysis of Fish Muscle		
	2	Estimation of Glucose in Fish Tissue or Extracts		
	3	Estimation of Soluble Protein Content		
	4	Analysis of Non-Protein Nitrogenous Compounds		
	5	Assessment of Lipid Oxidation		
	6	Determination of Fatty Acid Composition in Fish Oil		
	7	Determination of saponification value of fats and oils		
	8	Observation of Post-Mortem Changes in Fish Muscle		

References:

1. George, M.P. & Barbec, W.T., Seafood effects of Technology and Nutrition.
2. Joe, M. R. & Carrie, E.R, Food protein chemistry.
3. Lehninger, A.L., Principal of Biochemistry.
4. Michael Eskin N.A., Biochemistry of foods.
5. Ranganatha Rao, Textbook of Biochemistry.
6. Regenstein, J. M. & Regenstein C.E., Food Protein Chemistry.

7. Robert,G.A., Marine, Biogenic Lipids Fats and oils Vol.II.
8. Roy, E. M. & George, J.F., The sea food industry.
9. Roy, E.M., Geroge, J.F. & Donn, R.W., Chemistry and Biochemistry of marine food.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	2	2	1	1	3	1	2	1	3	2	1
CO 2	2	2	2	2	1	1	3	1	2	1	3	2	1
CO 3	2	3	2	2	1	2	2	1	2	2	3	2	2
CO 4	2	2	2	2	1	2	2	1	2	1	3	2	2
CO 5	2	3	2	2	1	2	3	1	2	2	3	2	2
CO 6	2	3	3	3	1	3	2	1	3	2	3	2	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	--	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	--	✓	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	✓	✓

Course Code & Title	FPY2CJ103	DESIGN AND MAINTENANCE OF FISH PROCESSING PLANT			
Type of Course	MAJOR	Semester	II	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> ▪ Fundamental knowledge in science disciplines ▪ Basic knowledge of fish biology and seafood processing methods. ▪ Understanding of general food safety and hygiene concepts. 				
Course Summary	This course covers the design, layout, and maintenance of fish processing plants, focusing on efficient workflow, hygiene, equipment, utilities, and compliance with food safety regulations. Students will also learn about modern technologies and sustainable practices in the seafood processing industry.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand how to choose a site and design a fish processing plant.	U	C	Quiz/ Assignment/ MCQ
CO2	Learn about the basic parts and layout of a seafood processing facility.	U	C	Quiz / Assignment / MCQ
CO3	Know how to plan cold storage, water supply, and waste systems.	Ap	P	Practical Assessment / Topic Presentation
CO4	Learn how to maintain equipment and ensure cleanliness and safety.	Ap	P	Practical Assessment / Field Study Record
CO5	Understand food safety rules like FSSAI, HACCP, and ISO standards.	U	F	Quiz / MCQ / Assignment
CO6	Get familiar with new trends like automation and eco-friendly design.	U	C	Assignment / Topic Presentation
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO FISH PROCESSING PLANT DESIGN		8	15
	1	Overview of fish and seafood processing industry – global and Indian scenario	1	
	2	Site selection criteria – proximity to raw material, water, power, transport	2	
	3	Principles of plant design and layout – flow of raw material to finished product	1	
	4	Planning of processing units – receiving, washing, grading, processing, packaging	2	
	5	Importance of hygienic design and layout for food safety and compliance	2	
II	FACILITY AND EQUIPMENT DESIGN		12	15
	6	Building materials – floors, walls, ceilings – requirements and standards	2	
	7	Design of drainage, lighting, and ventilation systems	2	
	8	Equipment layout – selection, positioning, and flow of operations	2	
	9	Cold storage and freezing unit design – insulation and temperature control	2	
	10	Waste management and effluent treatment systems	2	
	11	Design for water supply and ice plants – quality and capacity requirements	2	
III	UTILITIES AND MAINTENANCE MANAGEMENT		15	15
	12	Power supply systems – generators, power backup, energy efficiency	3	
	13	Boiler, refrigeration, and compressed air systems	2	
	14	Preventive and predictive maintenance – concepts and techniques	3	
	15	Maintenance of mechanical and electrical equipment	2	
	16	Sanitation and pest control systems in fish processing facilities	2	

	17	Safety devices and emergency handling infrastructure	3	
IV	REGULATIONS, CERTIFICATIONS AND MODERN CONCEPTS		13	15
	18	National and international standards – FSSAI, EIC, Codex, EU, USFDA	2	
	19	Requirements for HACCP-compliant plant design	3	
	20	Documentation for quality assurance and certification (ISO 22000, BRC)	2	
	21	Automation and smart systems in modern processing plants	3	
	22	Environmental considerations – green design, sustainability practices	3	
V	OPEN ENDED MODULE		12	
		Visit to a seafood processing facility and submission of a report/ Group project for the preparation of lay out and model		

References:

1. Balachandran, K. K. (2001). Post-Harvest Technology of Fish and Fish Products.
2. George M. Hall (1992). Fish Processing Technology.
3. Govindan, T. K. (1985). Fish Processing Technology.
4. Huss, H. H. (1994). Assurance of Seafood Quality.
5. Clucas, I. J., & Ward, A. R. (1996). Post-Harvest Fisheries Development: A Guide to Handling, Preservation, Processing, and Quality.
6. Morton, I. D., & MacLeod, A. J. (1990). Food Flavours: Part C: The Flavor of Fish.
7. Reilly, A. (Ed.). (2001). Quality and Safety of Fishery Products.
8. Crabtree, J. E. (2004). Sanitation in Food Processing.
9. FAO/WHO Codex Alimentarius Commission. Code of Practice for Fish and Fishery Products. (CAC/RCP 52-2003).
10. Kumar, R. R. (2013). Design of Food Processing Equipment and Plant Layout. New India Publishing Agency.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	3	3	2	1	2	3	1	2	2	3	2	2
CO 2	2	3	3	2	1	2	2	1	2	2	2	2	1
CO 3	2	3	3	3	1	2	2	1	2	2	3	3	2
CO 4	2	3	3	2	1	2	2	1	3	2	2	3	2
CO 5	2	3	3	3	1	2	3	1	2	2	3	3	2
CO 6	2	2	2	3	1	3	3	1	2	3	3	2	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	--	✓	✓
CO 4	--	✓	✓	✓
CO 5	✓		✓	✓
CO 6	✓	✓	✓	✓

IIIRD SEMESTER MAJOR COURSES

Course Code & Title	FPY3CJ201	FREEZING TECHNOLOGY IN SEAFOOD PLANTS			
Type of Course	MAJOR	Semester	III	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	--	2	75
Pre-requisites	<ul style="list-style-type: none"> ▪ Basic knowledge of fish biology and muscle composition ▪ Understanding of principles of food preservation ▪ Introductory awareness of post-harvest handling and food safety 				
Course Summary	<p>This course provides foundational and applied knowledge of freezing technology used in the preservation of fish and fishery products. It covers the principles of ice formation, freezing curves, methods of freezing, types of freezers, and cold storage systems. Emphasis is placed on chemical and sensory changes during freezing and storage, species-specific processing, and thawing techniques. The course also includes practical training in freezing operations, quality evaluation, and product handling.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Explain the principles of freezing, water structure, solute effects, and freezing point determination in fish	U	C	Written Test,
CO2	Compare different freezing methods, equipment, cold storage design, and their impact on product quality	An	P	MCQs, Assignments,
CO3	Identify the chemical changes and quality deterioration in fish during freezing and frozen storage	U	C	Descriptive Questions,
CO4	Apply pre-treatment and cryoprotectant techniques for quality retention in frozen products	Ap	P	Practical Record, Viva Voce
CO5	Demonstrate freezing and packaging of various seafood products and evaluate post-thaw quality	Ap	P	Sensory Evaluation Sheet
CO6	Analyze species-specific processing and advanced thawing techniques used in seafood freezing	An	P	Practical Exam, Report on Shrimp Styles/Thawing Trials
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FUNDAMENTALS OF FREEZING AND THERMODYNAMICS OF ICE FORMATION		10	15
	1	Structure of water and ice and its role in the freezing of fish	2	
	2	Effect of solutes on the structure and freezing behavior of water in fish tissue	2	
	3	Freezing curve of fish – interpretation of phase changes	2	
	4	Determination of freezing point using time–temperature plots	2	
	5	Calculation of freezing time for fish products	2	
	6	Concepts of supercooling, crystallization, and crystal growth	2	
II	FREEZING METHODS, EQUIPMENT, AND STORAGE SYSTEMS		12	15
	7	Technological steps in freezing fishery products	2	
	8	Comparison of slow freezing vs quick freezing	2	
	9	Types of freezers used in fish processing: Air-blast, Contact plate, Immersion/spray, IQF/Block	2	
	10	Freezer operating temperatures and their effect on product quality	2	
	11	Design and layout of cold storage, including space and temperature zones	2	
	12	Handling and stacking practices in cold storage to minimize temperature rise	2	
III	CHEMICAL ASPECTS OF FREEZING AND QUALITY MAINTENANCE		13	15
	13	Pre-treatment chemicals used before freezing: antioxidants, cryoprotectants, glazing	3	
	14	Theories of cryopreservation – cellular protection mechanisms	2	
	15	Freezer burn and recrystallisation – types and effects	3	
	16	Chemical changes during frozen storage: lipid oxidation, protein denaturation, nucleotide breakdown	2	
	17	Sensory deterioration: Changes in texture, odour, taste due to freezing and storage	3	

IV	SPECIES-SPECIFIC PROCESSING AND THAWING TECHNIQUES		10	15
	18	Filleting and preparation of fish for freezing	2	
	19	Freezing of shrimp in different styles: Whole, HL, PD, PUD, CPD, Block, IQF	2	
	20	Processing of crustaceans and cephalopods: Prawns, lobster, squid, cuttlefish, crab	2	
	21	Methods of thawing frozen fish – conventional and modern	2	
	22	Advantages and disadvantages of thawing techniques; recent advances	2	
V	PRACTICAL MODULE		30	
	1	Determination of freezing point and freezing curves		
	2	Demonstration of freezing in air-blast, plate, and immersion freezers		
	3	Application of cryoprotectants and glazing techniques		
	4	Freezing and packaging of shrimp (different styles)		
	5	Filleting, packing and freezing of fish		
	6	Physical/sensory evaluation of frozen and thawed fish		
	7	Study of cold storage layout and stacking practices		
	8	Thawing experiments with different methods		

References:

1. Balachandran, K.K., Post-harvest Technology of fish and fish products.
2. Cleland C Andrew, Food Refrigeration Processes.
3. Clucas, I.J., Fish Handling, Preservation and Processing in the Tropics.
4. Fennema, K. et al., Low Temperature Preservation of Foods and Living Matter.
5. Fennema, O.R., Principle of Food Science.
6. Gopakumar K., Text Book of Fish Processing Technology.
7. Hall G.M., Fish Processing Technology.
8. Sen D.P., Advances in Fish Processing Technology.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	3	2	1	0	2	3	0	1	0	2	0	0
CO 2	1	3	3	2	0	2	2	2	3	2	2	0	0
CO 3	2	3	2	2	0	2	2	0	2	0	3	2	0
CO 4	2	3	3	2	0	2	1	1	3	2	0	2	0
CO 5	1	3	3	2	1	2	0	2	3	0	2	1	2
CO 6	2	3	2	3	2	2	1	2	2	1	3	2	2

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	--	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	--	✓	✓
CO 4	--	✓	✓	✓
CO 5	✓	✓	--	✓
CO 6	--	✓	✓	✓

Course Code & Title	FPY3CJ202	THERMAL PROCESSING OF FISHERY PRODUCTS			
Type of Course	MAJOR	Semester	III	Academic Level	200 - 299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	--	2	75
Pre-requisites	<ul style="list-style-type: none"> ▪ Fundamentals of Food Processing and Preservation ▪ Should complete the previous papers 				
Course Summary	<p>This course provides comprehensive knowledge and practical skills related to thermal processing methods used in the preservation of fish and fishery products. It covers fundamental principles of heat transfer, microbial inactivation, classification of foods based on acidity, and detailed canning processes. The course further explores advanced technologies such as High Temperature Short Time (HTST) processing, aseptic canning, hurdle technology, and food irradiation. Emphasis is placed on safety standards, HACCP implementation, and quality evaluation. The practical component develops hands-on experience in canning, process validation, and sensory and microbial assessment of thermally preserved seafood.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the basic principles of thermal processing and heat transfer in fishery products.	U	C	Internal exam, MCQ, Assignment
CO2	Classify foods based on acidity and apply sterilisation concepts in seafood processing.	Ap	C	Short answer test, Oral quiz, Assignment
CO3	Analyse and interpret microbial destruction values (D, Z, F) and determine process parameters.	An	P	Lab evaluation, record, Viva
CO4	Perform fish canning operations and evaluate packaging integrity and product safety.	Ap	P	Lab evaluation, record, Viva
CO5	Develop and evaluate HACCP plans and apply safety standards in canned seafood production.	E	M	Group activity, HACCP worksheet
CO6	Demonstrate knowledge of advanced preservation techniques including hurdle technology and irradiation.	U	F	Seminar, Internal exam, End-semester exam
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	PRINCIPLES OF THERMAL PROCESSING AND HEAT TRANSFER		10	15
	1	Principles of thermal processing	2	
	2	Mechanisms of heat transfer: conduction, convection, radiation, dielectric and microwave heating	2	
	3	Heat resistance of bacteria and spores	2	
	4	Decimal reduction time (D value), thermal death time (TDT), Z-value and F-value	2	
	5	Cook value, 12D concept, integrated F value and their inter-relationships	2	
II	FOOD CLASSIFICATION, PROCESS DESIGN AND EQUIPMENT		10	15
	6	Classification of foods: low acid, medium acid, and acidic foods	1	
	7	Concepts of absolute sterility, statistical sterility, and commercial sterility	2	
	8	Pasteurisation and sterilisation – definitions and differences	2	
	9	Cold point, heat penetration, determination of process time, and F ₀ value	2	
	10	Heating equipment used in thermal processing	1	
	11	Additives used in thermal processing and value-added canned products	2	
	III	CANNING PROCESSES AND FOOD SAFETY		15
12		Canning process: steps, process flow, and types	3	
13		HTST (High Temperature Short Time) processing and aseptic canning	3	
14		Thermo-bacteriology: bacterial death and auto sterilization	2	
15		Bacteriology of canned and heat-processed fishery products	2	
16		HACCP principles and their application in canning	3	
17		Safety of canned foods and limitations of post-process sampling	2	

IV	ADVANCED PRESERVATION – HURDLE TECHNOLOGY AND IRRADIATION		10	15
	18	Hurdle technology: heat + pressure, low pH, NaCl, nitrite, irradiation, etc.		
	19	Combined effects: irradiation + NaCl, low aw, acids, nisin, etc.		
	20	Principles of food irradiation: sources, units, dose levels		
	21	Types of irradiation: radappertization, radacidation, radurization		
	22	Effects of irradiation on nutrients, microorganisms, physical and sensory properties of fish products		
V	PRACTICAL MODULE		30	
	1	Determination of Cold Point and Heat Penetration in Canned Fish		
	2	Calculation of D-value, Z-value and F-value Using Sample Data		
	3	Canning of Fish – Preparation, Packing, Sealing and Thermal Processing		
	4	Visual and Physical Examination of Cans and Seams		
	5	Demonstration of HTST (High Temperature Short Time) Processing		
	6	Study of HACCP Plan for a Fish Canning Unit		
	7	Sensory Evaluation and Shelf Life Observation of Thermally Processed Fish		
	8	Demonstration of Hurdle Technology Using Salt and Heat Treatment		

References:

1. Balachandran, K.K., Fish Canning Principles and Practices.
2. Gopakumar K., Text Book of Fish Processing Technology.
3. Hall, G.M., Fish Processing Technology.
4. Hersom, A. C &Hull and, E.D., Canned Foods.
5. Larousse, J & Brown,B.E., Food Canning Technology.
6. Stumbo, Thermo Bacteriology in Food Processing.
7. Thorne,S., Food Irradiation.

Mapping of CO's with : PSOs & POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	1	1	1	2	3	1	1	2	2	1	0
CO 2	2	3	2	1	1	1	2	1	2	1	2	2	1
CO 3	2	3	3	2	1	2	3	1	2	2	3	1	1
CO 4	3	3	3	2	2	2	2	2	3	2	2	2	2
CO 5	3	2	2	3	3	2	2	3	3	1	3	3	2
CO 6	2	2	2	3	2	3	2	2	2	3	3	2	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	--	✓	✓
CO 2	✓	--	✓	✓
CO 3	--	--	✓	✓
CO 4	--	✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6	--	✓	✓	✓

Course Code & Title	FPY3CJ203	CURING AND SMOKING TECHNIQUES IN FISH PRESERVATION			
Type of Course	MAJOR	Semester	III	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> Basic knowledge of Food Preservation and Processing and should complete the previous papers 				
Course Summary	<p>This course introduces students to the principles, methods, and applications of curing and smoking in fish preservation. It covers traditional and modern practices, including salting, brining, and various smoking techniques. Emphasis is placed on the scientific basis of water activity reduction, microbial control, smoke chemistry, quality assurance, and regulatory standards. The course also promotes hands-on learning through open-ended activities, encouraging innovation in value-added cured and smoked fish products.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the principles, types, and importance of curing techniques in fish preservation.	U	C	Assignment, Internal Examination
CO2	Describe and apply the methods and equipment used in fish curing and identify common defects.	Ap	P	Practical report, Observation, End Semester Examination
CO3	Explain the principles, types, and equipment of fish smoking and analyze influencing factors.	An	C	Seminar, Presentation, Internal Exam
CO4	Evaluate the nutritional, microbiological, and safety aspects of cured and smoked products.	E	M	End Semester Examination, Seminar presentation
CO5	Interpret relevant food safety regulations and apply HACCP in curing and smoking operations.	Ap	P	Assignment, Group Exercise, Viva
CO6	Create innovative or locally adapted cured/smoked fish products or preservation plans through project work.	C	P	Field Visit Report, Product Demonstration, Video Presentation
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO CURING AND TRADITIONAL PRESERVATION		10	15
	1	Definition and importance of curing in fish preservation	2	
	2	History and traditional practices of curing in coastal communities	2	
	3	Principles of water activity (aw) and its role in preservation	2	
	4	Types of curing: dry salting, brining, pickling	2	
II	TECHNIQUES AND METHODS OF CURING		13	15
	5	Influence of salt concentration and exposure time on microbial activity and shelf life	2	
	6	Process steps for dry salting and wet salting (brining)	2	
	7	Equipment used in curing operations	2	
	8	Use of natural and artificial additives in curing (e.g., vinegar, nitrates, spices)	2	
	9	Packaging and storage of cured fish products	2	
	10	Quality standards and grading of cured products	3	
III	SMOKING – PRINCIPLES AND TYPES		15	15
	11	Defects, spoilage, and quality deterioration in cured fish	2	
	12	Definition and objectives of smoking	3	
	13	Smoke composition and its preservative effect	2	
	14	Types of smoking: hot smoking, cold smoking, electrostatic smoking	3	
	15	Smokehouses and traditional vs modern smoking equipment	2	
	16	Factors influencing smoking efficiency: temperature, wood type, humidity, fish species	2	
IV	QUALITY, SAFETY, AND PRODUCT DEVELOPMENT		10	15
	17	Health and safety considerations in smoked fish production	3	
	18	Nutritional and organoleptic changes during curing and smoking	2	

	19	Microbiological safety and shelf life of cured and smoked products	2	
	20	National and international regulations (FSSAI, Codex, EU standards)	2	
	21	Value addition and development of ready-to-eat smoked fish products	2	
	22	HACCP application in curing and smoking units	2	
V	OPEN ENDED MODULE		12	
	1	Field visit to a traditional curing/smoking center and report submission		
	2	Development of a business plan for a small-scale smoked fish unit		
	3	Project on comparative shelf-life study of cured vs smoked fish		
	4	Preparation and presentation of innovative cured/smoked fish products		
	5	Seminar or video presentation on indigenous curing methods across coastal India		

References:

1. Gopakumar K., Text Book of Fish Processing Technology
2. Hall, G.M., Fish Processing Technology.
3. Hui, Y.H., Merle D.P., & J R., Gorham Food borne Disease Handbook.
4. Oefjen, G.W., Haseky & Peter, Freezedrying.
5. Sen D.P., Advances in Fish Processing Technology.
6. Wheaton & Lawson, Processing Aquatic Food Products.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	1	1	1	1	3	1	1	1	2	1	0
CO 2	2	3	3	2	1	1	2	1	3	1	2	1	1
CO 3	2	3	2	2	2	2	3	2	2	2	3	2	1
CO 4	2	2	2	3	2	2	3	2	2	2	3	3	2
CO 5	3	3	2	3	2	2	3	2	2	2	3	3	2
CO 6	3	3	3	3	3	3	2	3	3	3	3	2	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	--	✓	✓
CO 2	✓	--	✓	✓
CO 3	--	✓	✓	✓
CO 4	--	✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	--	✓

IVTH SEMESTER MAJOR COURSES

Course Code & Title	FPY4CJ201	APPLIED SEAFOOD MICROBIOLOGY AND QUALITY ASSURANCE			
Type of Course	MAJOR	Semester	IV	Academic Level	200 - 299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	--	2	75
Pre-requisites	<ul style="list-style-type: none"> Knowledge by attending the previous semester papers 				
Course Summary	<p>This course provides a comprehensive understanding of the microbiological aspects of fish and fishery products, focusing on the identification, enumeration, and control of microorganisms that influence fish quality and safety. Students will learn about the intrinsic and extrinsic factors affecting microbial growth, common spoilage organisms, foodborne pathogens, and the sanitary practices necessary to maintain hygiene in seafood handling and processing. The course also includes hands-on training in microbiological techniques such as Total Plate Count (TPC), MPN, pathogen detection, and the use of rapid testing kits. Special emphasis is given to international standards, microbiological criteria, and quality assurance protocols in the seafood industry.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Demonstrate preparation of culture media and perform aseptic techniques for microbiological analysis.	Ap	P	Lab Practical, Viva, Record
CO2	Conduct Total Plate Count (TPC) to assess microbial load in fish samples.	Ap	P	Practical Test, Worksheet, Lab Record
CO3	Estimate coliforms using MPN method and interpret results.	Ane	C	Internal Assessment, Lab Report, Viva
CO4	Isolate and identify specific seafood pathogens such as Vibrio and Salmonella.	Ap	P	Practical Evaluation, Identification Chart, Presentation
CO5	Perform and interpret rapid detection methods using ELISA or Lateral Flow techniques.	E	P	Demo Evaluation, Group Activity,
CO6	Apply sampling techniques in food environments and report findings from a certified seafood testing lab.	C	P	Practical Logbook, Seminar/Presentation

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P)

Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FUNDAMENTALS OF FISH MICROBIOLOGY AND GROWTH FACTORS		10	15
	1	Introduction to microbiology of raw and processed fish and shellfish	2	
	2	Common spoilage organisms and pathogens in fishery products	2	
	3	Intrinsic parameters influencing microbial growth: pH, water activity, nutrients, natural inhibitors	2	
	4	Extrinsic parameters: temperature, humidity, gaseous atmosphere, handling, and storage conditions	2	
	5	Microbial succession in fresh vs processed fish	2	
II	SOURCES OF CONTAMINATION AND SANITARY CONTROL		11	15
	6	Natural microflora of fish: skin, gills, gut, and mucous layers	2	
	7	Environmental sources of contamination: water, sediment, and biofilms	2	
	8	Handling and processing contamination: gear, equipment, personnel	2	
	9	Sanitary measures in capture, post-harvest, and processing stages	2	
	10	Good Manufacturing Practices (GMP), Sanitation Standard Operating Procedures (SSOP), and hygienic handling	3	
III	ENUMERATION AND DETECTION OF MICROORGANISMS		12	15
	11	Cultivation methods: qualitative and quantitative approaches	2	
	12	Total Plate Count (TPC) – principles and interpretation	2	
	13	Coliforms and faecal coliforms – MPN concept and estimation	2	
	14	Isolation and identification of pathogens: <i>Salmonella</i> , <i>Vibrio spp.</i> , <i>Listeria</i> , <i>Staphylococcus</i> , <i>Streptococcus</i>	2	
	15	Rapid detection techniques: ELISA, PCR, biosensors, lateral flow assays	2	

	16	Overview of international methods and agencies: FDA, CFIA, FSIS, AOAC	2	
IV	MICROBIOLOGICAL CRITERIA AND QUALITY ASSURANCE		12	15
	17	Microbiological criteria: mandatory vs advisory, product-specific limits	2	
	18	Microbial standards for fresh, frozen, cooked, and ready-to-eat seafood	2	
	19	Sampling methods for microbiological analysis	2	
	20	Regulatory framework: FSSAI, ICMSF, EU, Codex standards	2	
	21	Microbiological aspects in HACCP-based quality control systems	2	
	22	Risk assessment and predictive microbiology in seafood safety	2	
V	PRACTICAL MODULE		30	
	1	Preparation of media and aseptic techniques		
	2	Total Plate Count (TPC) of fresh fish sample		
	3	Enumeration of coliforms using MPN method		
	4	Isolation and identification of <i>Vibrio</i> from shellfish		
	5	Detection of <i>Salmonella</i> using selective media		
	6	Rapid detection demonstration: Lateral Flow / ELISA kit uses		
	7	Microbiological sampling from contact surfaces and swabs		
	8	Visit to certified seafood testing lab and report submission		

References:

1. Chincheste, C.O and Graham, H.D. Microbial Safety of Fishery products,
2. Frasier, W.C and Westhoff,D.C Food Microbiology ,
3. Jay, J.M. Van Nostrand.D. Modern Food Microbiology
4. Amerine,M.A, pangborm,R.M Principles of sensory evaluation of food
5. Connell.J.J Control of fish Quality,
6. Maat A.G. and Wiley A Microbial Physiology
7. Pelezar Read and Chan Microbiology

8. Collins C.H. and Lyns P.M. Microbiological Methods

9. Lengeler Biology of Prokaryotes

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	3	3	1	1	2	3	1	2	2	2	1	1
CO 2	2	3	3	1	1	2	3	1	3	2	2	1	1
CO 3	2	3	3	2	1	2	3	1	3	2	3	2	1
CO 4	2	3	3	2	1	2	3	1	3	2	3	2	2
CO 5	2	3	2	2	1	3	3	2	2	3	3	2	2
CO 6	3	3	3	3	2	3	3	3	3	3	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	--	✓	✓
CO 2	✓	--	✓	✓
CO 3	✓	--	✓	✓
CO 4	--	✓	✓	✓
CO 5	--	✓	✓	✓
CO 6	✓	✓	--	✓

Course Code & Title	FPY4CJ202	STORAGE AND TRANSPORTATION OF FISHERY PRODUCTS			
Type of Course	MAJOR	Semester	IV	Academic Level	200 - 299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	--	2	75
Pre-requisites	<ul style="list-style-type: none"> Should completed the previous semester courses 				
Course Summary	<p>This course provides comprehensive knowledge on the quality parameters of fish and fishery products and the preservation techniques used in the cold chain. Students will explore changes occurring during chilled and frozen storage, factors influencing spoilage, and modern storage infrastructure and logistics. The course also focuses on cold chain systems, including transport and temperature monitoring in the seafood industry. Practical components include sensory, microbiological, and physicochemical analyses of fresh and preserved fish, offering hands-on skills aligned with industry standards and employability needs.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Identify and explain the factors affecting the quality of fresh and preserved fish products	U	C	Internal Exam, Assignment
CO2	Analyse physical, chemical, microbiological, and sensory changes in fish during storage	An	P	Lab Practical, Internal Exam
CO3	Apply appropriate chilling and freezing techniques to extend fish shelf life	Ap	P	Lab Practical, Demonstration
CO4	Evaluate the advantages, limitations, and effectiveness of various storage methods	E	C	Seminar, End Semester Exam
CO5	Interpret cold storage facility requirements and cold chain logistics in fish transport	U	C	Presentation, Assignment
CO6	Operate basic tools for sensory and microbiological analysis and assess transport systems	Ap	P	Practical Record, Viva Voce, Demonstration
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	QUALITY ASPECTS OF FISH AND FISHERY PRODUCTS		10	15
	1	Quality of fresh fish and fishery products	2	
	2	Factors affecting quality of fresh fish	2	
	3	Quality changes in chilled, frozen, and stored fish	2	
	4	Changes in physical, chemical, microbiological, and sensory properties during cold storage	2	
	5	Spoilage indicators and quality degradation mechanisms	2	
II	CHILL STORAGE TECHNIQUES AND QUALITY MAINTENANCE		12	15
	6	Methods of chilling fish	1	
	7	Types of ice used in chilling	1	
	8	Factors affecting rate of chilling	2	
	9	Storage methods and shelf life in iced storage	2	
	10	Cold shock: effects and implications	2	
	11	Advantages and disadvantages of chill storage	2	
	12	Physical, chemical, microbiological and sensory methods of analysis in chill storage	2	
III	FROZEN STORAGE AND QUALITY CONSIDERATIONS		15	15
	13	Storage conditions for frozen fishery products	3	
	14	Factors influencing product quality in frozen storage	2	
	15	Frozen storage shelf life and spoilage patterns	2	
	16	Physical, chemical, microbiological and sensory changes during frozen storage	3	
	17	Advantages and disadvantages of frozen storage	2	
	18	Quality assessment methods for frozen fish products	3	

IV	INFRASTRUCTURE AND COLD CHAIN LOGISTICS		8	15
	19	Layout and design of processing and cold storage units (chill rooms, cold stores)	2	
	20	Factors in designing cold storage: location, temperature control, ventilation, lighting, structural needs, pest control	2	
	21	Transportation systems: live fish, raw fish, refrigerated transport	2	
	22	Cold chain in seafood industry: importance, management, temperature monitoring, and supply chain integration	2	
V	PRACTICAL MODULE		30	
	1	Sensory evaluation of fresh, chilled and frozen fish		
	2	Physical and chemical analysis (pH, TVBN, TMA, etc.)		
	3	Microbiological evaluation of spoilage levels		
	4	Icing and chill storage procedures		
	5	Use of different ice types (flake, block, slurry)		
	6	Recording and interpreting storage temperature logs		
	7	Demonstration of cold chain monitoring tools		
	8	Study of transportation systems and vehicle classification		

References:

1. Aitken, A., et al., Fish handling and processing.
2. Balachandran, K.K., Post harvest technology of fish and fish products.
3. Connell, J.J., Advances in fish sciences and technology. George, M.Hall., Fish processing technology
4. Huss, H. H. (1995). *Quality and quality changes in fresh fish* (FAO Fisheries Technical Paper No. 348).
5. Reilly, A. (Ed.). (2000). *Safety and quality issues in fish processing*.
6. Sikorski, Z. E. (Ed.). (1990). *Seafood: Resources, nutritional composition, and preservation*.
7. Bremner, H. A. (Ed.). (2002). *Safety and quality issues in fish processing*.
8. Joseph, J. (2001). *Fish processing and preservation*.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	3	2	2	1	1	3	1	2	1	2	2	1
CO 2	1	3	3	2	1	2	3	1	2	2	3	2	2
CO 3	2	3	3	2	1	2	2	2	3	2	2	2	2
CO 4	2	3	2	2	1	2	3	2	2	2	3	2	3
CO 5	2	3	3	3	2	3	2	3	2	3	2	2	2
CO 6	2	3	3	3	2	3	2	3	3	3	2	2	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	--	✓	✓
CO 3	--	--	✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	--	✓
CO 6	--	✓	--	✓

Course Code & Title	FPY4CJ203	PACKING AND LABELLING OF FISH AND FISHERY PRODUCTS			
Type of Course	MAJOR	Semester	IV	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> Basic knowledge of fish and fishery product types, fish processing techniques, and food safety principles. 				
Course Summary	<p>This course provides comprehensive knowledge on the principles, materials, and technologies used in the packaging and labelling of fish and fishery products. It covers the design and evaluation of packaging systems suitable for various seafood forms (fresh, frozen, and value-added), testing procedures for packaging materials, and the regulatory frameworks governing labelling standards. The course also explores emerging trends such as modified atmosphere packaging, sustainable packaging, and smart labelling for traceability and export compliance. Students will gain hands-on insight into practical packaging solutions and legal labelling requirements in both national and international markets.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Explain the role, importance, and functions of packaging in fishery products.	U	C	Internal Exam, Assignment
CO2	Identify and describe suitable packaging materials and systems for various fishery products.	Ap	F	Seminar, Assignment
CO3	Evaluate the mechanical and physical properties of packaging materials and containers.	E	P	Internal Exam, Assignment
CO4	Analyze national and international labelling requirements for fishery products.	An	C	End Semester Exam, Case Study
CO5	Design appropriate labels including nutritional and safety details for specific fishery products.	C	P	Assignment, Project work
CO6	Interpret sustainability, traceability, and smart packaging trends in the seafood industry.	U	M	Seminar, Project
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FUNDAMENTALS OF FOOD PACKAGING		10	15
	1	Role and importance of packaging in fishery products	2	
	2	Functions of food packaging – protection, preservation, marketing	2	
	3	Packaging procedures for fresh, frozen, and value-added seafood	2	
	4	Packaging for retail, institutional supply, and export	2	
	5	Packaging standards for domestic and international trade	2	
II	PACKAGING MATERIALS AND SYSTEMS		11	15
	6	Packaging materials – types, properties, and applications (plastics, films, laminates, etc.)	2	
	7	Barrier properties and resistance to physical, chemical, and microbial hazards	3	
	8	Protective packaging design for chilled, frozen, and dry fishery products	2	
	9	Retort pouch technology – structure, function, and application	2	
	10	Modified Atmosphere Packaging (MAP) and Controlled Atmosphere Packaging (CAP)	2	
III	TESTING AND EVALUATION OF PACKAGING		12	15
	11	Mechanical and physical testing of packaging materials	3	
	12	Design and evaluation of primary, secondary, and tertiary containers	2	
	13	Resistance to handling, transport, and storage hazards	2	
	14	Quality control in packaging operations	3	
	15	Sustainability and biodegradable packaging options	2	
IV	LABELLING – STANDARDS AND LEGISLATION		15	15
	16	Fundamentals of labelling – purpose and functions	3	
	17	National and international labelling standards (FSSAI, Codex, USFDA)	2	

	18	Label elements: product name, nutrition facts, origin, date coding, batch, storage	2	
	19	Labeling for special categories – organic, GM, irradiated, vegetarian, allergen info	2	
	20	Food grade packaging materials and safety symbols	2	
	21	Label design: size, layout, color, printing techniques	2	
	22	Labelling and traceability requirements in seafood exports	2	
V	OPEN ENDED MODULE		12	
	1	Industry case studies on packaging innovations		
	2	Design and develop packaging and label for a specific fish product		
	3	Regulatory compliance mapping for export-oriented fish products		
	4	Sustainable and smart packaging trends in fisheries		
	5	Comparative analysis of international packaging regulations		

References:

1. Balachandran K.K., Post Harvest Technology of Fish and Fishery Products.
2. Desrosier N.W. and Treasler D.K, Fundamentals of Food Freezing.
3. Govindan T.K., Fish Processing Technology.
4. Moorjani M.N., Fish Processing in India.
5. BrodyJ., Fishery Byproduct Technology.
6. Chicheste C.O. and Graham H.D., Microbial Safety of fishery Products.
7. AmerienM.A.et.al., Principles of sensory evaluation of Food.
8. Connel J.J., Control of Fish Quality.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	1	2	1	1	3	2	2	1	2	2	1
CO 2	2	3	2	3	1	2	3	2	3	2	2	2	2
CO 3	1	3	3	3	1	2	3	2	3	3	3	2	3
CO 4	2	2	2	3	2	2	3	3	3	2	3	3	3
CO 5	2	2	2	3	3	2	2	3	3	2	3	3	2
CO 6	3	2	3	3	2	3	3	3	3	3	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	--	✓
CO 6	✓	✓	--	✓

VTH SEMESTER MAJOR COURSES

Course Code & Title	FPY5CJ301	BIostatISTICS AND BIOinformatics IN FISH PROCESSING			
Type of Course	MAJOR	Semester	V	Academic Level	300 - 399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	--	2	75
Pre-requisites	<ul style="list-style-type: none"> Basic understanding of mathematics and biology at the higher secondary level, along with familiarity with fishery-related terminology and concepts. 				
Course Summary	<p>This course introduces students to the fundamental concepts of biostatistics and bioinformatics with direct applications in fish processing. Students will learn how to organize, analyze, and interpret biological and fishery-related data using statistical methods. The course also covers the use of bioinformatics tools and databases for species identification, traceability, and molecular data analysis in seafood safety and quality. Practical exercises are designed to develop hands-on skills in using software like Microsoft Excel, SPSS, and online platforms like NCBI, UniProt, and BLAST, thereby enhancing analytical and digital competencies relevant to the seafood industry.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the basic concepts of biostatistics and data types relevant to fish processing.	U	C	Assignment, Internal Exam
CO2	Apply statistical tools like t-test, ANOVA, and regression to fishery data analysis.	Ap	P	Assignment, Practical, Internal Exam
CO3	Use statistical software (MS Excel/SPSS) for visual representation and interpretation of fishery datasets.	Ap	P	Practical, Seminar Presentation
CO4	Understand the basics of bioinformatics and the use of biological databases in fishery science.	U	F	Assignment, End Semester Exam
CO5	Analyze and interpret molecular data using bioinformatics tools for species identification and traceability.	Ane	P	Practical, Internal Exam
CO6	Integrate statistical and bioinformatic methods to solve real-world problems in fish processing research and development.	C	M	Practical, Project Work, Seminar Presentation
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	BASICS OF BIOSTATISTICS		10	15
	1	Introduction to biostatistics – scope and applications	2	
	2	Types of data – qualitative and quantitative	2	
	3	Measures of central tendency – mean, median, mode	2	
	4	Measures of dispersion – range, standard deviation, variance	2	
	5	Introduction to probability and probability distributions	2	
II	STATISTICAL TOOLS IN FISH PROCESSING		12	15
	6	Sampling techniques – random, stratified, systematic	2	
	7	Hypothesis testing – concept, null and alternative hypotheses	2	
	8	t-test, chi-square test – applications in fishery studies	2	
	9	Analysis of variance (ANOVA) – basic concept	2	
	10	Correlation and regression – simple linear models	2	
	11	Use of statistical software (e.g., MS Excel/SPSS) in fishery data analysis	2	
III	INTRODUCTION TO BIOINFORMATICS		12	15
	12	Definition and scope of bioinformatics	2	
	13	Biological databases – types and uses (GenBank, EMBL, DDBJ)	3	
	14	Basic tools in bioinformatics – BLAST, FASTA	3	
	15	Sequence alignment – pairwise and multiple alignment	2	
	16	Application of bioinformatics in seafood quality and safety	2	
IV	APPLICATIONS IN FISH PROCESSING		11	15
	17	Statistical analysis in fish quality evaluation	1	
	18	Monitoring microbial load using statistical tools	2	
	19	Use of bioinformatics in fish species identification	2	

	20	Molecular data for traceability and authentication	2	
	21	Data analysis in fish genomics and proteomics	2	
	22	Integration of statistical and bioinformatic tools in R&D	2	
V	PRACTICAL MODULE		30	
	1	Calculate the mean, median, and mode of a given fish processing-related dataset		
	2	Calculate the standard deviation of a given dataset		
	3	Draw and interpret a bar graph manually and using Microsoft Excel		
	4	Prepare and interpret a pie chart based on basic fish processing data (manual or Excel)		
	5	Prepare and interpret a scatter plot using fish quality or microbial count data (manual or Excel)		
	6	Prepare and interpret a line graph to visualize trends in fish storage or processing (manual or Excel)		
	7	Search and retrieve gene/protein information from NCBI and UniProt databases		
	8	Use BLAST to perform a basic sequence alignment and interpret the output		
	9	Explore a GenBank entry and identify its main components		
	10	Translate a DNA sequence into a protein sequence using an online tool		

References:

1. "Biostatistics: A Foundation for Analysis in the Health Sciences" by Wayne W. Daniel and Chad L. Cross
2. "Principles of Biostatistics" by Marcello Pagano and Kimberlee Gauvreau
3. "Bioinformatics: Sequence and Genome Analysis" by David W. Mount
4. "Bioinformatics Algorithms: An Active Learning Approach" by Phillip Compeau and Pavel Pevzner
5. "Biostatistics and Computer-based Analysis of Health Data using R" by Christophe Lalanne and Mounir Mesbah
6. "Introduction to Bioinformatics" by Arthur M. Lesk
7. "Statistical Bioinformatics: with R" by Sunil K. Mathur

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	1	1	1	2	3	2	1	2	2	2	1
CO 2	2	3	3	2	1	2	3	2	3	3	3	2	2
CO 3	1	3	3	2	1	3	2	2	3	3	3	2	2
CO 4	2	2	2	2	1	3	3	2	2	3	2	2	2
CO 5	2	2	2	3	2	3	2	2	2	3	3	2	3
CO 6	3	3	3	3	2	3	3	2	3	3	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	--	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	--	✓	✓
CO 5	✓	✓	--	✓
CO 6	✓	✓	--	✓

Course Code & Title	FPY5CJ302	INSTRUMENTATION IN FISH PROCESSING ANALYSIS			
Type of Course	MAJOR	Semester	V	Academic Level	300 - 399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	--	2	75
Pre-requisites	<ul style="list-style-type: none"> Basic knowledge of biology, chemistry, and fish processing concepts at the higher secondary level. Familiarity with lab safety practices and interest in laboratory instrumentation are recommended. 				
Course Summary	<p>This course introduces students to the principles and applications of key instruments used in fish processing and quality assessment. It covers microscopy, spectrophotometry, chromatography, electrophoresis, and molecular diagnostic techniques. The students will learn how these instruments help analyze fish composition, detect contaminants, and ensure product safety. Through hands-on practical sessions, students gain experience in using essential lab equipment such as pH meters, refractometers, UV-visible spectrophotometers, and electrophoresis setups. This course builds analytical skills and prepares students for roles in quality control, R&D, and regulatory testing in the seafood industry.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe the working principles and applications of microscopes used in fish processing analysis.	U	C	Assignment, Internal Examination
CO2	Explain the operation and application of analytical instruments used in evaluating fish quality.	U	C	Assignment, End Semester Examination
CO3	Apply spectroscopic and chromatographic techniques in fish composition and contaminant analysis.	Ap	P	Practical, Internal Examination
CO4	Demonstrate knowledge of electrophoresis and its applications in fish protein and allergen analysis.	Ap	P	Practical, Assignment
CO5	Understand molecular and immunological methods used in fish disease detection and species identification.	U	F	End Semester Examination, Seminar Presentation
CO6	Perform basic laboratory demonstrations using modern analytical tools related to fish quality and safety.	Ap	P	Practical Examination

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P)
Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	BASICS OF MICROSCOPY AND IMAGING TECHNIQUES		10	15
	1	Working principles of light microscope – bright field and dark field	2	
	2	Phase contrast microscope – principles and applications	2	
	3	Fluorescence microscope – principle and use in microbial detection	2	
	4	Electron microscope – Transmission Electron Microscopy (TEM)	2	
	5	Scanning Electron Microscopy (SEM) – use in fish tissue studies	2	
II	ANALYTICAL INSTRUMENTS IN FISH QUALITY ASSESSMENT		12	15
	6	pH meter – principle and use in freshness evaluation	2	
	7	Oxygen and temperature probes – application in cold chain monitoring	2	
	8	Refractometer – salinity and Brix value measurement	2	
	9	Spectrophotometry – UV-Visible spectrophotometer	2	
	10	Flame photometry – estimation of sodium and potassium	2	
	11	Atomic Absorption Spectrophotometry (AAS) – heavy metal detection in fish	2	
III	CHROMATOGRAPHIC AND ELECTROPHORETIC TECHNIQUES		12	15
	12	Chromatographic separation methods – principles and types	2	
	13	High Performance Liquid Chromatography (HPLC) – use in additive detection	2	
	14	Thin Layer Chromatography (TLC) – applications in fish lipid analysis	2	
	15	Electrophoresis – SDS-PAGE and native PAGE	2	
	16	Isoelectric focusing – separation of fish proteins	2	
	17	Immuno-electrophoresis – principle and relevance in allergen detection	2	

IV	MOLECULAR AND IMMUNOLOGICAL TECHNIQUES		11	15
	18	Blotting techniques – Southern and Northern blotting	2	
	19	ELISA – principle and application of indirect ELISA	2	
	20	Polymerase Chain Reaction (PCR) – principle	2	
	21	PCR applications in fisheries – disease diagnosis, species ID	3	
	22	Microarrays – basic principles and overview	2	
V	PRACTICAL MODULE		30	
	1	Demonstration of light and phase contrast microscope		
	2	pH, temperature, and salinity measurement of fish samples		
	3	UV-visible spectrophotometer – absorbance reading		
	4	TLC – separation of fish lipids		
	5	SDS-PAGE for fish protein separation		
	6	ELISA demo or simulation – detection of fish allergens		
	7	PCR demonstration – DNA amplification		
	8	Basic HPLC demo or video interpretation – additive detection		

References:

1. Macleod A.J., Instrumental methods of food analysis.
2. Anand C., Instrumental methods of chemical analysis.
3. Dtermann H., Gel Chromatography.
4. CRC series (vol I–III), Thin Layer Chromatography.
5. Connell J.J., Advances in Fishery Sciences and Technology.
6. Jones A, Read R and WeyersJ, Practical Skills in Biology.
7. Choudhary R., Biochemical Techniques.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	2	2	1	2	3	2	2	2	2	2	1
CO 2	2	3	3	2	1	3	3	2	3	3	3	2	2
CO 3	2	3	3	2	1	3	3	2	3	3	3	2	2
CO 4	2	3	3	2	2	2	2	2	3	2	3	2	2
CO 5	2	2	2	3	2	3	2	2	2	2	3	2	3
CO 6	3	3	3	3	2	3	3	2	3	3	3	2	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	--	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	✓	--	✓
CO 5	✓	✓	--	✓
CO 6	--	✓	--	✓

Course Code & Title	FPY5CJ303	ECONOMICS AND MARKETING IN SEAFOOD TRADE			
Type of Course	MAJOR	Semester	V	Academic Level	300-399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> Basic understanding of general economics and awareness of the fisheries sector, Should complete the previous semester courses 				
Course Summary	<p>This course introduces students to the principles of fishery economics and marketing in the context of seafood trade. It covers economic concepts related to production, fishing effort, and resource management, including models such as Maximum Sustainable Yield (MSY) and Economic Yield. The course explores fisheries marketing functions, supply chain management, price determination, and value addition in domestic and export markets. Students will also learn to analyze market behavior, develop strategic marketing plans, and apply digital tools for marketing intelligence. Through open-ended modules and real-life case studies, learners will gain practical insights into economic planning and trade optimization in the fisheries sector.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the basic concepts and significance of fishery economics and production systems.	u	C	Assignment, Internal Examination
CO2	Apply resource management models to evaluate economic sustainability in fisheries.	Ap	P	Seminar Presentation, End Semester Examination
CO3	Analyze market structures, marketing strategies, and stakeholder roles in seafood trade.	An	C	Assignment, End Semester Examination
CO4	Evaluate the effectiveness of marketing infrastructure, regulations, and planning in fisheries.	E	C	Seminar Presentation, Internal Examination
CO5	Interpret price formation mechanisms and supply-demand behavior in fish markets.	U	C	Assignment, End Semester Examination
CO6	Create market-based solutions or strategies for real-world seafood trade challenges using case-based or data-driven tools.	C	M	Project, Case Study Presentation
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FOUNDATIONS OF FISHERY ECONOMICS AND PRODUCTION		10	15
	1	Fishery economics – definition, scope, and importance	2	
	2	Concepts of production economics in marine fisheries	2	
	3	Catch and effort studies – methods and challenges	2	
	4	Dimensions of fishing effort and cost components	2	
	5	Employment, earnings, and technological impacts in marine capture fisheries	2	
II	RESOURCE MANAGEMENT AND ECONOMIC MODELS		12	15
	6	Economic theories related to fishery resource development	2	
	7	Concepts and models of fish resource exploitation	3	
	8	Maximum Sustainable Yield (MSY) and Optimum Sustainable Yield (OSY)	2	
	9	Maximum/Net Economic Yield (MEY/NEY) – static and dynamic concepts	2	
	10	Principles of sustainable fishery resource management	3	
III	FISHERIES MARKETING SYSTEMS AND STRATEGIES		14	15
	11	Fisheries marketing – definition, scope, and core functions	3	
	12	Market structure and role of government/co-operatives	2	
	13	Market integration, marketing efficiency, and price spread	2	
	14	Fish marketing planning and strategy formulation	3	
	15	Marketing research, infrastructure, and regulatory environment	2	
	16	Constraints and approaches to marketing development	2	
	IV	VALUE CHAIN AND PRICING IN FISHERIES TRADE		12
17		Supply Chain Management (SCM) – concepts and evolution	2	

	18	Value addition and vertical integration in fish marketing	2	
	19	Price determination – concepts, variability, and elasticity	2	
	20	Domestic and international market linkages	2	
	21	Characteristics of demand and supply of fishery products	2	
	22	Price stabilization, future trading, and market intelligence tools	2	
V	OPEN ENDED MODULE		12	
	1	Case study analysis on seafood marketing strategies		
	2	Design a digital fish marketing campaign (e-marketing or MIS-based)		
	3	Use real-time price data to perform supply/demand forecasting		
	4	Develop an export market entry plan for a selected seafood product		
	5	Conduct a mini research project using econometric tools on price trends		
	6	Analyze a value chain in the local fish market using interviews/field data		

References:

1. Phillip Kotler, Marketing Management.
2. Robert E Branson & Norvel,, Introduction to Agricultural Marketing
3. Ian Chaston,, Marketing.
4. Dennis Adeock, *et al.*, Marketing Principles and Practice.
5. Jolson,M.A., Marketing Management,
6. Amarchand & Varadharajan, B., An introduction to marketing,
7. Phillip Kotler& Gary Armstrong, Principles of Marketing.
8. G.E. Shephard., Agricultural Price Analysis.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	2	2	1	1	3	2	2	1	2	1	1
CO 2	2	3	3	3	1	2	3	1	3	2	3	2	2
CO 3	2	3	3	3	2	2	3	2	3	2	3	2	2
CO 4	2	3	3	2	2	2	2	2	3	2	3	3	2
CO 5	2	2	3	2	1	2	3	1	3	2	3	2	2
CO 6	3	3	3	3	2	3	3	3	3	2	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	--	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	--	✓	✓
CO 6	✓	✓	--	✓

19. DETAILED SYLLABUS OF THE ELECTIVE COURSES (MAJOR)

IVTH SEMESTER ELECTIVE MAJOR COURSES

Course Code & Title	FPY4EJ211	NUTRITIONAL BIOCHEMISTRY OF FISH AND SEAFOOD			
Type of Course	MAJOR	Semester	IV	Academic Level	200 - 299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> Basic knowledge of biology and chemistry at the higher secondary level is essential. Familiarity with fundamental concepts of biochemistry and human nutrition will be advantageous. 				
Course Summary	<p>This course provides an in-depth understanding of the biochemical composition and nutritional value of aquatic foods, with a focus on finfish and shellfish. Students will explore the roles of proteins, lipids, carbohydrates, vitamins, minerals, and bioactive compounds in seafood, and how these components contribute to human health and wellness. Emphasis is placed on the influence of species, environment, and seasonal variation on nutritional profiles. The course also covers changes in nutrient composition due to post-harvest handling, processing, and cooking methods. Designed to support both theoretical understanding and vocational relevance, the course aligns with nutritional science, food processing, and public health perspectives.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the importance of nutritional biochemistry and the biochemical composition of fish and shellfish.	U	C	Assignment, Seminar, Internal Examination
CO2	Compare the nutritional profiles of finfish and shellfish and evaluate the influence of species, habitat, and season.	E	C	Assignment, Presentation, Examination
CO3	Classify fish muscle proteins and amino acids and explain their nutritional roles and digestibility.	U	C	Seminar, Internal test
CO4	Analyze lipid classes, fatty acid composition, and the nutritional significance of omega-3 and omega-6 fatty acids.	An		Assignment End Semester Examination,
CO5	Evaluate the role of vitamins, minerals, and bioactive compounds in fish with respect to human health and disease prevention.	E	C	Assignment, End Semester Examination
CO6	Examine the effects of post-harvest handling, processing, storage, and cooking on the nutrient retention in aquatic foods.	An	P	Internal Examination, End Semester Examination,
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO NUTRITIONAL BIOCHEMISTRY OF AQUATIC FOODS		10	15
	1	Importance of nutritional biochemistry in fish and seafood science	2	
	2	Overview of fish as a nutrient-rich food source	2	
	3	Basic concepts of biochemical composition: water, proteins, lipids, carbohydrates, vitamins, minerals	2	
	4	Influence of species, season, and habitat on fish composition	2	
	5	Comparison of nutritional profiles of finfish and shellfish	2	
II	FISH PROTEINS AND AMINO ACIDS		12	15
	6	Structural and functional properties of fish muscle proteins	2	
	7	Classification of fish proteins – myofibrillar, sarcoplasmic, and stromal	2	
	8	Essential and non-essential amino acids in fish	2	
	9	Nutritional value and digestibility of fish proteins	2	
	10	Changes in protein content during post-harvest handling and processing	2	
	11	Bioactive peptides and their health implications	2	
III	LIPIDS AND FATTY ACIDS IN SEAFOOD		14	15
	12	Lipid classes in fish – neutral lipids, phospholipids, glycolipids	2	
	13	Fatty acid composition – saturated, monounsaturated, and polyunsaturated fatty acids (PUFAs)	2	
	14	Omega-3 and omega-6 fatty acids – EPA, DHA and their nutritional significance	3	
	15	Lipid oxidation and rancidity in fish products	2	
	16	Role of antioxidants in preserving lipid quality	2	

	17	Comparative lipid profiles of marine vs freshwater species	3	
IV	VITAMINS, MINERALS, AND OTHER BIOACTIVE COMPONENTS		12	15
	18	Water-soluble and fat-soluble vitamins in fish (A, D, E, B-complex)	2	
	19	Important minerals in fish – calcium, phosphorus, iron, iodine, selenium	2	
	20	Nutraceutical and functional components in fish and seafood	3	
	21	Impact of cooking and preservation on nutrient retention	3	
	22	Role of fish consumption in preventing lifestyle diseases	2	
V	OPEN ENDED MODULE		12	
	1	Nutritional Composition Comparison: Prepare a report comparing nutritional content of 5 fish species available in your region using secondary data (books, online databases).		
	2	Food Label Evaluation: Analyze nutrition labels from 3 packaged seafood products. Identify the types of fats, proteins, and micronutrients listed.		
	3	Health Awareness Essay: Write an essay on “Role of Fish in Preventing Lifestyle Diseases,” incorporating current public health data and nutritional studies.		
	4	Infographic or Poster: Create a visual explaining the impact of different cooking methods on nutrient retention in fish.		
	5	Case Study Discussion: Present a case study of a population or culture with high fish consumption and low incidence of cardiovascular disease.		

References:

1. Gopakumar, K. (2009). Textbook of Fish Processing Technology.
2. Balachandran, K.K. (2001). Post-Harvest Technology of Fish and Fish Products.
3. Sen, D.P. (2005). Advances in Fish Processing Technology.
4. Sreekumar, K. R. & Nair, P. G. V. (2006). Nutritional Quality of Fish – A Review.
5. Venugopal, V. (2006). Seafood Processing: Adding Value through Quick Freezing, Retort-able Packaging, and Cook-Chilling.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	2	1	2	2	2	3	2	1	2	3	2	1
CO 2	2	3	2	2	2	1	3	2	2	2	3	2	1
CO 3	2	3	3	2	2	1	3	1	3	2	3	2	2
CO 4	2	3	3	2	2	2	3	1	2	2	3	2	2
CO 5	3	3	2	3	2	2	3	2	2	2	3	3	3
CO 6	2	3	3	2	2	2	3	2	3	2	3	3	2

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	--
CO 2	✓	✓	✓	✓
CO 3	--	✓	✓	
CO 4	--	✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6	--	--	✓	✓

Course Code & Title	FPY4EJ212	FISH BY-PRODUCTS AND VALUE-ADDED PRODUCTS DEVELOPMENT			
Type of Course	MAJOR	Semester	IV	Academic Level	200 - 299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> Basic knowledge of fish processing, Should completed the previous semester courses 				
Course Summary	<p>This course provides an overview of the effective utilization of fish and shellfish by-products, focusing on their recovery, conversion, and applications in industrial, biomedical, and commercial sectors. It covers products like fish meal, oil, hydrolysates, chitin, collagen, and value-added seafood items such as coated and ready-to-eat products. Emphasizing sustainability and circular economy principles, the course equips students with practical knowledge to transform waste into high-value resources.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the scope, classification, and potential of fish by-product utilization in India and abroad.	U	C	Assignment, Internal Examination, Seminar
CO2	Explain the processes and applications of major industrial fish waste products like fish meal, fish oil, hydrolysates, and silage.	U	C	Assignment, Internal Examination, Seminar
CO3	Analyze the biomedical, pharmaceutical, and commercial applications of fish-derived by-products such as collagen, enzymes, and bioactive compounds.	An	C	Internal Examination, Seminar, End Semester Examination
CO4	Evaluate the technological and market potential of value-added fish and shellfish products including RTE/RTC items, surimi, and coated products.	E	C	Assignment, Seminar, End Semester Examination
CO5	Apply techniques for the conversion and utilization of fish waste and development of value-added products.	Ap	P	Seminar presentation
CO6	Examine the packaging, storage, and quality control parameters for by-products and value-added seafood products.	An	P	Practical Test, Internal Assessment, End Semester Examination
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO FISH BY-PRODUCTS AND THEIR UTILIZATION		10	15
	1	Importance and scope of fish by-product utilization in India and abroad	2	
	2	Classification and types of fishery by-products	2	
	3	Fish processing waste: heads, bones, viscera, skins, scales – composition and recovery potential	2	
	4	Principles of by-product recovery and conversion	2	
	5	Environmental and economic implications of waste disposal vs. utilization	2	
II	INDUSTRIAL PRODUCTS FROM FISH WASTE		12	15
	6	Fish meal – composition, manufacturing, uses in feed and fertilizers	2	
	7	Fish oil – extraction, refining, health applications (EPA, DHA)	2	
	8	Fish hydrolysates – production and bioactive roles	2	
	9	Fish silage – types (acid and fermented), preparation and use	2	
	10	Fish ensilage vs fish meal – comparison of preservation and application	2	
	11	Chitin and chitosan – extraction from shellfish waste, properties, and uses	2	
III	BIOMEDICAL AND COMMERCIAL APPLICATIONS		14	15
	12	Gelatin and collagen – sources, extraction from fish skins/scales, biomedical relevance	2	
	13	Squalene and shark liver oil – collection and health significance	2	
	14	Enzymes from fish viscera – proteases, lipases: extraction and applications	2	
	15	Pearl essence from fish scales – production and cosmetic uses	2	
	16	Bioactive peptides and nutraceuticals from processing waste	3	
	17	Pharmaceutical, cosmetic, and industrial value of fish-derived	3	

		by-products		
IV	VALUE-ADDED FISH AND SHELLFISH PRODUCTS		12	15
	18	Definition and classification of value-added products (VAPs)	2	
	19	Coated products: fish fingers, nuggets, cutlets – preparation and quality aspects	3	
	20	Minced fish meat and surimi – production, utilization, and restructured products	2	
	21	Ready-to-eat (RTE) and ready-to-cook (RTC) fish products – technology and trends	2	
	22	Packaging, storage, and marketing of value-added seafood products	3	
V	OPEN ENDED MODULE		12	
	1	Analyze and compare the economic, environmental, and social impacts of effective conversion of fish processing waste into commercial or health products.		
	2	Create a comparison chart showing at least five fish-derived by-products used in industrial vs. biomedical sectors. Include source material, process, and final application for each.		
	3	Conduct a survey or secondary market research to document the availability of coated, RTE, or RTC fish products. Include branding, packaging, pricing, and shelf-life comparison.		
	4	Illustration of the process flow of fish waste conversion into high-value products like chitin, collagen, or fish oil. Emphasize sustainability and economic benefits.		
	5	Write an essay or deliver a seminar on how by-product recovery aligns with circular economy principles, including zero-waste goals, cost savings, and environmental compliance.		

References:

1. Balachandran, K.K., Post Harvest Technology of fish and fish products.
2. Gopakumar K., Text Book of Fish Processing Technology.
3. Hall, G.M., Fish Processing Technology.
4. Hui, Y.H., M.D. Pierson & J.R. Gorham Food borne Disease
5. Sen D.P., Advances in Fish Processing Technology.
6. Wheaton & Lawson, Processing Aquatic Food Products.
7. Windsor, M. & Barlow, Introduction to Fishery Byproducts, Fishing.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	2	1	2	2	2	3	2	1	2	3	3	1
CO 2	3	3	2	2	2	2	3	1	2	2	3	2	2
CO 3	2	3	3	2	2	2	3	2	2	2	3	2	3
CO 4	2	3	3	3	2	2	3	2	3	2	3	3	3
CO 5	2	3	3	3	2	3	2	2	3	3	3	2	3
CO 6	2	2	3	2	2	3	2	1	3	3	2	2	2

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	--
CO 2	✓	✓	✓	--
CO 3	--	✓	✓	✓
CO 4	✓	✓	--	✓
CO 5	--	--	✓	✓
CO 6	--	--	✓	✓

Course Code & Title	FPY4EJ213	ADVANCED FISH PROCESSING TECHNIQUES			
Type of Course	MAJOR	Semester	IV	Academic Level	200 - 299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> General awareness on Post-harvest handling and preservation of seafood, should complete the previous semester courses 				
Course Summary	<p>This course provides an overview of modern and minimal processing techniques in fish preservation, focusing on advanced methods such as High Pressure Processing (HPP), Modified Atmosphere Packaging (MAP), irradiation, and freeze drying. It covers the preparation of coated, cured, and fermented products, along with automation, IoT-based quality control, and regulatory compliance. Emphasis is placed on developing ready-to-eat and ready-to-cook fish products with extended shelf life while ensuring food safety and industry standards.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the principles of modern food preservation techniques like hurdle technology, natural preservatives, and bio-preservation.	U	C	Assignment, Internal Examination, Seminar
CO2	Explain and differentiate thermal and non-thermal innovations such as HPP, ohmic heating, irradiation, PEF, and freeze drying.	U	C	Seminar Presentation, Assignment, Internal Exam
CO3	Apply modern processing techniques in the preparation and preservation of coated, cured, and fermented fish products.	Ap	P	Practical Exam, Internal Lab Assessment, Assignment
CO4	Analyze the integration of automation, robotics, sensors, and IoT in fish processing and real-time quality monitoring.	An	C	Internal Exam Seminar, End Semester Exam
CO5	Create and develop ready-to-cook (RTC) and ready-to-eat (RTE) value-added fish products using innovative packaging and processing methods.	C	P	Demonstration, Viva Voce
CO6	Evaluate food safety, HACCP implementation, traceability systems, and regulatory compliance (FSSAI, EU, USFDA) in advanced processing.	E	C	Assignment, End Semester Examination
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	MODERN PRESERVATION AND MINIMAL PROCESSING TECHNIQUES		12	15
	1	Principles of modern food preservation: hurdle technology	2	
	2	High Pressure Processing (HPP): concept, applications in seafood	2	
	3	Modified Atmosphere Packaging (MAP) and Vacuum Packaging	2	
	4	Use of natural preservatives and bio-preservation in fish products	3	
	5	Cold Plasma and Ultraviolet Light treatment in fish preservation	3	
II	THERMAL AND NON-THERMAL PROCESSING INNOVATIONS		12	15
	6	Ohmic heating and microwave processing in fish	2	
	7	Retort pouch processing and aseptic packaging	2	
	8	Irradiation of fish and fishery products – doses, applications, safety	2	
	9	Pulsed Electric Field (PEF) and Ultrasound in fish processing	2	
	10	Freeze drying and vacuum drying of high-value fish products	2	
	11	Comparison of traditional and emerging thermal techniques	2	
III	COATED, CURED, AND FERMENTED FISH PRODUCTS		12	15
	12	Preparation and preservation of coated products: fingers, nuggets, fillets	2	
	13	Innovative coating technologies – edible films and batters	3	
	14	Smoking and curing: traditional vs mechanized systems	2	
	15	Pickled and fermented fish products: methods and microbial role	2	
	16	Shelf-life extension strategies for RTC and RTE fish products	3	
QUALITY CONTROL, SAFETY, AND AUTOMATION			12	15

IV	17	Advances in chilling, freezing, and glazing techniques	2	
	18	Automation and robotics in fish processing lines	2	
	19	Role of sensors and IoT in real-time quality monitoring	2	
	20	HACCP in advanced processing plants – case examples	2	
	21	Traceability and blockchain in fish product supply chains	2	
	22	Regulatory compliance and certification (FSSAI, EU, USFDA)	2	
V	OPEN ENDED MODULE		12	
	1	Create a chart or poster comparing traditional and modern fish preservation methods using images and keywords.		
	2	Design a mock packaging for a fish product using transparent pouches and labels, simulating vacuum or modified atmosphere packaging.		
	3	Prepare a short presentation or video explaining how a non-thermal method like High Pressure Processing or irradiation works in seafood.		
	4	Identify the preservation method, expiry date, certification marks, and storage instructions from labels of RTE and RTC products		
	5	Group discussion on using natural versus chemical preservatives in fish products, listing pros and cons.		

References:

1. Gopakumar, K. (2002). *Textbook of Fish Processing Technology*
2. Balachandran, K.K. (2001). *Post-Harvest Technology of Fish and Fish Products*
3. Sen, D.P. (2005). *Advances in Fish Processing Technology*
4. Venugopal, V. (2006). *Seafood Processing: Adding Value through Quick Freezing, Retort-able Packaging, and Cook-Chilling*

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	2	2	1	1	2	3	1	2	1	2	3	0
CO 2	3	3	2	2	1	2	3	1	3	2	3	3	2
CO 3	3	3	3	2	1	2	3	2	3	2	3	2	3
CO 4	3	3	3	3	1	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 6	3	3	3	3	1	3	3	2	3	2	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	--	--
CO 4	--	✓	✓	✓
CO 5	✓	--	--	--
CO 6	✓	--	--	✓

VTH SEMESTER ELECTIVE MAJOR COURSES

Course Code & Title	FPY5EJ311	MARKETING AND EXPORT PROMOTION OF FISHERY PRODUCTS			
Type of Course	MAJOR	Semester	V	Academic Level	300 - 399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> Basic understanding of fisheries and marketing, Should have completed the previous semester courses 				
Course Summary	This course provides an overview of fish marketing systems, covering domestic and export market structures, supply chains, pricing, and promotional strategies. It introduces students to branding, consumer behavior, export documentation, and international trade regulations, along with quality standards and government policies relevant to the fisheries sector.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the concepts, structure, types, and supply chains involved in domestic fish markets in India.	U	C	Assignment, Seminar, Internal Examination
CO2	Analyze consumer behavior, branding, advertising, and promotional strategies in seafood marketing.	An	C	Assignment, Internal Examination
CO3	Evaluate fishery product exports in terms of major items, buyer preferences, export procedures, and the role of export organizations.	E	C	Assignment, Internal Exam, End Semester Examination
CO4	Apply knowledge of cold chain logistics, international distribution systems, and trade regulations in fish exports.	Ap	P	Seminar, Internal Examination
CO5	Evaluate food safety standards, traceability systems, and eco-labelling practices for global seafood compliance.	E	C	Assignment, End Semester Examination, Practical Report
CO6	Analyze government policies, schemes, and institutional support available for fish marketing and export growth.	An	C	Seminar, Presentation, Internal and End Semester Examination
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FUNDAMENTALS OF FISH MARKETING AND MARKET STRUCTURE		11	15
	1	Introduction to marketing: concepts, scope, and relevance in fisheries	1	
	2	Structure and functioning of domestic fish markets in India	2	
	3	Types of markets: wholesale, retail, landing centers, e-markets	2	
	4	Supply chain and distribution channels for fish and fish products	2	
	5	Price determination and price spread in fish marketing	2	
	6	Role of intermediaries and market margins	2	
II	MARKETING STRATEGIES AND CONSUMER BEHAVIOR		15	15
	7	Market research and consumer preference analysis in seafood marketing	3	
	8	Branding and labelling of value-added fish products	3	
	9	Advertisement, promotion, and retail strategies	3	
	10	Demand forecasting and market intelligence tools	3	
	11	Role of cooperatives and fisherfolk organizations in fish marketing	3	
III	FISH EXPORTS AND GLOBAL TRADE		12	15
	12	Export potential and trends in Indian fishery products	2	
	13	Major export items, destinations, and buyer preferences	2	
	14	Role of MPEDA and SEAI in fish export promotion	2	
	15	Export documentation and procedures	2	
	16	International logistics and cold chain management for seafood	2	
	17	WTO, SPS, and TBT regulations affecting fish trade	2	
	IV	QUALITY STANDARDS, CERTIFICATION & GOVERNMENT POLICIES		10
18		Quality assurance and food safety in fish exports	2	

	19	FSSAI, EIC, EU, USFDA, and other regulatory certifications	2	
	20	Traceability and eco-labelling for export compliance	2	
	21	Incentives, schemes, and subsidies for fish exporters	2	
	22	Government policies and export-import regulations affecting fisheries	2	
V	OPEN ENDED MODULE		12	
	1	Conduct a survey in local fish market or landing centre to observe how prices are set and how many intermediaries are involved.		
	2	Design a label and simple brand name for a value-added fish product aimed at urban consumers.		
	3	Collect and compare advertisements or packaging styles of seafood products from local markets or online platforms.		
	4	Prepare a flowchart showing the domestic or export supply chain of a commonly traded fish product, including all actors involved.		
	5	Create a presentation on a case study of a successful fish export business or cooperative society in India		

References:

1. Gopakumar, K. (Ed.) (2002) *Textbook of Fish Processing Technology*
2. Balachandran, K.K. (2001) *Post-Harvest Technology of Fish and Fish Products*
3. MPEDA Publications (Kochi) Export Guidelines, Seafood Exporters Directory, Traceability Manuals
4. Kurien, John (1995) *Fish Marketing Systems in Kerala*
5. FSSAI and EIC Manuals on Seafood Exports and Food Safety

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	3	2	2	2	1	3	2	3	1	2	2	1
CO 2	2	3	2	2	3	2	2	3	3	2	3	2	2
CO 3	2	3	2	3	2	2	3	2	3	2	3	2	3
CO 4	2	3	3	3	1	3	2	2	3	3	3	2	3
CO 5	2	2	3	3	1	3	2	2	3	2	3	3	3
CO 6	2	3	3	2	2	2	3	3	3	2	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	--
CO 2	✓	✓	✓	--
CO 3	✓		✓	✓
CO 4	--	✓	✓	--
CO 5	✓	--	--	✓
CO 6	✓	✓	✓	✓

Course Code & Title	FPY5EJ312	GLOBAL SEAFOOD TRADE AND MARKET TRENDS			
Type of Course	MAJOR	Semester	V	Academic Level	300 - 399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> Basic understanding of fishery products, post-harvest technology, and introductory knowledge of marketing and export procedures related to seafood. Should have completed the previous semester courses 				
Course Summary	<p>This course on Global Seafood Trade and Market Trends provides students with a comprehensive understanding of international seafood trade dynamics, export procedures, market access requirements, and emerging marketing strategies. It explores India's role in global seafood exports, key destination markets, and the impact of trade regulations, certifications, and consumer trends. The course also delves into the influence of sustainability, climate change, and digital innovation on seafood trade, enabling learners to analyze global opportunities and challenges in the seafood export industry with practical, policy, and promotional perspectives.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the structure, trends, and economic importance of global seafood trade.	U	C	Assignment, Internal Examination
CO2	Analyze major export commodities, market destinations, and regulatory requirements.	An	C	Seminar Presentation, Internal Exam, End Semester Exam
CO3	Evaluate the role of trade bodies like MPEDA, EIC, SEAI in export promotion.	E	C	Assignment, End Semester Examination
CO4	Examine emerging trends in seafood marketing, certification, and consumer behavior.	An	C	Assignment, Internal Exam, Presentation
CO5	Apply tools for analyzing international trade data, sustainability trends, and market access strategies.	Ap	P	Practical File, Case Study
CO6	Critically evaluate policy impacts, climate change, and future challenges in seafood trade.	E	C	End Semester Examination, Seminar
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	OVERVIEW OF GLOBAL SEAFOOD TRADE		12	15
	1	Introduction to global seafood trade and its economic importance	2	
	2	Major seafood exporting and importing countries	2	
	3	Global trade patterns and consumption trends	2	
	4	Role of FAO, WTO, and other international organizations	2	
	5	India's position in the global seafood trade	2	
	6	Contribution of seafood to foreign exchange and GDP	2	
II	EXPORT TRENDS AND MARKET ACCESS		12	15
	7	Major export commodities from India: shrimp, tuna, squid, etc.	2	
	8	Key destination markets: US, EU, China, Japan, Middle East	2	
	9	Import regulations and compliance requirements of major markets	3	
	10	Tariff and non-tariff barriers in seafood trade	2	
	11	Role of MPEDA, EIC, and SEAI in market access and promotion	3	
III	EMERGING TRENDS AND INNOVATIONS IN SEAFOOD MARKETING		14	15
	12	Shifts in consumer preferences and demand for sustainable seafood	2	
	13	Role of certifications: MSC, ASC, Organic, Dolphin-safe, Halal	3	
	14	Growing markets for organic, functional, and ready-to-eat seafood	3	
	15	Digital seafood trade platforms and B2B networks	2	
	16	Trends in seafood branding, eco-labelling, and storytelling	2	
	17	Innovations in seafood value chains and packaging technologies	2	
SUSTAINABILITY, TRADE POLICY, AND FUTURE			10	15

IV	OUTLOOK			
	18	Blue economy and its influence on seafood trade	2	
	19	Impact of climate change and fisheries management on exports	2	
	20	International seafood sustainability benchmarks and SDGs	2	
	21	Trade wars, pandemics, and their impact on seafood supply chains	2	
	22	Future opportunities and challenges in Indian seafood exports	2	
V	OPEN ENDED MODULE		12	
	1	Prepare a country-wise comparison chart showing the top seafood exporters and importers, their key products, and recent trade volumes.		
	2	Create a short presentation or video on how climate change or trade disruptions (like pandemics or trade wars) have affected global seafood supply chains.		
	3	Research and report on an emerging digital B2B seafood trading platform and explain how it benefits small-scale exporters or startups.		
	4	Conduct a group discussion or case study on India's strengths, weaknesses, opportunities, and threats (SWOT) in the global seafood export market.		
	5	Conduct a case study on a seafood product from Kerala (e.g., shrimp, cuttlefish, or sardines) and analyze its journey, market demand, export destinations, and global competitiveness.		

References:

1. Kurien, J. (2005). *Globalisation and Fisheries: Insights from the Indian Experience*.
2. George, T. C. (2007). *Marketing and Export of Fishery Products*.
3. CMFRI & MPEDA Publications – Annual Reports and Trade Bulletins
4. FAO Fisheries and Aquaculture Reports – *FAO State of World Fisheries and Aquaculture (SOFIA)*
5. MPEDA (2022). *Export Performance of Marine Products*.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	3	2	3	1	2	3	1	1	0	2	0	0
CO 2	1	3	2	2	2	2	2	2	2	1	2	0	2
CO 3	2	3	2	3	1	2	2	2	2	1	2	1	3
CO 4	2	3	2	3	2	3	2	3	3	2	3	1	3
CO 5	2	2	3	2	1	3	3	2	3	3	3	1	3
CO 6	2	2	2	3	1	3	3	2	2	2	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	--
CO 2	✓	✓	✓	✓
CO 3	✓	✓	--	✓
CO 4	✓	✓	✓	--
CO 5	✓	--	--	✓
CO 6	--	✓	--	✓

Course Code & Title	FPY5EJ313	FISHERY PRODUCT EXPORT DOCUMENTATION AND COMPLIANCE			
Type of Course	MAJOR	Semester	V	Academic Level	300 - 399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> Basic understanding of fishery products, post-harvest technology, and introductory knowledge of marketing and export procedures related to seafood. Should have completed the previous semester courses 				
Course Summary	<p>This course provides an in-depth understanding of the documentation, procedures, legal frameworks, and compliance requirements related to the export of fishery products. It introduces students to national and international regulatory bodies, export promotion agencies, and major global market requirements. The course emphasizes hands-on training in preparing export documents, complying with food safety standards, and understanding export logistics and schemes relevant to the seafood sector. By the end of the course, students will be equipped to handle real-time export operations and compliance issues in the fish processing industry.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the structure of global seafood trade and India's major export markets.	U	C	Assignment, Internal Examination
CO2	Identify and interpret different types of seafood export documents and their purposes.	R	F, P	Internal Examination, Practical Record
CO3	Analyze legal frameworks and regulatory bodies governing fishery exports.	An	C	Seminar, End Semester Examination
CO4	Demonstrate knowledge of food safety certifications and international compliance requirements.	Ap	P	Assignment, End Semester Examination
CO5	Evaluate the role of export incentives, logistics infrastructure, and promotion schemes.	E	C	Presentation, End Semester Examination
CO6	Create a complete export documentation file for a sample seafood consignment.	C	P	Practical File, Viva Voce
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO FISHERY EXPORTS AND TRADE REGULATIONS		12	15
	1	Overview of global fishery product trade	2	
	2	Major seafood export markets for India	2	
	3	Export potential of Indian fishery products	2	
	4	Introduction to WTO, FAO and Codex Alimentarius	2	
	5	Marine Products Export Development Authority (MPEDA): Role and functions	2	
	6	Role of EIA (Export Inspection Agency) and other regulatory bodies	2	
II	EXPORT DOCUMENTATION PROCEDURES		13	15
	7	Types of export documents: Regulatory, Commercial, and Transport	3	
	8	Proforma invoice, Commercial invoice, and Packing list	2	
	9	Certificate of Origin, Health Certificate, and Phytosanitary Certificate	2	
	10	Bill of Lading, Airway Bill, Shipping Instructions	2	
	11	Letter of Credit, Bank Realization Certificate (BRC), and other payment instruments	2	
	12	Digital documentation systems: ICEGATE, DGFT online systems	2	
III	LEGAL COMPLIANCE AND CERTIFICATIONS		15	15
	13	FSSAI and food safety compliance for export	2	
	14	HACCP certification and traceability in fishery exports	3	
	15	EU, USFDA, China, Japan — specific compliance requirements	3	
	16	Import/export restrictions, trade barriers, and non-tariff measures	2	
	17	IUU Fishing and Catch Certification Scheme	2	
	18	Compliance with SPS and TBT agreements	3	

IV	EXPORT LOGISTICS, PROMOTION, AND SUPPORT SCHEMES		8	15
	19	Cold chain management in seafood export logistics	2	
	20	Role of SEZs and Export Oriented Units (EOUs)	2	
	21	MPEDA subsidies and schemes for seafood exporters	2	
	22	Export Promotion Councils and international trade fairs	2	
V	OPEN ENDED MODULE		12	
	1	Preparation of a full set of sample export documents for seafood consignment		
	2	Video presentation on seafood exporting from India		
	3	Case study analysis on non-compliance issues in seafood exports		
	4	Visit/report from seafood exporting company		
	5	Preparation of chart showing India's top 5 seafood export destinations and major products sent to each.		

References:

1. Mahajan, M. I. (2022). Export Import Procedures and Documentation (10th ed.). Snow White Publications Pvt. Ltd.
2. Cherunilam, F. (2018). International Marketing: Text and Cases (21st ed.). Himalaya Publishing House.
3. Balagopal, T. A. S. (2015). Export Marketing (5th ed.). Himalaya Publishing House.
4. Agrawal, D. K. (2016). Logistics and Supply Chain Management (2nd ed.). Macmillan India.
5. Commercial Law Publishers. (2023). Food Safety and Standards Act, Rules & Regulations. Commercial Law Publishers (India) Pvt. Ltd.
6. Jahncke, M., Hardy, J. B., & Martin, R. E. (Eds.). (2005). Seafood Safety and Quality. FAO Fisheries Technical Paper No. 574, FAO, Rome.
7. Salvatore, D. (2013). Introduction to International Trade and Finance (2nd ed.).
8. MPEDA. (2021). Manual on Fish and Fishery Products Export. Marine Products Export Development Authority (MPEDA), Government of India.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	3	2	3	1	1	3	1	2	1	2	1	2
CO 2	2	3	3	2	1	3	2	1	3	3	2	1	3
CO 3	3	3	2	2	1	2	3	2	2	2	3	3	2
CO 4	2	2	3	3	1	3	2	1	3	3	3	3	3
CO 5	2	3	3	3	2	2	2	2	3	2	2	2	3
CO 6	2	3	3	3	2	3	2	2	3	3	2	2	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	--	✓	✓	--
CO 3	✓	✓	✓	✓
CO 4	--	✓	✓	✓
CO 5	--	✓	--	✓
CO 6	✓	--	--	✓

20. DETAILED SYLLABUS OF THE FOUNDATION COURSES

SKILL ENHANCEMENT COURSES (SEC)

Course Code & Title	FPY1FS111	VALUE ADDITION AND PRODUCT DIVERSIFICATION IN SEAFOOD			
Type of Course	SEC	Semester	I	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	--	--	45
Pre-requisites	<ul style="list-style-type: none"> ▪ Basic understanding of fish processing and marketing ▪ Interest in entrepreneurship or rural livelihood development 				
Course Summary	This course enables students to explore practical applications of value addition and product diversification in seafood. It bridges processing technologies with innovation, market readiness, and entrepreneurship, equipping students with the skills for high-value product development.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the concept, scope, and significance of value addition in seafood processing.	U	C	Assignment, Internal Examination
CO2	Identify and classify various traditional and modern value-added seafood products.	R	F	Assignment, End Semester Examination
CO3	Apply techniques for the development of coated, cured, and convenience seafood products.	Ap	P	Practical Record, Group Work, Internal Exam
CO4	Analyze product diversification strategies including by-product utilization and innovation.	An	C	Case Study, Assignment, Seminar
CO5	Evaluate the cost, quality, shelf life, and marketability of a value-added product.	E	P	Product Report, Viva Voce
CO6	Design and present an innovative seafood product with branding and market strategy.	C	M	Project Report, Product Demo, Presentation
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO VALUE ADDITION IN SEAFOOD		5	10
	1	Concept and importance of value addition	1	
	2	Status of seafood processing in India and export trends	1	
	3	Classification of fishery products: fresh, preserved, value-added	1	
	4	Factors influencing product selection and design	1	
	5	Regulatory standards for value-added seafood (FSSAI, EIA, MPEDA)	1	
II	TRADITIONAL AND NOVEL VALUE-ADDED PRODUCTS		10	10
	6	Cured products – dried, smoked, pickled, salted seafood	1	
	7	Coated products – battered, breaded fish and shrimp	2	
	8	Fish mince and surimi-based products	2	
	9	Ready-to-Eat (RTE) and Ready-to-Cook (RTC) products	1	
	10	Seafood snacks and convenience foods	2	
	11	Heat processed and retort pouch products	2	
III	PRODUCT DIVERSIFICATION AND INNOVATION		12	15
	12	By-product utilization – fish bone, skin, viscera, roe, shell waste	2	
	13	Development of nutraceuticals – fish oil, collagen, peptides	2	
	14	Value-added shellfish products – squid rings, crab cakes, shrimp pops	2	
	15	Fermented and probiotic seafood products	2	
	16	Eco-friendly packaging for diversified seafood products	2	
	17	Product formulation and sensory evaluation basics	2	
IV	MARKETING AND COMMERCIALIZATION OF VALUE-ADDED SEAFOOD		10	15
	18	Costing and pricing of value-added products	2	

	19	Branding, labelling, and nutritional claims	2	
	20	Cold chain and packaging solutions	2	
	21	Quality assurance and shelf-life testing	2	
	22	Government schemes and support for seafood startups (PMFME, MSME, MPEDA)	2	
V	OPEN ENDED MODULE		8	
	1	Design and develop a new seafood value-added product		
	2	Field/lab-based trials for formulation and sensory analysis		
	3	Team project with mock branding and cost analysis		

References:

1. Balachandran, K. K. (2001). Post-harvest technology of fish and fish products.
2. Gopakumar, K. (2002). Textbook of fish processing technology.
3. George, M. R. (2009). Value addition and quality management in fisheries.
4. Sen, D. P. (2005). Advances in fish processing technology.
5. FAO. (2018). Seafood value chain development: Fishery products and value addition.
6. ICAR-CIFT. (2015). Ready-to-eat and ready-to-cook fishery products: A handbook.
7. Khurana, H. K., & Jain, N. K. (2015). Food product development.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	2	0	2	0	2	3	0	0	2	2	2	0
CO 2	2	3	2	0	0	0	3	0	2	0	2	0	0
CO 3	2	3	3	2	0	2	2	0	3	2	3	0	2
CO 4	2	3	2	2	0	2	3	2	3	2	3	2	3
CO 5	2	3	2	2	0	2	3	0	2	2	3	3	3
CO 6	3	3	3	3	3	3	3	3	3	3	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	--	✓	✓
CO 2	✓	--	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	✓	--	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	--	✓

Course Code & Title	FPY4FS112	VISUAL BRANDING OF COASTAL ENTERPRISE			
Type of Course	SEC	Semester	IV	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	--	--	45
Pre-requisites	<ul style="list-style-type: none"> ▪ Basic understanding of fish processing and marketing ▪ Interest in entrepreneurship or rural livelihood development 				
Course Summary	This course equips students with the creative and technical skills to build visual brand identities for coastal and seafood enterprises. It merges cultural elements, market insights, and digital tools to empower small-scale entrepreneurs and processors with effective branding strategies.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the principles and importance of branding in coastal and seafood-based enterprises.	U	C	Assignment, Internal Examination
CO2	Identify and explain components of visual identity such as logos, typography, and colors.	R	F	Quiz, Assignment, End Semester Examination
CO3	Apply design principles to create visual assets using branding tools.	Ap	P	Portfolio, Practical Task, Assignment
CO4	Analyze brand identity and packaging designs for seafood products in local and global contexts.	An	C	Case Study, Presentation, Internal Examination
CO5	Evaluate branding strategies and communication approaches for various market segments.	E	P	Assignment, Group Discussion, Seminar
CO6	Create a brand identity and promotional material for a mock coastal enterprise.	C	M	Project, Presentation, Viva Voce

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P)

Metacognitive Knowledge (M)

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FUNDAMENTALS OF BRANDING FOR COASTAL ENTERPRISES		7	10
	1	Concept and importance of branding in seafood and coastal ventures	1	
	2	Difference between brand, branding, and brand identity	1	
	3	Elements of a strong brand: name, logo, color, tone, typeface	2	
	4	Target audience, brand positioning, and brand personality	2	
	5	Coastal culture and traditional influences in local branding	1	
II	VISUAL IDENTITY AND PACKAGING DESIGN		10	15
	6	Principles of visual identity design: consistency and clarity	2	
	7	Logo design basics: forms, colors, meaning	1	
	8	Typography and layout in visual branding	2	
	9	Color psychology and coastal themes	2	
	10	Role of packaging in branding seafood products	1	
	11	Label design and compliance with FSSAI/MPEDA standards	2	
III	TOOLS AND TECHNIQUES FOR VISUAL COMMUNICATION		10	15
	12	Introduction to branding tools (Canva, Adobe Express, CorelDRAW basics)	1	
	13	Creating digital graphics, posters, and social media templates	2	
	14	Photography and image selection for seafood product branding	1	
	15	Brand storytelling: narratives for coastal communities and sustainability	2	
	16	Product branding case studies from coastal India	2	
	17	Low-cost branding techniques for micro and small enterprises	2	
IV	BRANDING STRATEGY, MARKETING & BRAND COMMUNICATION		10	10

	18	Building brand loyalty and consumer trust	2	
	19	Digital marketing tools: Facebook, Instagram, WhatsApp Business	2	
	20	Strategies for rural and urban markets	2	
	21	Measuring brand impact: feedback and improvement	2	
	22	Government schemes supporting coastal branding and enterprise promotion	2	
V	OPEN ENDED MODULE		8	
	1	Designing a full brand kit for a mock coastal enterprise (e.g., dried fish brand, shrimp pickle line, eco-packaging startup).		

References:

1. Wheeler, A. (2017). Designing brand identity: An essential guide for the whole branding team (5th ed.).
2. Healey, M. (2008). What is branding?
3. Olins, W. (2008). The brand handbook.
4. Kapoor, N. (2020). Advertising and branding basics.
5. Pricken, M. (2010). Creative strategies: Idea generation for advertising and marketing.
6. MPEDA. (2022). Guidelines for branding of marine products from India.
7. Lockwood, T. (2010). Design thinking: Integrating innovation, customer experience, and brand value

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	2	2	2	2	0	3	0	0	0	2	0	0
CO 2	2	2	1	0	3	2	2	2	0	2	0	0	0
CO 3	2	3	3	2	2	3	2	0	3	3	2	0	2
CO 4	2	2	2	3	2	2	3	2	3	2	3	2	2
CO 5	2	3	2	2	2	2	2	3	2	2	3	3	3
CO 6	3	3	3	3	3	3	3	3	3	3	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	--	✓	✓
CO 2	✓	--	✓	✓
CO 3	✓	--	--	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	--	✓
CO 6	✓	✓	--	✓

Course Code & Title	FPY5FS113	E-COMMERCE AND DIGITAL MARKETING OF FISHERY PRODUCTS			
Type of Course	SEC	Semester	V	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	--	--	45
Pre-requisites	<ul style="list-style-type: none"> Basic knowledge of fish processing and preserved products, Should have completed the previous semester courses 				
Course Summary	This course equips learners with practical and theoretical knowledge on building and promoting fishery products through digital platforms. It blends e-commerce strategy, digital marketing, analytics, and entrepreneurship, enabling students to thrive in the tech-driven seafood market.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the fundamentals and scope of e-commerce in the fishery sector.	U	C	Quiz, Internal Test
CO2	Apply knowledge of website platforms and digital listing techniques for fishery products.	Ap	P	Assignment, presentation
CO3	Design and implement digital marketing strategies across various online platforms.	C	M	Group activity, presentation
CO4	Analyse customer behavior and sales data using digital analytics tools.	An	P	Google Analytics Task, Report
CO5	Evaluate pricing, branding, and marketplace strategies for fishery product sales.	E	C	Group Discussion, Comparative Assignment, Presentation
CO6	Create a simulated e-commerce brand and marketing campaign for a fish product in an open-ended format.	C	M	Project , Presentation
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FUNDAMENTALS OF E-COMMERCE AND DIGITAL TRADE		5	10
	1	Introduction to e-commerce and online trade in the seafood sector	1	
	2	Types of e-commerce models: B2B, B2C, D2C, and aggregator platforms	1	
	3	Components of an e-commerce business: product, platform, logistics, payments	1	
	4	Role of government initiatives: Digital India, ONDC, PMMSY in digital fish trade	1	
	5	Case studies of Indian e-fish markets (e.g., eNAM, FishBazaar, eMatsya, etc.)	1	
II	WEBSITE AND MARKETPLACE MANAGEMENT		12	15
	6	Building a basic fish product e-store using platforms (Shopify, Wix, Instamojo)	2	
	7	Listing fishery products on marketplaces: Amazon, Flipkart, JioMart, BigBasket	2	
	8	Product photography, digital cataloguing, and QR-based traceability	2	
	9	Packaging, shelf-life labelling, FSSAI norms for online retail	2	
	10	Payment gateways, COD, UPI, refund policies, and data security essentials	2	
	11	Logistics integration: cold chain, courier partners, and e-commerce fulfilment	2	
III	DIGITAL MARKETING ESSENTIALS		12	15
	12	Basics of digital marketing: SEO, SEM, PPC, influencer marketing	2	
	13	Social media platforms: Facebook, Instagram, WhatsApp, YouTube for fish products	2	
	14	Brand creation using Canva: logo, labels, ad creatives (hands-on task)	2	
	15	Email marketing, SMS campaigns, and customer feedback systems	2	
	16	Use of Google Business, Maps, and local listings	2	

		for fish vendors		
	17	Ethics in digital promotion: false claims, greenwashing, and transparency	2	
IV	ANALYTICS, TRENDS, AND GLOBAL PRACTICES		8	10
		Google Analytics: user tracking, bounce rate, and customer journey	2	
		Sales funnel basics: awareness → interest → decision → action (AIDA model)	1	
		Pricing strategies for online fish sales: dynamic, subscription, bundled	2	
		Export e-commerce: international marketing, payment, and regulatory overview	2	
		Global case studies: digital seafood marketing in Norway, Vietnam, Thailand	1	
V	OPEN ENDED MODULE		8	
	1	Identify a unique value-added or fresh fishery product		
	2	Design a basic online shop (mock/demo on Wix/Canva)		
	3	Create a digital ad campaign (social post, video, or reel)		
	4	Develop brand assets: name, logo, packaging concept		
	5	Present a simulated product launch pitch (with peer/mentor review)		

References:

1. Chaffey, D. (2022). Digital Marketing: Strategy, Implementation and Practice
2. Laudon, K. C., & Traver, C. G. (2021). E-Commerce: Business, Technology, Society
3. Ryan, D. (2016). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation
4. FSSAI. (2020). Food Safety and Standards Regulations Manual: Packaging and Labelling.
5. MPEDA. (2021). Seafood Export Marketing Manual.
6. Ministry of Commerce & Industry. (2022). ONDC – Open Network for Digital Commerce Guidelines.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	2	2	2	2	2	3	2	2	2	2	1	2
CO 2	2	3	3	2	2	3	3	2	3	3	2	1	2
CO 3	2	3	3	3	3	3	2	3	3	3	3	2	3
CO 4	1	2	3	3	2	3	2	2	2	3	3	2	3
CO 5	2	3	3	3	2	3	2	2	3	3	3	2	3
CO 6	3	3	3	3	3	3	3	3	3	3	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	--	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	--	✓
CO 6	✓	✓	--	✓

MULTI-DISCIPLINARY COURSES (MDC)

Course Code & Title	FPY1FM105	VALUE ADDITION IN SEAFOOD			
Type of Course	MDC	Semester	I	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	--	--	45
Pre-requisites	<ul style="list-style-type: none"> ▪ Fundamental knowledge in science disciplines ▪ Awareness in general hygienic practices ▪ Interest in innovation and entrepreneurship 				
Course Summary	This course provides comprehensive knowledge on the principles, techniques, and applications of value addition in seafood and to equip students with applied knowledge and technical skills in developing, preserving, packaging, and marketing value-added seafood products, while addressing safety, innovation, and entrepreneurship.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand why value addition in seafood is important and how it helps the industry.	U	C	Written tests, group discussion, assignment
CO2	Identify different types of value-added seafood products and how they are made.	U	P	MCQs, practical demonstrations
CO3	Learn about the tools, machines, and packaging used in seafood processing.	Ap	P	viva, process flowchart creation
CO4	Know how to check seafood quality and follow safety and regulatory rules.	An	P	Case study, checklist preparation
CO5	Explore new ideas and products in seafood using underused species and by-products.	C	M	Project work, product development trials, presentation
CO6	Gain basic knowledge on starting a seafood business and marketing value-added products.	Ap	P	Business model canvas, role play, field report
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO VALUE ADDITION IN SEAFOOD		8	10
	1	Importance and Scope of Value Addition in Seafood	1	
	2	Overview of the Indian and Global Seafood Processing Industry	1	
	3	Preprocessing essentials for value addition	2	
	4	Economics of Value Addition – Cost, Market, and Profitability	2	
	5	Regulatory Framework – FSSAI, EIC, HACCP, EU/USFDA standards	2	
II	VALUE-ADDED PRODUCT CATEGORIES-TRADITIONAL AND REGIONAL SPECIFIC		9	10
	6	Frozen Value-Added Products – Fillets, Nuggets, IQF	1	
	7	Marinated and Spiced Products	1	
	8	Coated, Breaded and Battered Seafood Products	2	
	9	Cured Products – Dried, Salted, and Smoked Fish	2	
	10	Canned and Thermally Processed Seafood	2	
	11	Specialty and Indigenous Products – Pickles, Patties, Soups	1	
III	PROCESSING TECHNOLOGY AND EQUIPMENT		10	15
	12	Equipment for Cutting, Shaping, Coating, and Packaging	2	
	13	Modified Atmosphere Packaging (MAP) and Vacuum Technology	2	
	14	Cold Chain Infrastructure and Logistics	2	
	15	Waste Minimization and Fish By-Product Processing	2	
	16	Energy and Water Efficiency in Seafood Processing Units	2	
IV	INNOVATION, QUALITY AND ENTERPRISE DEVELOPMENT		10	15
	17	Nutraceuticals and Functional Ingredients from Seafood	2	
	18	Quality Assurance – HACCP, ISO, GMP, and Traceability	2	

	19	Consumer Preferences and Sensory Evaluation	2	
	20	Labeling, Certification, and Export Compliance	2	
	21	Entrepreneurship Models and Business Planning in Seafood Value Addition	2	
V	OPEN ENDED MODULE		8	
	1	Pilot scale Innovative Product Development and Sensory Trials		

References:

1. Balachandran, K.K., Post Harvest Technology of fish and fish products.
2. Gopakumar K., Text Book of Fish Processing Technology.
3. Hall, G.M., Fish Processing Technology.
4. Hui, Y.H., M.D. Pierson & J.R. Gorham Food borne Disease
5. Sen D.P., Advances in Fish Processing Technology.
6. Wheaton & Lawson, Processing Aquatic Food Products.
7. "Innovative Food Processing Technologies: A Comprehensive Review" by K. J. Buckle
8. "Value-Added Products from Beekeeping" by R. Krell
9. Value Added Products From Food Waste by Elsa Cherian, Gurunathan Baskar
10. "Seafood Processing: Adding Value Through Quick Freezing, Retortable Packaging, and Cook-Chill Processing" – J. N. L. Linton & M. M. Green
11. FAO Publications on Value-Added Fish Products and Export Trends

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	3	2	2	1	1	3	2	2	1	2	1	2
CO 2	3	3	2	2	1	1	3	1	2	1	2	1	2
CO 3	2	3	3	2	1	2	2	1	3	2	2	2	2
CO 4	3	3	3	2	2	2	3	2	3	2	3	3	2
CO 5	3	3	2	2	2	2	3	2	2	2	3	2	3
CO 6	3	3	2	2	2	2	2	2	3	2	2	2	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	--	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	--	✓	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	--	✓

Course Code & Title	FPY2FM106	ENTREPRENEURSHIP IN FISH PROCESSING			
Type of Course	MDC	Semester	II	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	--	--	45
Pre-requisites	<ul style="list-style-type: none"> ▪ Interest in seafood, food innovation, or starting a small business. ▪ Willingness to learn hands-on skills in product development and marketing. 				
Course Summary	This course equips students with the foundational knowledge and practical skills to start and manage fish processing enterprises. Through hands-on learning and real-world case studies, students will explore product development, branding, financial planning, and innovative startup creation in the seafood sector.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the role of fish processing in business and how to become a seafood entrepreneur.	U	C	Quiz, Assignment, Discussion
CO2	Learn how to make value-added fish products using simple methods.	Ap	P	Practical Assessment, MCQ
CO3	Follow basic hygiene, safety, and quality rules in fish processing.	Ap	P	Practical Assessment,
CO4	Create marketing and branding ideas for selling fish products.	C	C	Topic Presentation, Assignment
CO5	Make a basic business plan with cost, pricing, and funding details.	An	P	Assignment, Discussion, Topic Presentation
CO6	Develop and present a small fish product business idea through a pilot project.	C	P	Topic Presentation, Practical Assessment,
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO FISH PROCESSING AND ENTREPRENEURSHIP		7	10
	1	Importance of fish processing in the seafood value chain	1	
	2	Overview of entrepreneurship in the fisheries sector	1	
	3	Identifying business opportunities in fish processing	1	
	4	Entrepreneurial Skills for Seafood Startups	2	
	5	Key challenges and risk management	1	
	6	Government schemes and support for fishery enterprises	1	
II	BASICS OF VALUE ADDITION AND PRODUCT DEVELOPMENT		10	10
	7	Understanding Value-Added Fish Products	1	
	8	Low-Cost Processing Techniques (Drying, Pickling, Smoking)	2	
	9	Sanitation and Hygiene in Small-Scale Processing	2	
	10	Introduction to Food Safety and Quality Standards	2	
	11	Simple Fish Product Recipes for Startups	1	
	12	Case examples of successful small-scale processors	2	
III	MARKETING, BRANDING, AND CUSTOMER OUTREACH		10	15
	13	Basics of Seafood Marketing	1	
	14	Creating a Brand Identity for Fish Products	2	
	15	Packaging Designs for Small Businesses	2	
	16	Local and Export Market Channels	2	
	17	Digital Marketing and social media for Fishpreneurs	3	
IV	BUSINESS PLANNING AND FINANCIAL MANAGEMENT		10	15
	18	Preparing a business plan	2	

	19	Estimating costs and profits	2	
	20	Pricing and break-even analysis	2	
	21	Funding options and subsidies	2	
	22	Managing supply chains and logistics	2	
V	OPEN ENDED MODULE		8	
	1	Pilot scale start up project on processed fishery products		

References:

1. Balachandran, K.K. (2001). Post-Harvest Technology of Fish and Fish Products. Daya Publishing House.
2. Gopakumar, K. (2002). Textbook of Fish Processing Technology. ICAR-Central Institute of Fisheries Technology.
3. FAO (2021). Training Manual on Small-Scale Fish Processing and Value Addition. Food and Agriculture Organization of the United Nations.
4. Sen, D.P. (2005). Advances in Fish Processing Technology. Allied Publishers Pvt. Ltd.
5. ICAR-CIFT. (2019). Fishpreneur: A Guide for Fish-Based Startups. Central Institute of Fisheries Technology, Kochi.
6. National Fisheries Development Board (NFDB). (2020). Entrepreneurship Opportunities in Fisheries Sector.
7. Ministry of Food Processing Industries (MOFPI). (2022). Operational Guidelines for PM-FME Scheme.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	3	2	3	3	2	3	3	3	2	2	2	3
CO 2	2	3	3	2	1	3	2	1	3	2	2	2	2
CO 3	3	2	3	2	1	3	3	2	3	2	3	3	1
CO 4	2	3	2	3	3	2	3	3	2	2	2	2	3
CO 5	2	3	2	3	2	2	2	2	3	2	2	2	3
CO 6	3	3	3	3	3	3	3	3	3	3	3	2	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	--	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	✓	--	✓
CO 5	✓	--	--	✓
CO 6	✓	✓	--	--

VALUE ADDED COURSES (VAC)

Course Code & Title	FPY3FV108	SUSTAINABLE PRACTICES IN COASTAL AND MARINE INDUSTRIES			
Type of Course	VAC	Semester	III	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	--	--	45
Pre-requisites	<ul style="list-style-type: none"> ▪ Basic understanding of marine ecosystems and coastal resources ▪ Introductory knowledge of environmental science or ocean studies ▪ Completion of relevant previous semester courses 				
Course Summary	<p>This course introduces students to the core concepts, methods, and innovations driving sustainable development in coastal and marine industries. Covering a wide range of sectors—fisheries, aquaculture, tourism, shipping, and energy—the course emphasizes environmental stewardship, circular economy models, and responsible resource use. Students will explore regulatory frameworks, eco-innovation, and emerging sustainable technologies, culminating in practical projects that encourage real-world application of sustainable solutions.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand core entrepreneurial concepts, startup types, and the fisheries innovation ecosystem.	U	C	Quiz, Internal Test
CO2	Analyse business planning elements, legal structures, and environmental sustainability for fisheries startups.	An	P	Group Assignment, Case Study
CO3	Evaluate financial planning, branding strategies, and digital marketing tools applicable to fish enterprises.	E	C	Budget Sheet, Canva Project, Internal Test
CO4	Apply technology, layout design, and cold chain concepts in fish startup development.	Ap	P	Seminar, Model Unit Design
CO5	Create a comprehensive startup model using BMC, digital tools, and multimedia pitch content.	C	M	Group Activity, Presentation
CO6	Demonstrate leadership, collaboration, and problem-solving through interdisciplinary capstone projects.	C	M	Project Report, Team Presentation
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FOUNDATIONS OF SUSTAINABILITY IN COASTAL AND MARINE CONTEXTS		5	10
	1	Introduction to sustainability: concepts, pillars, and relevance to marine industries	1	
	2	Coastal and marine ecosystems: structure, services, and anthropogenic pressures	1	
	3	Climate change and ocean health: impacts on coastal economies and livelihoods	1	
	4	Marine pollution: sources (plastics, oil, chemicals), impacts, and mitigation strategies	1	
	5	Blue economy: principles and sustainable development goals (SDGs)	1	
II	SUSTAINABLE MARINE RESOURCE MANAGEMENT		12	15
	6	Responsible fisheries and aquaculture practices	2	
	7	Ecosystem-based management (EBM) and marine spatial planning (MSP)	2	
	8	Carrying capacity in coastal zones – ecological vs economic limits	2	
	9	Waste management and circular economy in seafood processing	2	
	10	Case studies in sustainable harvesting and certification (MSC, ASC, etc.)	2	
	11	Role of traditional ecological knowledge (TEK) in coastal sustainability	2	
III	GREENING COASTAL INDUSTRIES AND INFRASTRUCTURE		10	10
	12	Sustainable coastal tourism – eco-tourism, community-based tourism	2	
	13	Green ports and harbors – low-impact infrastructure and energy-efficient practices	2	
	14	Sustainable shipping and marine transport – emission control, ballast water treatment	2	
	15	Offshore renewable energy – wind, tidal, wave energy potentials	2	
	16	Coastal construction and land-use planning –	2	

		minimizing habitat degradation		
IV	POLICY, GOVERNANCE, AND INNOVATION		10	15
	17	National and international regulatory frameworks (FSSAI, CRZ, MARPOL, UNCLOS)	2	
	18	Coastal zone management plans (CZMPs) and integrated coastal zone management (ICZM)	1	
	19	Environmental impact assessment (EIA) for marine projects	2	
	20	Role of NGOs, cooperatives, and community participation in governance	2	
	21	Technological innovations – remote sensing, GIS, and AI in monitoring coastal sustainability	1	
	22	Financing sustainable marine projects – blue bonds, CSR, public-private partnerships	2	
V	OPEN ENDED MODULE		8	
	1	Design a poster or infographic on sustainable coastal practices		
	2	Study a local beach or harbor and suggest eco-friendly improvements		
	3	Interview a local fisher or coastal worker and learn about sustainability challenges		
	4	Build a project idea that solves a coastal pollution or waste problem		
	5	Write a short report on how your town or district can protect its coast better		

References:

1. Kay, R., & Alder, J. (2005). Coastal planning and management
2. Holden, A. (2008). Environment and tourism
3. UNEP. (2015). Blue economy: Sharing success stories to inspire change.
4. Pinet, P. R. (2019). Invitation to oceanography (8th ed.).
5. Cicin-Sain, B., & Knecht, R. W. (1998). Integrated coastal and ocean management: Concepts and practices.
6. FAO. (2018). Sustainable fisheries and aquaculture for food security and nutrition. Food and Agriculture Organization of the United Nations.

Mapping of CO's with : PSOs AND Pos

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	2	2	2	2	1	1	1	2	1	3	2	2
CO 2	2	3	2	1	2	3	2	1	2	2	2	3	2
CO 3	2	2	3	3	2	2	1	1	3	2	2	2	3
CO 4	2	3	2	2	3	2	1	1	3	2	2	3	2
CO 5	2	2	3	3	2	2	1	2	2	3	2	2	3
CO 6	3	3	2	3	1	3	2	3	2	2	3	3	2

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓
CO 5	--	✓	--	✓
CO 6	✓	✓	--	✓

Course Code & Title	FPY4FV109	STARTUP ESSENTIALS FOR FISH PROCESSING ENTREPRENEURS			
Type of Course	VAC	Semester	IV	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	--	--	45
Pre-requisites	<ul style="list-style-type: none"> Basic knowledge of fish processing and preservation techniques, Should have completed the previous semester courses 				
Course Summary	This course nurtures entrepreneurial readiness in the fish processing domain through interactive, field-based, and digital learning experiences. It integrates regulatory understanding, financial and marketing tools, technological innovation, and open-ended creativity to prepare students for both self-employment and industry leadership.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand core entrepreneurial concepts, startup types, and the fisheries innovation ecosystem.	U	C	Quiz, Internal Test
CO2	Analyse business planning elements, legal structures, and environmental sustainability for fisheries startups.	An	P	Group Assignment, Case Study, Feasibility Presentation
CO3	Evaluate financial planning, branding strategies, and digital marketing tools applicable to fish enterprises.	E	C	Budget Sheet, Canva Project, Internal Test
CO4	Apply technology, layout design, and cold chain concepts in fish startup development.	Ap	P	Activity-based Task, Seminar, Model Unit Design
CO5	Create a comprehensive startup model using BMC, digital tools, and multimedia pitch content.	C	M	Group activity, presentation
CO6	Demonstrate leadership, collaboration, and problem-solving through interdisciplinary capstone projects.	C	M	Project Report, Team Presentation
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	ENTREPRENEURIAL FOUNDATIONS AND INDUSTRY LINKAGES		5	10
	1	Concept of entrepreneurship and intrapreneurship in fish processing	1	
	2	Traits, leadership styles, and emotional intelligence of successful entrepreneurs	1	
	3	Types of startups: social, youth-led, tech-enabled, cooperative, export-oriented	1	
	4	Startup ecosystem in India: MSME, PMMSY, Atmanirbhar Bharat, FPOs, EDPs	1	
	5	Role of incubators, accelerators, and fisheries innovation hubs	1	
II	BUSINESS PLANNING, REGULATIONS, AND ETHICS		12	15
	6	Business Model Canvas: fishery startup idea	2	
	7	Feasibility analysis: market survey, technical fit, costing	2	
	8	Company structures: LLP, FPC, SHG, cooperative, Udyam registration	2	
	9	Legal & food safety: FSSAI, MPEDA, EIA, HACCP, pollution control compliance	2	
	10	Environmental ethics, gender inclusion, sustainability and SDG mapping	2	
	11	Sustainable business plan with traceability and zero-waste focus	2	
III	FINANCE, BRANDING, AND DIGITAL MARKETING		12	15
	12	Startup costing and budget planning	2	
	13	Funding: PMMSY, SFURTI, MUDRA, NABARD, CSR grants	2	
	14	Basics of accounting, break-even, pricing strategy	2	
	15	Branding: name/logo creation	2	
	16	Social media marketing: Facebook, WhatsApp, Instagram for fishery products	2	

	17	Export basics: trade bodies, documentation, case of Indian marine exports	2	
IV	TECHNOLOGY, INNOVATION, AND GLOBAL ALIGNMENT		8	10
	18	Layout planning for a small processing unit using sketch/free tools	2	
	19	Cold chain, insulated boxes, traceability	1	
	20	Smart innovations in seafood: RTE, RTC, plant-based fish analogs	2	
	21	Global case studies: success stories from Norway, Japan, Vietnam, Kerala	2	
	22	Innovation Challenges in Fish Startups	1	
V	OPEN ENDED MODULE		8	
	1	Identify a unique fish processing or value-added product idea		
	2	Prepare and present a business model using real/local data		
	3	Build a product prototype/mock brand package (physical or digital)		
	4	Develop a basic budget, funding plan, and promotional strategy		
	5	Deliver a pitch presentation		

References:

1. Desai, V. (2011). Dynamics of Entrepreneurial Development and Management
2. Drucker, P. F. (2006). Innovation and Entrepreneurship.
3. Vijayaragavan, T., & Sivakumar, S. (2014). Entrepreneurship Development.
4. Khandare, S. S. (2016). Fishery Business Management.
5. MPEDA & ICAR-CIFT. (2018). Handbook on Fish Processing Technologies for Entrepreneurs.
6. FSSAI. (2020). Manual of Food Safety and Standards Regulations – Licensing and Compliance.
7. NABARD & Startup India. (2021). Agri and Fisheries Startup Toolkits and Entrepreneur Guides.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	3	2	2	3	2	3	3	2	2	2	2	3
CO 2	3	3	3	2	2	2	3	2	3	2	3	3	3
CO 3	2	3	2	2	2	3	3	2	3	3	3	3	3
CO 4	2	3	3	3	1	3	3	2	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 6	3	3	3	3	3	3	3	3	3	3	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	--	✓
CO 6	✓	✓	--	✓

Course Code & Title	FPY5FV110	SEAFOOD CULINARY SKILLS FOR TOURISM MARKETS			
Type of Course	VAC	Semester	V	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	--	--	45
Pre-requisites	<ul style="list-style-type: none"> Basic knowledge of fish processing and preserved products, Should have completed the previous semester courses 				
Course Summary	This course equips students with practical culinary skills tailored to tourism markets, combining traditional and modern seafood cooking, menu design, food presentation, and culinary branding. Students gain hands-on expertise relevant to hospitality, coastal tourism, and food entrepreneurship.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the role of seafood in culinary tourism and regional cuisines.	U	C	Internal Examination, Quiz
CO2	Apply basic and advanced seafood preparation and cooking techniques.	Ap	P	Lab Work, Assignment, Practical Assessment
CO3	Analyse seafood menu trends and develop innovative product concepts.	An	M	Menu Design Task, Assignment, Presentation
CO4	Evaluate packaging, branding, and culinary entrepreneurship opportunities in tourism markets.	E	C	Case Study, Group Discussion, Peer Review
CO5	Create a tourism-oriented seafood product or culinary service model.	C	M	Prototype Development, Pitch
CO6	Demonstrate team collaboration and communication skills through an open-ended culinary project.	C	P	Cooking Video/Presentation, Peer Evaluation
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO SEAFOOD GASTRONOMY AND TOURISM		5	10
	1	Importance of seafood in regional and global culinary tourism	1	
	2	Cultural diversity in seafood dishes across India and the world	1	
	3	Nutritional and health benefits of seafood for the hospitality sector	1	
	4	Food safety and hygiene in seafood culinary handling	1	
	5	Popular seafood-based tourist circuits (Goa, Kerala, West Bengal, Northeast)	1	
II	CULINARY PREPARATION TECHNIQUES		12	15
	6	Primary processing: cleaning, dressing, filleting, and portioning	2	
	7	Cooking methods: steaming, grilling, baking, frying, poaching, and sous-vide	2	
	8	Value addition: marinades, spice mixes, batters, and coatings	2	
	9	Seafood preservation for tourism outlets: chilled, frozen, smoked, vacuum packed	2	
	10	Regional specialties: fish curry (Kerala), prawn balchão (Goa), fish momo (Northeast), etc.	2	
	11	Plating, garnishing, and portion control in culinary presentation	2	
III	MENU DEVELOPMENT AND PRODUCT INNOVATION		10	15
	12	Designing seafood menus for restaurants, resorts, and cruise catering	2	
	13	Customizing menus for wellness, vegetarian-pescatarian, and diet trends	2	
	14	Fusion cuisine: Indo-continental seafood innovations	2	
	15	Ready-to-cook (RTC) and ready-to-eat (RTE) fishery products for tourists	2	
	16	Innovation in sauces, dips, and accompaniments for seafood dishes	2	

IV	BUSINESS, BRANDING & CULINARY TOURISM INTEGRATION		10	10
	17	Packaging and labelling for seafood culinary products (travel-safe, eco-friendly)	2	
	18	Food entrepreneurship in culinary tourism (pop-ups, food trucks, cloud kitchens)	1	
	19	Branding and storytelling in seafood culinary experiences	2	
	20	Use of social media and influencers in seafood promotion	2	
	21	Online platforms and reviews: Zomato, Tripadvisor, Swiggy, etc.	1	
	22	Events and festivals: seafood expos, food trails, cooking demos for tourists	2	
V	OPEN ENDED MODULE		8	
	1	Develop an original regional seafood recipe for tourists		
	2	Standardize the recipe with portion size, ingredients, and method		
	3	Present a live or recorded culinary demonstration (team/individual)		
	4	Design promotional material (menu card, label, or flyer)		
	5	Pitch it as a product in a tourist setting (resort, homestay, cruise, etc.)		

References:

1. Wirth, F. F., & Davis, L. D. (2019). *Seafood Handbook: The Comprehensive Guide to Sourcing, Preparation and Cooking*.
2. Roday, S. (2016). *Food Hygiene and Sanitation*.
3. Kinton, R., Ceserani, V., & Foskett, D. (2017). *Theory of Catering* (11th ed.).
4. Ramesh, M. N. (2005). *Food Processing Technology: Principles and Practice*.
5. George, B. P., & Swain, S. K. (2019). *Culinary Tourism: Exploring the Roles of Food, Wine and Taste in Tourist Experiences*.
6. Gopakumar, K. (2002). *Textbook of Fish Processing Technology*.
7. Ministry of Tourism, Government of India. (2022). *Incredible India: Culinary Tourism Guidelines*.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	2	2	2	2	1	3	2	2	1	2	2	2
CO 2	3	3	3	2	2	2	3	2	3	2	2	2	2
CO 3	2	3	2	2	2	3	2	2	3	2	3	2	3
CO 4	2	3	2	3	2	3	2	3	2	3	2	3	3
CO 5	3	3	3	3	3	3	3	3	3	2	3	2	3
CO 6	3	3	3	3	3	3	3	3	3	2	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	--	✓
CO 6	✓	✓	--	✓

21. DETAILED SYLLABUS OF THE MINOR COURSES

Course Code & Title	FPY1MN101	INTRODUCTION TO AQUATIC VENTURE OPPORTUNITIES			
Type of Course	MINOR	Semester	I	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> Interest in entrepreneurship or self-employment in the aquatic sector 				
Course Summary	<p>This course introduces students to aquatic-based enterprises, focusing on small-scale aquaculture, post-harvest value addition, and entrepreneurial skills. It covers enterprise types, site selection, integrated farming, processing techniques, marketing strategies, and digital tools. Skill components include business planning, field visits, and case studies to promote self-employment in the aquatic sector.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the scope, classification, and value chain of aquatic-based enterprises.	U	C	Seminar, Internal Examination
CO2	Identify and evaluate small-scale aquaculture opportunities and site selection criteria.	Ap	P	Assignment, End Semester Examination
CO3	Demonstrate basic knowledge of post-harvest practices and value addition techniques in fisheries.	U	F	Internal Examination, Practical
CO4	Apply entrepreneurship principles in planning and managing aquatic enterprises.	Ap	P	Business Plan Report, Seminar
CO5	Develop marketing and digital promotion strategies for aquatic products.	C	M	Market Research Report, Presentation
CO6	Analyze challenges and case studies of successful aquatic enterprises, and use accounting and cooperative models effectively.	An	C	Case Study, End Semester Examination
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	OVERVIEW OF AQUATIC ENTERPRISES		10	15
	1	Introduction to aquatic-based livelihoods	2	
	2	Scope and significance of aquatic enterprises in rural economies	2	
	3	Classification of aquatic enterprises: capture-based, culture-based, and allied sectors	2	
	4	Value chain in aquatic products	2	
	5	Government schemes and support systems for small-scale aquatic enterprises	2	
II	SMALL-SCALE AQUACULTURE OPPORTUNITIES		12	15
	6	Site selection and design for small-scale aquaculture	2	
	7	Ornamental fish culture as a small enterprise	2	
	8	Integrated fish farming (duck-cum-fish, poultry-cum-fish, pig-cum-fish, etc.)	3	
	9	Recirculating Aquaculture Systems (RAS) and Biofloc: potential and limitations	3	
	10	Cage and pen culture in inland waters	2	
III	POST-HARVEST AND VALUE-ADDED OPPORTUNITIES		12	20
	11	Basics of fish preservation and processing	3	
	12	Small-scale units for fish drying, salting, smoking, and pickling	3	
	13	Ready-to-cook and ready-to-eat fish products	2	
	14	Packaging and branding for local and niche markets	2	
	15	Hygienic handling and food safety standards for small processors	2	
IV	ENTREPRENEURSHIP AND BUSINESS MANAGEMENT		14	20
	16	Principles of small business management	2	
	17	Cost estimation and financial planning for micro-enterprises	2	

	18	Marketing strategies and direct-to-consumer models	2	
	19	Basics of e-commerce and digital promotion for aquatic products	2	
	20	Role of cooperatives and self-help groups (SHGs) in enterprise development	2	
	21	Record keeping and simple accounting methods	2	
	22	Challenges and success stories in small-scale aquatic enterprises	2	
V	OPEN ENDED MODULE		12	
	1	Development of an aquatic business plan		
	2	Aquarium setting and Maintenance		
	3	Case study and report on small scale aquatic enterprises		
	4	Market research on aquapreneurship		
	4	Field visit to small scale aquatic industries		

References:

1. Jhingran, V. G. (1991). *Fish and Fisheries of India* (3rd ed.). Hindustan Publishing Corporation.
2. Pillay, T. V. R., & Kutty, M. N. (2005). *Aquaculture: Principles and Practices* (2nd ed.). Blackwell Publishing.
3. Rath, R. K. (2018). *Textbook of Freshwater Aquaculture*. PHI Learning Pvt. Ltd.
4. Gopakumar, K. (2009). *Textbook of Fish Processing Technology*. ICAR-Central Institute of Fisheries Technology.
5. Santhosh, B., & Singh, N. P. (2007). *Guidelines for Water Quality Management for Fish Culture in Tripura*. ICAR Research Complex for NEH Region, Tripura Center.
6. Balachandran, K. K. (2001). *Post-Harvest Technology of Fish and Fish Products*. Daya Publishing House.
7. Pandey, R. K., & Shukla, J. P. (2005). *Fishery Science and Indian Fisheries*. Rastogi Publications.
8. Ghosh, S. (2013). *Integrated Fish Farming in India*. Daya Publishing House.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	2	1	3	2	2	2	2	1	2	2	2
CO 2	1	3	2	1	3	3	2	1	3	2	1	3	2
CO 3	2	3	3	2	3	2	2	2	3	2	2	3	3
CO 4	3	3	2	2	2	3	2	2	3	3	3	2	3
CO 5	3	2	3	3	2	2	1	2	2	3	3	2	3
CO 6	2	3	3	2	2	3	2	3	2	3	2	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	--	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	✓	--	✓
CO 5	✓	✓	--	✓
CO 6	--	✓	✓	✓

Course Code & Title	FPY2MN101	ORNAMENTAL FISH CULTURE: TECHNIQUES AND TRADE			
Type of Course	MINOR	Semester	II	Academic Level	100-199
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	▪ Interest in entrepreneurship or self-employment in the aquatic sector				
Course Summary	This course introduces ornamental fish culture with emphasis on species identification, breeding methods, aquarium management, and fish health. It covers trade trends, export potential, and enterprise development strategies. Practical modules focus on aquarium setup, breeding demonstrations, and business plan preparation for ornamental fish enterprises.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe the scope, trade, and policy framework of ornamental fisheries.	U	C	Assignment, Internal Examination
CO2	Identify and differentiate major ornamental fish species and breeding methods.	Ap	F	Seminar, Practical, End Semester Exam
CO3	Demonstrate breeding, larval rearing, and broodstock management techniques.	Ap	P	Assignment, Practical
CO4	Maintain aquaria and manage water quality, nutrition, and fish health.	Ap	P	Practical, Internal Exam
CO5	Evaluate business aspects, marketing strategies, and enterprise planning in ornamental fisheries.	E	M	Presentation, Business Plan Report
CO6	Prepare a plan for setting up a small-scale ornamental fish unit.	C	P	Assignment, Practical, Project Report
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO ORNAMENTAL FISHERIES		10	15
	1	Definition and scope of ornamental fish culture	2	
	2	Global and Indian scenario of ornamental fish trade	2	
	3	Major freshwater and marine ornamental fish species	2	
	4	Importance of ornamental fisheries in livelihood and exports	2	
	5	Government policies, schemes, and support for ornamental fisheries	2	
II	CULTURE AND BREEDING TECHNIQUES		14	15
	6	Broodstock selection and management	2	
	7	Breeding techniques of common ornamental fishes (e.g., guppy, molly, goldfish, betta)	3	
	8	Livebearers vs. egg layers – breeding differences	2	
	9	Larval rearing and fry management	2	
	10	Use of hormones and controlled breeding methods	3	
	11	Ornamental shrimp and snail culture basics	2	
III	AQUARIUM MANAGEMENT AND HEALTH		14	20
	12	Types of aquaria: glass, acrylic, planted, biotope	2	
	13	Aquarium setup: substrate, filtration, aeration, lighting	2	
	14	Water quality management in aquaria	3	
	15	Fish nutrition and feeding schedules	3	
	16	Common diseases in ornamental fish and treatment	2	
	17	Biosecurity and quarantine practices	2	
IV	MARKETING, TRADE AND ENTERPRISE DEVELOPMENT		10	20
	18	Value chain in ornamental fish trade	2	
	19	Role of cooperatives and private sector in trade	2	
	20	Export potential and certification requirements	2	

	21	Online and retail marketing strategies	2	
	22	Economics of small-scale ornamental fish enterprise	2	
V	OPEN ENDED MODULE		12	
	1	Setting up and managing different types of aquaria		
	2	Identification of ornamental fish species and classification		
	3	Breeding demonstration of livebearers and egg layers		
	4	Water quality testing and filtration setup		
	5	Preparation of a small-scale ornamental fish business plan		

References:

1. Ghosh, A., Mahapatra, B. K., & Datta, N. C. (2013). *Ornamental Fish Culture and Trade*.
2. Swain, S. K., Das, B. K., & Sahu, A. K. (2010). *Ornamental Fish Culture and Aquarium Management*.
3. Jayaram, K. C. (1999). *The Freshwater Fishes of the Indian Region*.
4. Santhosh, B., & Singh, N. P. (2007). *Ornamental Fish Farming – Successful Small Scale Aqua Business in India*. ICAR-NEH Region.
5. Armugam, N. (2005). *Breeding and Rearing of Ornamental Fishes*.
6. Talwar, P. K., & Jhingran, A. G. (1991). *Inland Fishes of India and Adjacent Countries* (Vol. 1 & 2).
7. Jhingran, V. G. (1991). *Fish and Fisheries of India* (3rd ed.).
8. Basavaraja, N. (2012). *Ornamental Fish Production and Management*.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	3	2	2	2	2	2	2	2	2	2	3
CO 2	2	3	2	2	3	3	2	1	3	2	2	3	2
CO 3	2	3	2	1	3	2	2	1	3	2	2	3	2
CO 4	2	3	2	2	3	3	3	2	3	2	2	3	2
CO 5	3	2	3	3	2	2	1	2	2	3	3	2	3
CO 6	3	3	3	2	2	3	2	2	3	3	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	--	✓	✓
CO 5	✓	✓	--	✓
CO 6	✓	✓	--	✓

Course Code & Title	FPY3MN201	EDIBLE FISH CULTURE SYSTEMS AND MANAGEMENT			
Type of Course	MINOR	Semester	III	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	▪ Interest in entrepreneurship or self-employment in the aquatic sector				
Course Summary	This course introduces the scientific, technical, and economic aspects of edible fish culture systems. It covers system classification, species selection, pond and tank design, feeding and health management, harvesting, and sustainability practices. Students learn to evaluate cost-benefit, regulatory frameworks, and post-harvest handling, with hands-on exposure to farm visits and project planning.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Explain the scope, classification, and importance of edible fish culture systems.	U	C	Assignment, Internal Exam
CO2	Describe the design, components, and operation of different fish culture systems.	U	P	Seminar, Internal Exam
CO3	Apply knowledge of feeding, stocking, and health management in fish farming.	Ap	P	Assignment, Practical
CO4	Analyze the sustainability, environmental impacts, and economics of edible fish farming systems.	An	M	Case Study, End Semester Exam
CO5	Evaluate post-harvest techniques, market linkages, and value addition in edible fish production.	E	P	Seminar, Assignme
CO6	Design and present a basic plan for an edible fish farming unit.	C	P	Project Work, Practical, End Semester Exam
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	INTRODUCTION TO EDIBLE FISH CULTURE SYSTEMS		10	15
	1	Importance and scope of edible fish culture in food security and livelihoods	2	
	2	Classification of edible fish based on habitat, feeding habits, and market demand	2	
	3	Overview of freshwater, brackishwater, and marine fish culture systems	2	
	4	Comparative analysis of traditional and modern aquaculture practices	2	
	5	Species selection criteria for edible fish culture (carps, tilapia, catfish, murrel, etc.)	2	
II	CULTURE SYSTEM DESIGN AND OPERATION		12	15
	6	Pond construction, layout, and preparation for fish farming	2	
	7	Cage and pen culture systems: structure, installation, and management	3	
	8	Tank-based systems: cement tanks, RAS, and biofloc technologies	3	
	9	Water quality parameters and management in different culture systems	2	
	10	Aeration systems, filtration, and circulation technologies	2	
III	FEEDING, STOCKING, AND HEALTH MANAGEMENT		12	20
	11	Seed sourcing, transport, and stocking densities for edible fish species	2	
	12	Nutritional requirements and formulation of feed for various stages	3	
	13	Feeding strategies and feed management in different systems	2	
	14	Disease diagnosis, prevention, and treatment in fish culture	3	
	15	Use of probiotics, immunostimulants, and biosecurity measures	2	
IV	HARVESTING, ECONOMICS, AND SUSTAINABILITY		14	20
	16	Harvesting techniques and post-harvest handling of edible fish	2	

	17	Yield estimation and quality assessment	2	
	18	Cost-benefit analysis of different culture systems	2	
	19	Environmental impacts and sustainable practices in fish farming	2	
	20	Legal regulations and licensing requirements for fish culture	2	
	21	Value addition and marketing of edible fish	2	
	22	Case studies on successful edible fish farming models	2	
V	OPEN ENDED MODULE		12	
	1	Survey and identification of edible fish species used in local aquaculture		
	2	Pond preparation and water quality testing exercises		
	3	Feed preparation and feeding trial observation		
	4	Fish sampling, growth monitoring, and health inspection		
	5	Visit to commercial edible fish farms		

References:

1. Jhingran, V. G. (1991). Fish and Fisheries of India (3rd ed.).
2. Pillay, T. V. R., & Kutty, M. N. (2005). Aquaculture: Principles and Practices (2nd ed.).
3. Rath, R. K. (2011). Freshwater Aquaculture.
4. Gopakumar, K. (2009). Textbook of Fish Processing Technology.
5. Santhosh, B., & Singh, N. P. (2007). Guidelines for Water Quality Management in Aquaculture. ICAR-NEH Region.
6. Balachandran, K. K. (2001). Post-Harvest Technology of Fish and Fish Products.
7. Ayyappan, S., & Jena, J. K. (2003). Grow-Out Production of Carps in India. NRCCWF (ICAR).
8. Sharma, A., & Chakraborty, S. K. (2015). Aquaculture Engineering.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	3	2	3	2	3	2	2	2	2	2	3
CO 2	2	3	2	2	3	3	2	1	3	2	2	3	2
CO 3	2	3	2	2	3	3	2	2	3	2	2	3	2
CO 4	2	3	2	2	2	3	3	2	2	3	2	3	2
CO 5	2	2	3	3	2	2	2	2	3	3	2	2	3
CO 6	3	3	3	2	2	3	2	2	3	3	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	--	✓	✓
CO 5	✓	✓	--	✓
CO 6	✓	✓	--	✓

Course Code & Title	FPY3MN202	INTEGRATED AQUATIC FARMING SYSTEMS AND PRACTICES			
Type of Course	MINOR	Semester	III	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> Interest in entrepreneurship or self-employment in the aquatic sector 				
Course Summary	<p>This course introduces integrated aquatic farming systems that combine fish culture with crops and livestock to optimize resource use and productivity. It covers historical development, system models, aquaponics, biofloc, and RAS integration. Learners explore farm planning, sustainability, economics, and health management. Practical modules include system design, water quality monitoring, and visits to integrated farms.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe the principles, components, and historical perspectives of integrated aquatic farming systems.	U	C	Assignment, Internal Examination
CO2	Differentiate between models of integrated farming systems and evaluate their applicability.	An	C	Seminar, Internal Examination
CO3	Demonstrate knowledge of aquaponics, biofloc, and RAS integration in farming.	Ap	P	Assignment, Practical
CO4	Plan and manage system layout, nutrient cycling, and species integration.	Ap	P	Assignment, End Semester Examination
CO5	Evaluate environmental, economic, and sustainability aspects of integrated systems.	E	M	Seminar, Case Study, End Semester Exam
CO6	Design a basic integrated aquatic farming model with compatible species and system components.	C	P	Practical, Project Work
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FUNDAMENTALS OF INTEGRATED AQUATIC FARMING		12	15
	1	Definition, principles, and objectives of integrated aquatic farming systems	2	
	2	Historical evolution and global perspectives of integrated aquaculture	2	
	3	Benefits and limitations of integrated systems in food production	2	
	4	Components of integrated farming: fish, livestock, crops, water	2	
	5	Role in climate resilience, sustainability, and rural development	2	
	6	Comparison between monoculture and integrated systems	2	
II	TYPES AND MODELS OF INTEGRATED AQUATIC FARMING		12	15
	7	Livestock and Crop-Based Integrated Fish Farming Systems	2	
	8	Horticulture and vegetable integration with fish culture	3	
	9	Aquaponics systems: types (media-based, NFT, DWC) and working principles	3	
	10	Biofloc technology: concept, design, and suitability for integration	2	
	11	Recirculating Aquaculture Systems (RAS) in integrated setups	2	
III	SYSTEM DESIGN AND OPERATION MANAGEMENT		14	20
	12	Layout and infrastructure planning for integrated farms	2	
	13	Water use efficiency and recycling in integrated systems	2	
	14	Manure management and nutrient flow between components	3	
	15	Species selection for fish and co-components (crops/livestock)	3	
	16	Feeding strategies and input optimization	2	
	17	Disease control and health management in integrated setups	2	

IV	ECONOMICS, POLICY, AND SUSTAINABILITY		10	20
	18	Cost-benefit analysis of different integrated farming systems	2	
	19	Government schemes for integrated and sustainable farming systems	2	
	20	Environmental impact and sustainability assessment	2	
	21	Market linkages and value chain development for integrated farm products	2	
	22	Risk assessment and mitigation strategies in integrated farming enterprises	2	
V	OPEN ENDED MODULE		12	
	1	Design and demonstration of an integrated farm model		
	2	Water quality monitoring in multi-component systems		
	3	Identification and matching of compatible fish, crop, and livestock species		
	4	Demonstration of a basic aquaponics unit or biofloc system		
	4	Field visit to a commercial integrated aquatic farming or aquaponics setup		

References:

1. Ayyappan, S. (2006). Handbook of Fisheries and Aquaculture.
2. Pillay, T. V. R., & Kutty, M. N. (2005). Aquaculture: Principles and Practices (2nd ed.).
3. Ghosh, A. (2013). Integrated Fish Farming in India.
4. Saha, G. S. (2018). Aquaponics and Hydroponics: Integrated Systems for Sustainable Agriculture.
5. Jhingran, V. G. (1991). Fish and Fisheries of India (3rd ed.).
6. Santhosh, B., & Singh, N. P. (2007). Guidelines for Water Quality Management in Aquaculture.
7. Yadav, B. K. (2019). Biofloc Technology in Aquaculture.
8. Devi, R., & Singh, H. (2020). Innovative Aquaculture Systems: RAS, Biofloc, and Aquaponics.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	2	1	1	1	0	3	2	2	1	1	1	0
CO 2	1	2	2	1	2	1	2	3	2	1	2	2	1
CO 3	1	3	2	2	2	1	3	2	2	1	3	2	2
CO 4	1	3	2	2	2	1	3	2	2	1	3	2	2
CO 5	2	2	3	2	1	2	2	3	3	2	2	3	3
CO 6	3	3	3	2	2	2	3	3	3	2	3	3	3

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	--	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	✓	✓

Course Code & Title	FPY4MN201	AQUAFEED TECHNOLOGY AND NUTRITION MANAGEMENT FOR STARTUPS			
Type of Course	MINOR	Semester	IV	Academic Level	200-299
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	▪ Interest in entrepreneurship or self-employment in the aquatic sector				
Course Summary	This course provides foundational knowledge in the nutrition and feeding of finfish and shellfish. Students will learn about dietary requirements, feed formulation techniques, feed types, processing, quality control, and sustainability in aquafeed production. Emphasis is given to practical approaches, low-cost technologies, live feed culture, and small-scale feed enterprise development to promote self-reliance and innovation in aquaculture nutrition.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the nutritional requirements and feeding behavior of fish and shrimp.	U	C	Internal Exam, Assignment
CO2	Identify feed ingredients and apply basic feed formulation techniques.	Ap	P	Assignment, Practical, Internal Exam
CO3	Differentiate feed types and assess feed processing methods and quality control measures.	An	P	Seminar Presentation, End Semester Exam
CO4	Develop small-scale aquafeed production techniques using local and low-cost ingredients.	C	P	Practical, Assignment, Open-Ended Module
CO5	Evaluate economic, environmental, and marketing aspects of sustainable aquafeed production.	E	C	Internal Exam, Seminar, End Semester Exam
CO6	Design and operate basic live feed and pellet feed systems for aquaculture enterprises.	C	P	Practical, Assignment, Field Visit
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FUNDAMENTALS OF FISH AND SHRIMP NUTRITION		10	15
	1	Nutritional requirements of finfish and shellfish (protein, fat, vitamins, minerals)	2	
	2	Feeding behavior and digestibility in different species	2	
	3	Growth stages and corresponding feed needs (hatchery, nursery, grow-out)	2	
	4	Differences in feed formulation for fish vs shrimp	2	
	5	Role of feed in health and immunity	2	
II	FEED FORMULATION AND PRODUCTION TECHNIQUES		14	15
	6	Basics of feed formulation and ration balancing	2	
	7	Selection and nutritional evaluation of feed ingredients (plant, animal, mineral sources)	2	
	8	Additives and binders used in aquafeeds	3	
	9	Small-scale pellet preparation techniques (floating and sinking feeds)	2	
	10	Use of software tools and manual methods for formulation	2	
	11	Alternative and low-cost feed ingredients in rural aquaculture	3	
III	FEED TYPES AND QUALITY MAINTENANCE		14	20
	12	Types of feed: dry, moist, semi-moist, microdiet	2	
	13	Feed processing technologies: grinding, mixing, pelleting, extrusion	3	
	14	Feed plant setup: layout, equipment, and operational management	3	
	15	Packaging, labeling, and storage of fish feed	2	
	16	Feed quality control and standard testing protocols	2	
	17	Live feed culture: types (Artemia, Moina, Daphnia, algae) and production methods	2	
IV	SUSTAINABLE MARKETING AND GOVERNANCE IN AQUAFEED PRODUCTION		10	20

	18	Economics of small-scale aquafeed units	2	
	19	Marketing packaged feeds for backyard, ornamental, and smallholder aquaculture	2	
	20	Branding, value addition, and customer engagement	2	
	21	Environmental impacts of feed use in aquaculture and mitigation measures	2	
	22	Government schemes, standards, and certification in aquafeed production	2	
V	OPEN ENDED MODULE		12	
	1	Ingredient identification and proximate analysis		
	2	Formulation of simple feed recipes using local resources		
	3	Demonstration of pellet preparation and feed drying techniques		
	4	Feed production using fish and shellfish waste		
	5	Setting up and operating a small-scale live feed culture unit		

References:

1. De Silva, S.S. & Anderson, T.A. (1995). Fish Nutrition in Aquaculture.
2. Halver, J.E., & Hardy, R.W. (2002). Fish Nutrition (3rd ed.).
3. Tacon, A.G.J. (1987). The Nutrition and Feeding of Farmed Fish and Shrimp: A Training Manual. FAO.
4. Bhosale, S.V. (2021). Principles of Fish Nutrition and Feed Technology. Agrotech Publishing Academy.
5. Ayyappan, S. et al. (2011). Handbook of Fisheries and Aquaculture.
6. FAO (2018). Aquaculture Feed and Fertilizer Resources Information System (AFFRIS).
7. Webster, C.D., & Lim, C. (2002). Nutrient Requirements and Feeding of Finfish for Aquaculture.
8. Swain, P. & Nayak, S.K. (2012). Aquafeed Formulation and Feed Management.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	3	2	1	0	0	3	2	0	0	2	0	0
CO 2	2	3	2	1	0	0	3	2	1	0	3	2	3
CO 3	2	3	3	2	0	0	3	3	1	0	3	0	0
CO 4	1	3	2	2	1	0	3	2	0	1	2	2	1
CO 5	2	3	2	2	2	0	2	3	2	2	2	2	0
CO 6	2	3	3	3	2	1	3	2	1	0	3	3	2

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	--	✓	✓
CO 3	✓	--	✓	✓
CO 4	✓	✓	--	✓
CO 5	✓	✓	--	✓
CO 6	--	✓	✓	✓

Course Code & Title	FPY5MN301	MARKETING AND INSTITUTIONAL SUPPORT FOR AQUATIC VENTURES			
Type of Course	MINOR	Semester	V	Academic Level	300-399
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	--	--	60
Pre-requisites	<ul style="list-style-type: none"> Interest in entrepreneurship or self-employment in the aquatic sector 				
Course Summary	<p>This course introduces the principles of marketing with a focus on aquatic products, covering consumer trends, pricing, branding, and digital marketing. It explores distribution channels, institutional support systems, and export policies. Through hands-on activities and exposure visits, students will develop practical skills in market research, business planning, and sustainable promotion strategies tailored to the fisheries and aquaculture sectors.</p>				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the principles of marketing and their relevance to aquatic products.	U	C	Assignment, Internal Exam
CO2	Identify market trends, pricing strategies, and consumer preferences in the aquatic sector.	An	C	Assignment, Internal Exam, End Sem Exam
CO3	Explore and evaluate various market access models and promotion strategies.	E	P	Assignment, Seminar, End Sem Exam
CO4	Analyze institutional support systems and policy frameworks for fish marketing and export.	An	F	Internal Exam, End Sem Exam
CO5	Demonstrate business planning, traceability, and record-keeping skills for sustainable marketing.	Ap	P	Assignment, Presentation, End Sem Exam
CO6	Create a digital marketing strategy or market survey report for an aquatic product.	C	M	Seminar, Presentation, End Sem Exam
<p>* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)</p>				

Detailed Syllabus:

Module	Unit	Content	Hours	Marks
I	FUNDAMENTALS OF MARKETING IN AQUATIC SECTORS		12	15
	1	Introduction to marketing principles and the marketing mix (4Ps)	2	
	2	Characteristics of aquatic products and their market behavior	2	
	3	Consumer preferences and demand trends in seafood markets	2	
	4	Pricing strategies for fresh, processed, and value-added aquatic products	2	
	5	Distribution channels in domestic and export markets	2	
	6	Branding and packaging of aquatic products	2	
II	MARKET ACCESS AND PROMOTION STRATEGIES		12	15
	7	Direct marketing models: farmer markets, retail outlets, online sales	2	
	8	Cooperative marketing and fishers' producer organizations (FPOs)	2	
	9	Role of middlemen and market intermediaries	2	
	10	E-commerce platforms and digital marketing of aquatic products	2	
	11	Use of ICT and mobile applications in fish marketing	2	
	12	Participation in trade fairs, exhibitions, and expos	2	
III	INSTITUTIONAL ECOSYSTEM AND POLICY FRAMEWORK		15	20
	13	Role of government bodies (MPEDA, NFDB, FISHFED, NABARD, etc.)	2	
	14	Overview of subsidies and financial assistance schemes	2	
	15	Export promotion policies and certifications (EIC, FSSAI, etc.)	3	
	16	Role of Self-Help Groups (SHGs), cooperatives, and NGOs	3	
	17	Public-private partnerships in market infrastructure development	2	
	18	Policies and regulations related to fish marketing and trade	3	

IV	SUSTAINABLE AQUATIC BUSINESS DEVELOPMENT		9	20
	19	Business planning and feasibility assessment for aquatic ventures	2	
	20	Risk management and insurance in aquatic product marketing	3	
	21	Value chain development and traceability systems	2	
	22	Financial literacy and record-keeping for small aquatic businesses	2	
V	OPEN ENDED MODULE		12	
	1	Development of a marketing plan for an aquatic product		
	2	Survey of local fish markets and retail channels		
	3	Visit to a cooperative/fish processing/export unit		
	4	Preparation and presentation of a digital promotion strategy		
	5	Interaction with stakeholders from MPEDA/NFDB/cooperatives		

References:

1. Kotler, P., Keller, K.L. (2017). Marketing Management.
2. Saxena, R. (2010). Marketing Management.
3. Badi, R.V. & Badi, N.V. (2013). Rural Marketing.
4. Cundiff, E.W., Still, R.R., & Govoni, N.A.P. (2004). Fundamentals of Modern Marketing.
5. Sontakki, C.N. (2011). Marketing Management.
6. Jha, S.M. (2010). Services Marketing.
7. Mahapatra, A.K. (2014). Fisheries Extension and Economics.
8. Srivastava, U.K., Shah, P., & Dubey, S. (2009). Agribusiness and Food Processing Management.

Mapping of CO's with : PSOs AND POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	2	2	2	0	0	3	2	1	1	2	2	0
CO 2	3	3	2	2	1	0	3	3	2	1	3	2	0
CO 3	2	3	3	2	1	0	2	3	2	2	3	2	0
CO 4	2	2	2	2	0	0	2	2	3	2	2	2	1
CO 5	2	3	2	3	1	1	3	2	2	2	3	3	2
CO 6	3	2	3	3	1	1	2	2	2	3	2	3	2

Assessment Rubrics:

- Assignment
- Seminar Presentation
- Internal Examination
- End Semester Examination

Mapping of CO's to Assessment Rubrics:

	Assignment	Seminar Presentation	Internal Examination	End Semester Examination
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓
CO 5	✓	✓	✓	✓
CO 6	✓	✓	✓	✓

22. MODEL QUESTION PAPERS

Format of the Question Papers – Type I (Foundation Courses)

I Semester B. Voc. Degree Examinations – October 2025
FPY1FS101:FISH PRODUCT DEVELOPMENT AND MARKETING
(Credits: 3)

Maximum Time: 1:30 Hours

Maximum Marks: 50

Course Outcomes (COs)

Co #	CO Statement
CO1	Understand the basic use of fish and shellfish in making products.
CO2	Recognize different types of fish products and how they are made.
CO3	Learn how to pack and store fish products safely and for longer use.
CO4	Know how to check product quality and follow food safety rules.
CO5	Learn how to study the market and promote fish products.
CO6	Create new fish product ideas and understand how to start a small fish-based business.

Section A

[Answer all questions. Each question carries 2 marks] [Ceiling: 16 Marks]

1. Define the term *value-added fish products*. [CO1]
2. List two important nutritional benefits of fish meat. [CO1]
3. What are the common additives used in fish product development? [CO2]
4. Mention any two types of *Ready-to-Cook* (RTC) fish products. [CO2]
5. What is vacuum packaging? How is it useful in fish preservation? [CO3]
6. Write a note on the importance of shelf-life studies. [CO3]
7. What is sensory evaluation in fish products? [CO4]
8. State any two roles of FSSAI in fish product regulation. [CO4]
9. What is meant by branding in the seafood industry? [CO5]
10. Name any two digital marketing tools used in fish product promotion. [CO5]

Section B

[Answer all questions. Each question carries 6marks] [Ceiling:24 Marks]

11. Explain the stages in the new product development (NPD) cycle. [CO1]
12. Describe the processing methods involved in making fermented or cured fishery products. [CO2]
13. Discuss modified atmosphere packaging (MAP) and its application in seafood. [CO3]
14. Describe the role of HACCP and ISO in seafood quality assurance. [CO4]
15. Discuss the importance of market analysis and pricing strategies for fish products. [CO5]

Section C

[Answer any One. Each question carries 10 marks]

16. Develop a new fish product idea and explain how you would turn it into a successful small business. Include formulation, cost estimation, and market strategy. [CO6]
17. Present a case study analysis of a successful seafood entrepreneur. What lessons can you apply from this case to your own venture? [CO6]

Format of the Question Papers – Type II (Major Courses)
I Semester B. Voc. Degree Examinations – October 2025
FPY1CJ101: HARVESTING AND ONBOARD HANDLING OF FISH
(Credits: 4)

Maximum Time: 2 Hours

Maximum Marks: 60

Course Outcomes (COs)

Co #	CO Statement
CO1	Course Outcome Statement 1 Identify and differentiate between various fish harvesting methods and fishing gears used in marine and inland fisheries.
CO2	Explain the operational procedures of fish harvesting and evaluate their impact on catch quality and sustainability.
CO3	Demonstrate hygienic onboard handling techniques including sorting, bleeding, washing, and gutting of fish.
CO4	Apply appropriate onboard preservation methods such as chilling and freezing to maintain fish freshness.
CO5	Recognize and adhere to hygiene, sanitation, and safety standards required for onboard fish handling as per national regulations.
CO6	Conduct basic quality assessment and maintain onboard handling protocols for different types of aquatic species.

Section A

[Answer all questions. Each question carries 2 marks] [Ceiling: 20 Marks]

1. Differentiate between active and passive fishing methods. [CO1]
2. Name two commonly used fishing gears in inland fisheries. [CO1]
3. Mention one advantage each of mechanized and traditional fishing vessels. [CO1]
4. What is bycatch? How does it affect sustainability? [CO2]
5. List two species-specific harvesting techniques used in marine fishing. [CO2]
6. What is the significance of stress during fish capture? [CO2]
7. List the steps involved in onboard handling of fish immediately after catch. [CO3]
8. Why is potable water important for fish handling on board? [CO3]
9. What is the recommended fish-to-ice ratio for effective chilling? [CO4]
10. List two signs of spoilage observed in freshly caught fish. [CO4]
11. Mention two hygiene practices followed by crew members on fishing vessels. [CO5]
12. Name two Indian regulatory bodies involved in monitoring onboard fish handling. [CO5]

Section B

[Answer all questions. Each question carries 6 marks] [Ceiling: 30 Marks]

13. Explain the operational differences between trawl and gill net fishing methods. [CO1]
14. Describe the species-specific harvesting techniques used for shrimp and tuna. [CO2]
15. Explain the importance of onboard sorting, bleeding, washing, and gutting of fish. [CO3]

16. Discuss the types of ice used in onboard chilling and its importance in preserving quality. [CO4]
17. Explain the HACCP guidelines for hygiene on fishing vessels. [CO5]
18. Describe the quality assessment indicators used for evaluating freshly caught fish. [CO6]

Section C

[Answer any one. Each question carries 10 marks]

19. Write a detailed account of sustainable fishing practices and reduction of bycatch, including current trends and technologies. [CO2]
20. Design an onboard fish handling protocol for a small mechanized fishing vessel targeting sardines. Include preservation, hygiene, and safety standards. [CO6]

Format of the Question Papers – Type III (Minor Courses)
I Semester B. Voc. Degree Examinations – October 2025
FPY1MN101: INTRODUCTION TO AQUATIC VENTURE OPPORTUNITIES

(Credits: 4)

Maximum Time: 2 Hours

Maximum Marks: 70

Course Outcomes (COs)

Co #	CO Statement
CO1	Understand the scope, classification, and value chain of aquatic-based enterprises.
CO2	Identify and evaluate small-scale aquaculture opportunities and site selection criteria.
CO3	Demonstrate basic knowledge of post-harvest practices and value addition techniques in fisheries.
CO4	Apply entrepreneurship principles in planning and managing aquatic enterprises.
CO5	Develop marketing and digital promotion strategies for aquatic products.
CO6	Analyze challenges and case studies of successful aquatic enterprises, and use accounting and cooperative models effectively.

Section A

[Answer all questions. Each question carries 3 marks] [Ceiling: 24 Marks]

1. List any three key stakeholders in the Indian seafood industry. [CO1]
2. Briefly describe the role of aquaculture in supporting coastal livelihoods. [CO1]
3. Mention any three features of modern seafood business models. [CO2]
4. What are the advantages of seafood e-commerce platforms? [CO2]
5. List the entrepreneurial traits essential for a coastal startup. [CO3]
6. Mention three components of a feasibility study for a seafood venture. [CO4]
7. What are the objectives of the PMFME or MUDRA scheme? [CO4]
8. Define traceability in the seafood supply chain. Why is it important? [CO5]
9. What is the Blue Economy? Give one example related to fisheries. [CO5]
10. List any three innovative seafood business ideas for local entrepreneurs. [CO6]

Section B

[Answer all questions. Each question carries 6 marks] [Ceiling: 36 Marks]

11. Explain the value chain of the seafood business and its importance in the industry. [CO1]
12. Compare traditional and modern seafood retail business models with examples. [CO2]
13. Describe the contract farming and cluster-based models in aquaculture. [CO2]
14. Discuss the steps to identify a viable seafood-based entrepreneurial opportunity in a coastal area. [CO3]
15. Write the key elements of a business plan for a mobile fish vending kiosk. [CO4]
16. Explain any two financial schemes that support seafood-based MSMEs in India. [CO4]
17. Discuss the importance of sustainability and responsible entrepreneurship in seafood

businesses. [CO5]

18. Describe how community engagement and gender equity can be promoted in coastal enterprises. [CO5]

Section C

[Answer any one. Each question carries 10 marks]

19. Design a seafood startup plan based on home-delivery and subscription services. Include business model, feasibility, funding, and marketing strategy. [CO6]
20. Develop an eco-friendly seafood processing unit plan focusing on waste management, food safety, and sustainable practices. [CO6]

APPENDICES

I FORMAT OF THE INTERNSHIP/ APPRENTICESHIP REPORT

FORMAT OF THE INTERNSHIP/ APPRENTICESHIP REPORT

1. **Title Page:**

- Title of the report, Name of the organization, Name of the intern, Duration of the internship, Date of submission.

2. **Certificate, Declaration and Acknowledgments:**

- Internship / Apprenticeship completion certificate from the organization
- Include a declaration stating that the internship/ Apprenticeship report is original work and has not been submitted elsewhere.
- Express gratitude.

3. **Table of Contents:**

- Provide a list of sections and subsections with corresponding page numbers

4. **Introduction:**

- Introduce the organization where the internship/ Apprenticeship was conducted, including its background, mission, products/services, industry sector, and any other relevant information.
- State the objectives of the internship/ Apprenticeship report.

5. **Description of the Organization:**

- Provide a detailed overview of the organization, its history, organizational structure, core functions, target market, competitors, and industry trends.
- Describe the department or division where the internship/ Apprenticeship was undertaken and its role within the organization.

6. **Internship / Apprenticeship Experience:**

- Describe the tasks, projects, and responsibilities undertaken during the internship/ Apprenticeship.
- Discuss the skills, knowledge, and competencies acquired or enhanced through practical experience.
- Provide examples of significant achievements, challenges faced, and how they were overcome.

7. **Learning Outcomes:**

- Reflect on the key learning and insights gained from the internship/ Apprenticeship experience.
- Discuss how the internship/ Apprenticeship contributed to personal and professional development, including skill development, industry knowledge, and career aspirations.

8. **Recommendations:**

- Offer recommendations for the organization based on observations and experiences during the internship/ Apprenticeship.
- Suggest areas for improvement, future opportunities, or strategies to enhance organizational effectiveness.

9. **Conclusion:** Summarize the main findings and outcomes of the internship/ Apprenticeship experience

10. **Appendices:**

11. Include any references, sources, or materials cited in the internship report.

II. FORMAT OF INTERNSHIP DAILY REPORT

INTERNSHIP DAILY RECORD	
Intern Name:	
Department/Division:	
Supervisor/Mentor:	
Objective/Task for the Day:	
Work Activities:	
Challenges Faced:	
Learning and Insights:	
Feedback and Comments:	
Signature:	
Signature of Mentor	
Date	

III FORMAT OF INTERNSHIP WEEKLY REPORT

INTERNSHIP WEEKLY REPORT	
Name of the Intern:	
Register Number:	
Department:	
Company Name:	
DATE	ACTIVITIES/ WORK DONE
Signature of Supervisor	

IV FORMAT OF INTERNSHIP CERTIFICATE


Certificate of Internship Completion	
<p>This is to certify that [Intern's Name] has successfully completed the internship program at [Organization Name] from [Start Date] to [End Date].</p>	
<p>During this period, [he/she] actively participated in [brief description of internship responsibilities and projects], demonstrating [list of skills developed] and achieving [mention any notable achievements].</p>	
[Signature]	
[Name and Title of Signatory]	
Signature and Name of Faculty in Charge Signature of HoD	
Date	

V FORMAT OF OPTIONAL PROJECT REPORT

Sl.No	Content
1	Introduction 1.1 Background of the Study 1.2 Statement of the Problem 1.3 Relevance & Scope of the Study 1.4 Objectives of the Study
2	Review of Literature 2.1 An Overview of Earlier Studies 2.2 Uniqueness of Research Study
3	Methodology of the study 3.1 Research Approach and design 3.2 Sources of Data 3.3 Sampling Design – Reliability & Content Validity 3.4 Data Analysis Tools 3.5 Report Structure 3.6 Limitations of the Study
4	Data Analysis, Interpretation and Inference
5	Findings and Conclusion
6	Suggestions
7	Appendix Bibliography

VI FORMAT OF PRACTICAL RECORD WORK

FRONT SHEET

M.E.S. ASMABI COLLEGE P.VEMBALLUR, KODUNGALLUR – 680671	
	
DEPARTMENT OF FISH PROCESSING TECHNOLOGY	
PRACTICAL RECORD (COURSE NAME WITH CODE)	
<i>Name of the Student:</i>	
<i>Class Number:</i>	
<i>Register Number:</i> <i>Year:</i>	
<i>Certified that this a bonafide Record of Practical Work of</i>	
<i>Sri/ Smt.</i>	
<i>with Reg.No.</i> <i>in the year.</i>	
<i>Date:</i>	<i>Teacher in Charge</i>
<i>Submitted for the Practical Exam held in.</i>	
	<i>Signature of Examiner</i>
<i>Date:</i>	