



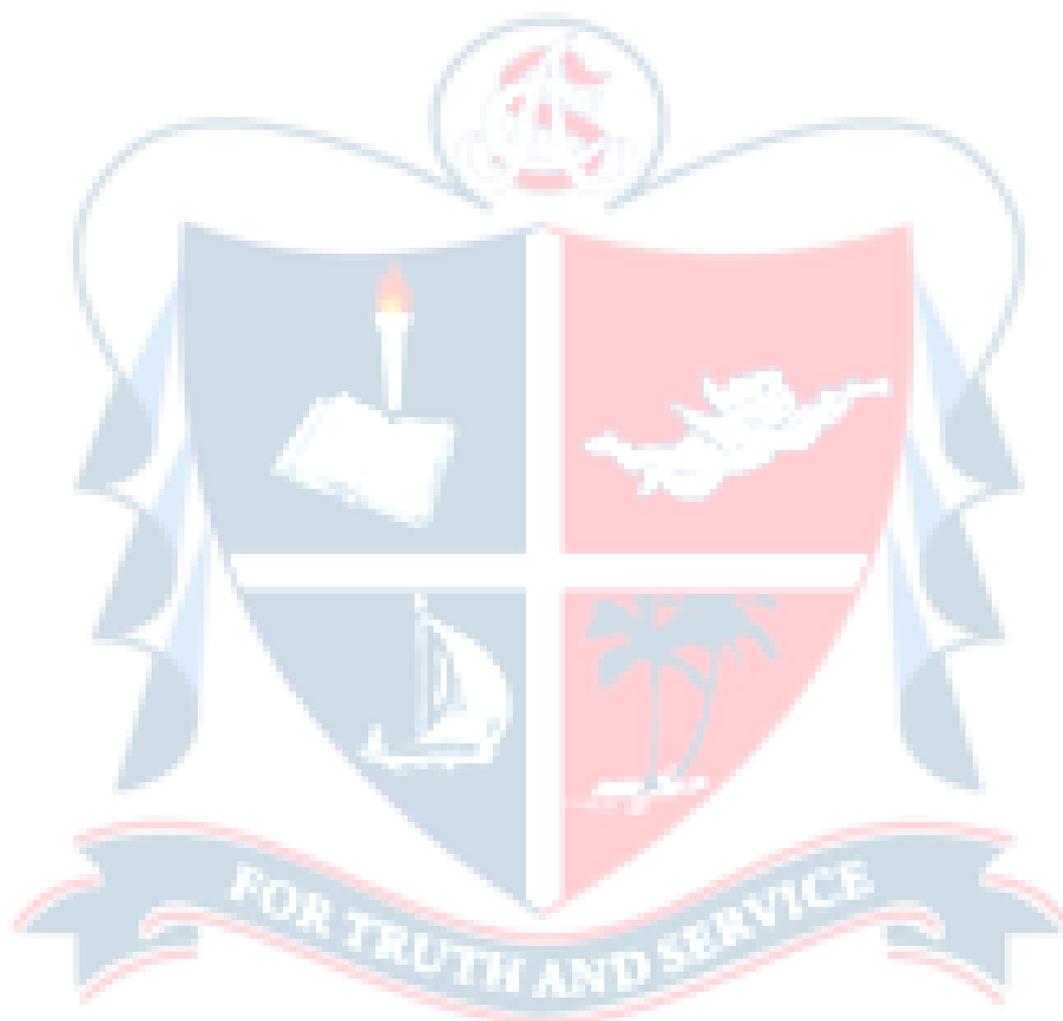
**ST. ALBERT'S COLLEGE (AUTONOMOUS)
ERNAKULAM**

Affiliated to Mahatma Gandhi University, Kottayam, Kerala

SYLLABUS FOR UNDERGRADUATE PROGRAMME

**BACHELOR OF SCIENCE (HONOURS) IN
INDUSTRIAL FISHERIES**

**SACA – UGP
(WITH EFFECT FROM 2024 ADMISSION)**



Syllabus of B.Sc. Industrial Fisheries

Proposed by the Board of Studies on 29th February 2024

Dr. Vibin M

Chairman, Board of Studies

Approved by the Academic Council on 14th March 2024

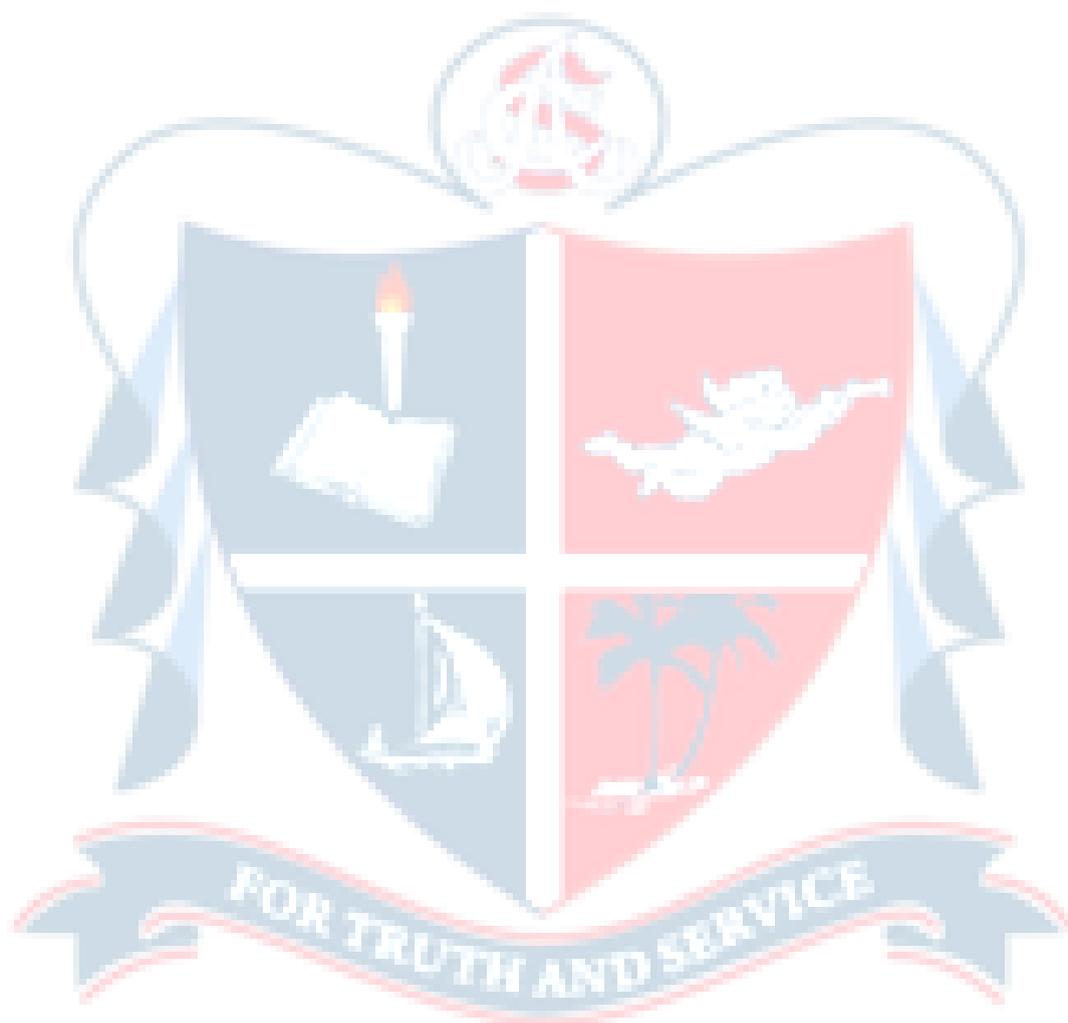
Dr. Bijoy V M, Principal

Chairman, Academic Council

Adopted by the Governing Council on 27th March 2024

Rev. Fr. Dr. Antony Thoppil

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ST. ALBERT'S COLLEGE (AUTONOMOUS), ERNAKULAM

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PREFACE

As envisaged in the recent regulations of Autonomous colleges in India by University Grants Commission, autonomous colleges enjoy the academic freedom to enrich the curriculum by incorporating recent trends and needs. Curriculum and syllabus of each academic program has to be revised periodically to impart major objectives like global competency, skill component, values and regional relevance. Academicians and scholars in the respective area of knowledge have to express a missionary zeal for this great purpose.

In 2016, when St. Albert's College was granted autonomy, we adopted the curriculum and syllabus followed by the Mahatma Gandhi University, Kottayam for the year 2016. In 2017, when the Mahatma Gandhi University made a comprehensive revision of their curriculum and syllabus, it was adopted by the college as it was a better curriculum that met the needs and current demands of the culture, the society, and the expectations of the population being served. However the Syllabus revision committee of the department studied the present curriculum in detail and proposed some reasonable changes for further enrichment which had been implemented from 2019 admission onwards.

Aquaculture has been an area of specialization in St. Albert's College (Autonomous) with the commencement of the degree programme in Aquaculture as a regular programme in 1995. Being a Model III programme of the Mahatma Gandhi University, second language is not mandatory. The three year degree programme is run under the CBCSS stream. This is the only degree program in Aquaculture under Mahatma Gandhi University presently offered by the Research Department of Fisheries and Aquaculture, St. Albert's College (Autonomous). The facilities of the department include a 1ha farm for the culture of fishes and shrimps, aquarium and hatchery complex for breeding and rearing of aquarium fishes and plants, Aquaculture lab for morphometric and anatomical studies of finfishes and shellfishes as well as analytical studies of fish pond water and soil, Microbiology Lab for isolation and identification of bacterial strains and Biochemistry lab for biochemical studies on fish samples. In addition the department has an instrumentation room and museum preserving samples of different species of fishes, shrimps, molluscs, cephalopods, seaweeds etc. The 50 seater aquaculture lab also serves as lab for fish processing technology and fishing gear technology. The Lab of the Conservation Research Group is located adjacent to the department and the faculty members are actively involved in the

research activities of the group through which the college was recognized in 2012 as one among the ten best colleges in the world undertaking conservation research aimed at conservation of endangered species on the IUCN Red list. In 2012 the Aquarium and Hatchery Complex of the department was the venue for the International Internship on “Empowerment through Aquaponics”, for the students of the University of Wisconsin, Madison USA. The students of Wisconsin along with the students of the department installed the first demonstrable aquaponics system in the state which led to the spread of this technology across the state and beyond. The closeness of the Vembanad Lake which is the largest brackishwater lake in the country as well as to the ocean and estuaries, allows fieldwork in these habitats to be a central part of students’ education. The proximity of Central Government Institutes like CMFRI, NIO, CIFNET, NIPHATT and CIFT enable the students to use the excellent library facilities as well as the assistance of scientists and technical staff of these institutes to broaden their horizon of knowledge in the subject and pursue their research interests. A unique activity of the programme is the participation of the students in a one month long On Job Training when the students get exposed to the finer aspects of seafood processing, quality control and marketing. The students are attached to processing plants across the state and beyond for the OJT. As part of the curriculum the students also undergo training in an ornamental fish hatchery where they get an in depth exposure to hatchery technology of freshwater ornamental and food fishes. The fish / shrimp farm enables the students to have a first-hand experience in the culture of fishes and shrimps as well as interact with the farmers to have an understanding of the socio-economic conditions and undertake environmental impact studies in the region. Thus the three year degree program provides a mix of a broad science background and applied hands-on and technical skills. The syllabus underwent revisions in 1999, 2009, 2012 and 2019 wherein several modifications were incorporated to fine tune the content taking into view the developments in the field of aquaculture and fisheries regionally, nationally and across the globe. The graduating students who do not opt for higher studies get placed in scientifically run Aquaculture Farms, Hatchery’s, Feed Manufacturing Units, Seafood Processing Plants, Quality Assessment Labs, Export Inspection Council, Export Inspection Agency, Central and State Govt. Organizations in Fisheries and Aquaculture, Universities, Colleges and allied industries. In 2024, adopting the Mahatma Gandhi University Under Graduate Programmes (Honours) Regulations, 2024, {MGU- UGP (Honours)}, under the New Curriculum and Credit Framework, 2024, the syllabus for the programme B. Sc. Industrial Fisheries was designed.

THE ST. ALBERTS COLLEGE (AUTONOMOUS) UNDERGRADUATE PROGRAMMES (HONOURS) REGULATIONS, 2024

SACA-UGP (Honours)

PREAMBLE

The University Grants Commission (UGC) has issued the Curriculum and Credit Framework for Undergraduate Programmes 2023 (CCFUP) which would provide a flexible choice-based credit system, multidisciplinary approach, multiple entry and exit options, and establish three Broad Pathways, (a) 3-year UG Degree, (b) 4-year UG Degree (Honours), and 4-year UG Degree (Honours with Research).

The Kerala Higher Education Reforms Commission has recommended a comprehensive reform in the undergraduate curriculum for the 2023-24 academic year, adopting 4-year undergraduate programmes to bring Kerala's undergraduate education at par with well acclaimed universities across the globe.

The Kerala State Curriculum Committee for Higher Education has been constituted and have proposed a model Kerala State Higher Education Curriculum Framework (KSHECF) for Undergraduate Education. Further, an Executive Committee and various sub committees were constituted for the implementation of the Regulations. Further, MGU has framed the Rules and Regulations based on this namely: THE MAHATMA GANDHI UNIVERSITY UNDERGRADUATE PROGRAMMES (HONOURS) REGULATIONS, 2024 {MGU-UGP (Honours)} under the New Curriculum and Credit Framework, 2024. Being an Autonomous college affiliated to MG University, St. Albert's College is adopting all the major components of MGU UGP (Honours) 2024 in the title SACA-UGP (Honours) to our UG curriculum from the academic year (2024-25) onwards.

1. Short Title and Commencement

- i. The Regulations will be called as “THE ST. ALBERT’S COLLEGE (AUTONOMOUS) UNDERGRADUATE PROGRAMMES (HONOURS) REGULATIONS, 2024 {SACA-UGP (Honours)}” under the New Curriculum and Credit Framework 2024.
- ii. These Regulations will come into effect from the academic year 2024-2025 and will have prospective effect.

2. Scope, Application

- i. These Regulations shall apply to all undergraduate programmes (except B. Voc.) of ST. ALBERT’S COLLEGE (AUTONOMOUS) for the Admissions commencing in the academic year 2024-2025.

- ii. Every programme conducted under the SACA-UGP shall be monitored by the SACA-UGP Academic Committee (Academic Council).

3. Definitions

Unless context otherwise required,

- i. FYUGP means Four Year Undergraduate Programme.
- ii. Academic Year: Two consecutive (one odd and one even) semester followed by a vacation in one academic year.
- iii. Academic Coordinator/Nodal Officer: Academic Coordinator/Nodal Officer is a faculty nominated by the College Council to co-ordinate the effective conduct of the FYUGP including Continuous Comprehensive Assessment (CCA) undertaken by various departments within the College. She/ he/ they shall be the convenor for the College level Academic Committee.
- iv. Academic Week: A unit of five working days in which the distribution of work is organized, with five contact hours of one-hour duration on each day.
- v. Academic Credit: A unit by which the course work is measured. It determines the number of hours of instructions required per week in a semester. It is defined both in terms of student efforts and teacher's efforts. A course which includes one hour of lecture or tutorial or minimum 2 hours of lab work/ practical work/ field work per week is given one credit hour. Accordingly, one credit is equivalent to one hour of lecture or tutorial or two hours of lab work/ practical work/ field work/ practicum and learner engagement in terms of course related activities (such as seminar preparation, submitting assignments, group discussion, recognized club-related activities etc.) per week. Generally, a one credit course in a semester should be designed for 15 hours lecture/ tutorials or 30 hours of practical/ fieldwork/ practicum and 30 hours learner engagement.
- vi. Academic Bank of Credits (ABC): An academic service mechanism as a digital/ virtual entity established and managed by Government of India to facilitate the learner to become its academic account holders and facilitating seamless learner mobility, between or within degree-granting Higher Education Institutions (HEIs) through a formal system of credit recognition, credit accumulation, credit transfers and credit redemption to promote distributed and flexible process of teaching and learning. This will facilitate the learner to choose their own learning path to attain a Degree/ Diploma/ Certificate, working on the principle of multiple entry and exit, keeping to the doctrine of anytime, anywhere, and any level of learning.
- vii. Credit Accumulation: The facility created by ABC in the Academic Credit Bank Account (ABA) opened by the learner across the country in order to transfer and consolidate the credits earned by them by undergoing courses in any of the eligible HEIs.

- viii. Credit Recognition: The credits earned through eligible/ partnering HEIs and transferred directly to the ABC by the HEIs concerned.
- ix. Credit Redemption: The process of commuting the accrued credits in the ABC of the learner for the purpose of fulfilling the credits requirements for the award of various degrees. Total credits necessary to fulfil the criteria to get a degree shall be debited and deleted from the account concerned upon collecting a degree by the learner.
- x. Credit Transfer: The mechanism by which the eligible HEIs registered with ABC are able to receive or provide prescribed credits to individuals registered with ABA in adherence to the UGC credit norms for the course(s) registered by the learner in any HEIs within India.
- xi. Credit Cap: Maximum number of credits that a student can take per semester, which is restricted to 30.
- xii. Continuous Comprehensive Assessment (CCA): The mechanism of evaluating the learner by the course faculty at the institutional level.
- xiii. End Semester Evaluation (ESE): The mechanism of evaluating the learner at the end of each semester.
- xiv. Audit Course: A course that the learner can register without earning credits and is not mandatory for completing the SACA-UGP. The student has the option not to take part in the CCA and ESE of the Audit Course. If the student has 75% attendance in an Audit Course, he/ she/ they are eligible for a pass in that course, without any credit (zero-credit).
- xv. Courses: Refer to the papers which are taught and evaluated within a programme, which include lectures, tutorials, laboratory work, studio activity, fieldwork, project work, vocational training, viva, seminars, term papers, presentations, assignments, self-study, group discussion, internship, etc., or a combination of some of these elements.
- xvi. Choice Based Credit System (CBCS) means the system wherein students have the option to select courses from the prescribed list of courses.
- xvii. College-level Academic Committee: Is a committee constituted for the FYUGP at the College level comprising the Principal as the Chairperson, the Academic Co-ordinator/ Nodal Officer as its convenor.
- xviii. Academic Co-ordinator/ Nodal Officer: A senior faculty member nominated by the College Council.
- xix. Course Faculty: A faculty member nominated by the Head of the Department shall be in charge of offering a particular course in a particular semester of FYUGP.
- xx. Department means any teaching department in a college offering a course of study approved by the Governing body and statutory bodies of the College.

- xxi. Senior Faculty Advisor (SFA) is a faculty nominated by a Department Council to coordinate all the necessary work related to FYUGP undertaken in that department, including the Continuous Comprehensive Assessment.
- xxii. Department Council means the body of all teachers of a department in a college.
- xxiii. Faculty Advisor (FA) means a teacher from the parent department nominated by the Department Council to advise students in academic matters.
- xxiv. Graduate Attributes means the qualities and characteristics to be obtained by the graduates of a programme of study at the College, which include the learning outcomes related to the disciplinary areas in the chosen field of learning and generic learning outcomes. The graduate attributes for its programmes will be specified.
- xxv. Programme means the entire duration of the educational process including the evaluation leading to the award of a degree.
- xxvi. Programme Pathway: Combination of courses that can be chosen by a student that give options to pursue interesting and unconventional combinations of courses drawn from different disciplinary areas, like the sciences and the social sciences/ humanities. The pathways could be in terms of major- minor options with different complementary/allied disciplines.
- xxvii. Regulatory Body means University Grants Commission (UGC), All India Council for Technical Education (AICTE), National Council for Teacher Education (NCTE), Medical Council of India (MCI), Pharmacy Council of India (PCI), Indian Council for Agricultural Research (ICAR), Bar Council of India, Council of Architecture, National Assessment and Accreditation Council (NAAC) and National Board of Accreditation (NBA) etc.
- xxviii. Signature Courses: Signature courses are the specialized Discipline Specific Elective courses or skill enhancement/value addition courses offered by the regular/ ad hoc/visiting/emeritus/ adjunct faculty member of a particular Department with the prior recommendation of the BoS and the approval of Academic Council of the College.
- xxix. Letter Grade or simply 'Grade' in a course is a letter symbol (O, A+, A, B+, B, C, P, F, and Ab). Grade shall mean the prescribed alphabetical grade awarded to a student based on their performance in various examinations. The Letter grade that corresponds to a range of CGPA.
- xxx. Grade Point: Each letter grade is assigned a 'Grade point' (G) which is an integer indicating the numerical equivalent of the broad level of performance of a student in each course. Grade Point means point given to a letter grade on 10-pointscale.
- xxxi. Semester Grade Point Average (SGPA) is the value obtained by dividing the sum of credit points obtained by a student in the various courses taken in a semester by the total number of credits in that semester. SGPA shall be rounded off to two decimal places. SGPA determines the overall performance of a student at the end of a semester.
- xxxii. Credit Point (P) of a course is the value obtained by multiplying the grade point (G) by the credit (C) of the course: $P = G \times C$

- xxxiii. Cumulative Grade Point Average (CGPA) is the value obtained by dividing the sum of credit points in all the semesters earned by the student for the entire programme by the total number of credits in the entire programme and shall be rounded off to two decimal places
- xxxiv. Grade Card means the printed record of students' performance, awarded to them.
- xxxv. Words and expressions used and not defined in this regulation but defined in the M. G. University Act and Statutes, and College handbook shall have the meaning assigned to them in the Act and Statutes and handbook

4. Features and Objectives of SACA-UGP 2024

The features and objectives of the SACA-UGP 2024 shall be:

- i. The features, meaning, and purpose of FYUGP shall be as stipulated by the UGC and as adapted by the Kerala State Higher Education Curriculum Framework (KSHECF) and MGU-UGP (Honours) for undergraduate education.
- ii. The practice of lateral entry of students to various semesters exists, but an exit with a Degree shall be awarded only upon successful completion of 133 credits as per the conditions stipulated in this regulation.
- iii. FYUGP shall have three Broad Pathways, (a) 3-year UG Degree, (b) 4-year UG Degree (Honours), and (c) 4-year UG Degree (Honours with Research).
- iv. Students who choose to exit after 3 years shall be awarded UG Degree in their respective Discipline/ Disciplines after the successful completion of the required minimum Courses with 133 credits.
- v. A 4-year UG Degree (Honours) in the Discipline/ Disciplines shall be awarded to those who complete the SACA-UGP with a specific number of Courses with 177 credits including 12 credits from a capstone level graduate project/dissertation. Those students who are not doing capstone project shall do three courses at the level 400 or above or three vocational training courses or internships for 12 credits.
- vi. Students who acquire minimum 75% in their graduation (upto 6th semester) are eligible for Honours with Research Programme. However, if necessary, College may conduct screening test for the honours with research programme in accordance with University and College Regulations time to time.
- vii. 4-year UG Degree (Honours with Research): Students who aspire to pursue research as a career may opt for 4-year UG Degree Honours with Research stream under FYUGP with a specific number of Courses with 177 credits including 12 credits from a research project in their major discipline.
- viii. The recognized research departments or departments with at least two faculty members having PhD shall offer the Honours with Research programme. Minimum 2 students (mentees) should be allotted to a faculty member (Mentor).

- ix. Students who have chosen the honours with research stream shall do their entire fourth year under the mentorship of a mentor.
- x. The mentor shall prescribe suitable advanced level/capstone level courses for a minimum of 20 credits to be taken within the institutions along with the courses on research methodology, research ethics, and research topic-specific courses for a minimum of 12 credits which may be obtained either within the institution or from other recognized institutions, including online and blended modes. Students shall also be allowed to pursue these three courses of 12 credits from suitable interdisciplinary/ transdisciplinary/ multidisciplinary/ vocational areas of their choice.
- xi. Students who have opted for the honours with research should successfully complete a research project under the guidance of the mentor and should submit a research report for evaluation. They need to successfully defend the research project to obtain 12 credits under a faculty member of the University/ College/Recognized Research Institute. The research shall be in the Major/ allied discipline.
- xii. The research outcomes of their project work may be published in peer-reviewed journals or presented at conferences or seminars or patented.
- xiii. The proposed FYUGP curriculum comprises three broad parts: a) Foundation Components, b) Discipline Specific Pathway components (Major/ Minor), and c) Discipline Specific Capstone Components.
- xiv. The Foundation component of the FYUGP shall consist of a Set of General Foundation Courses and a Set of Discipline Specific Foundation Courses.
- xv. General Foundation Courses shall be grouped into 4 major baskets as Ability Enhancement Courses (AEC), Skill Enhancement Courses (SEC), Value Addition Courses (VAC), and Multi-Disciplinary Courses (MDC).
- xvi. Ability Enhancement Courses shall be designed specifically to achieve competency in English, other languages as per the student's choice with special emphasis on language and communication skills.
- xvii. English or other language courses shall be designed to enable the students to acquire and demonstrate the core linguistic skills, including critical reading, academic and expository writing skills as well as the cultural and intellectual heritage of the language chosen. Separate courses will be designed for Science, Humanities and Commerce streams.
- xviii. Multi-Disciplinary Courses (MDC) shall be so designed as to enable the students to broaden their intellectual experience by understanding the conceptual foundations of Science, Social Sciences, Humanities, and Liberal Arts. Students shall not be eligible to take the MDC in the same discipline that they have studied during their Plus Two. Third semester MDC can be Kerala specific content. Each BoS can prepare basket of courses under MDC.
- xix. Skill Enhancement Courses (SEC) shall be designed to enhance 21st century workplace

skills such as creativity, critical thinking, communication, and collaboration.

- xx. Discipline Specific Courses shall include Discipline Specific Pathway Courses, both Major and Minor streams, enabling students to gain basic knowledge in the chosen discipline.
- xxi. Discipline Specific Foundation Courses shall focus on foundational theories, concepts, perspectives, principles, methods, and critical thinking essential for taking up advanced/ Capstone Courses. Practical courses shall be included in discipline specific foundation courses.
- xxii. The curriculum of the SEC should be designed in a manner that at the end of year-1, year-2, year-3, and year-4 students are able to meet the level descriptors for levels 5, 6, 7, and 8 of the UGC Guidelines on National Skills Qualifications Framework (NSQF).
- xxiii. Value Addition Courses (VAC) shall be so designed as to empower the students with personality development, perspective building, and self-awareness.
- xxiv. Discipline Specific Pathway Components (Major/Minor) shall provide the students with an opportunity to pursue in-depth study of a particular subject or discipline and develop competency in that chosen area, which includes Discipline Specific Core (DSC) courses and Discipline Specific Elective (DSE) courses as Major and Minor courses.
- xxv. Major components consist of three types: Discipline Specific Core or the Discipline Specific Elective Courses, and the research/laboratory/fieldwork.
- xxvi. Minor Courses can be selected from any discipline. A student who completes 12 credits in a particular stream will be eligible for a minor.
- xxvii. Students who complete a sufficient number of Courses in a discipline or an interdisciplinary area of study other than their chosen Major shall qualify for a Minor in that discipline or in a chosen interdisciplinary area of study.
- xxviii. Major Components shall be the main focus of study. By selecting a Major, the student shall be provided with an opportunity to pursue an in-depth study of a particular discipline.
- xxix. Each Board of Studies (BoS) shall identify specific Courses or baskets of Courses towards Minor Course credits. Students shall have the option to choose Courses from disciplinary/ interdisciplinary minors and skill-based courses related to a chosen programme.
- xxx. Students can opt for a change of Major at the end of the second semester to any Minor discipline studied among the foundation level courses. Students can also opt for a change of Major at the end of the second semester to any MDC.
- xxxi. Students should opt their 5th and 6th semester VAC and SEC from their Major disciplines only.
- xxxii. Course cum Credits Certificate: After the successful completion of a semester, this

certificate is essential as proof for re-entry to another institution. This will help the learner for preserving the credits in the Academic Bank of Credits.

- xxxiii. The Advanced Level/ Capstone Level Courses shall be designed in such a manner as to enable students to demonstrate their cumulative knowledge in their main field of study, which shall include advanced thematic specialization or internships or community engagement or services, vocational or professional training, or other kinds of work experience.
- xxxiv. Advanced/ Capstone level Major Specialization shall include Courses focused on a specific area of study attached to a specific Major, which could be an Elective Course. They shall include research methodology as well.
- xxxv. The student has the option to register for and attend a course without taking part in the CCA and ESE of that course. Such a course is called the Audit Course. If the student has 75% attendance in an Audit Course, he/she/they is eligible for a pass in that course, without any credit (zero-credit). The Audit Course will be recorded in the final grade card of the student.
- xxxvi. All students shall undergo Summer Internship or Apprenticeship in a Firm, Industry or Organization; or Training in labs with faculty and researchers or other Higher Education Institutions (HEIs) or Research Institutions. A separate guideline for Internship Programmes will be published.
- xxxvii. Students will be provided the opportunities for internships with local industries, business organizations, agriculture, health and allied sectors, Local Government institutions (such as panchayats, municipalities), State Planning Board, State Councils/Boards, Research Institutions, Research Labs, Library, elected representatives to the parliament/state assembly/panchayath, media organizations, artists, crafts persons etc. These opportunities will enable the students to actively engage with the practical aspects of their learning and improve their employability.
- xxxviii. The College will assist in providing opportunities for field-based learning/minor Projects enabling them to understand the different socio-economic and development-related issues in rural and urban settings. The College will assist in providing the students with opportunities for Community engagement and services, exposing them to socio-economic issues to facilitate theoretical learning in real-life contexts.
- xxxix. Additional Credits will be awarded for those who actively participate in Social Activities, which may include participation in National Service Scheme (NSS), Sports and Games, Arts, participation in University/ college union related activities (for respective elected/nominated members), National Cadet Corps (NCC), adult education/literacy initiatives, mentoring school students, and engaging in similar social service organizations that deemed appropriate to the College.
- xl. Grace marks shall be awarded to a student for meritorious achievements in co-curricular activities (in Sports/ Arts/ NSS/ NCC etc.). Such a benefit is applicable in the same

academic year spreading over two semesters, in which the said meritorious achievements are earned. The Academic Council will decide from time to time the eligibility and other rules of awarding the grace marks.

- xli. Options will be made available for students to earn credit by completing quality-assured remote learning modes, including Online programmes offered on the Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM) or other Online Educational Platforms approved by the competent body from time to time.
- xlii. Students shall be entitled to gain credits from courses offered by other recognized institutions directly as well as through distance learning.
- xliii. For the effective operation of the FYUGP, a system of flexible academic transaction timings shall be implemented for the students and teachers.
- xliv. Specialization: Student will have the option to achieve specialization within their Major by securing 12 credits from a disciplinary/interdisciplinary area. By choosing atleast 3 courses from discipline specific elective basket under a chosen field (preferably one from 200 level course and two 300 level courses) student will be awarded specialization in that particular area of study. Each student will have the option to achieve two specializations at a time from the institution

5. Eligibility for Admission and Reservation of Seats

- i. The eligibility for admissions and reservation of seats for various FYUG Degree Programmes shall be in accordance with the norms/ rules made by the Government/University/College from time to time.
- ii. No student shall be eligible for admission to FYUG Degree Programmes in any of the disciplines unless he/she/they have successfully completed the examination conducted by a Board/University at the Plus Two level of schooling or its equivalent.
- iii. Students shall be admitted and enrolled in the respective programmes solely based on the availability of the academic and physical facilities within the institution. The College shall provide all students with a brochure detailing the Courses offered by the various departments under the various Programmes and the number of seats sanctioned for each Programme.
- iv. During the time of admission each student may be provided with a unique higher education student ID which may be linked with the Aadhar number of the students so that his ID can be transferred if required to other higher education institutions as well.
- v. The students at the end of second semester may be permitted to change their major programme of study to any course/ institution/ university across the state. Based on the availability of seats and other facilities, the students may be permitted to opt any discipline which he/she/they had studied during the first two semesters as Discipline Specific Foundation courses/ Multidisciplinary Foundation courses. If ranking is required, it will be

in the order of the highest-grade points secured in the discipline to which the switching of Major is sought.

- vi. Students shall be allowed to change their major programmes, if required, to a maximum of 10% of the sanctioned strength of that particular programmes depending upon the academic and infrastructural facilities available in the Institution.
- vii. Depending upon the availability of academic and infrastructural facilities, the Institution may also admit a certain number of students who are registered for particular programmes in each semester by transfer method, if required, from other Institutions subject to conditions as may be issued by the University.
- viii. A student who has already successfully completed a First-Degree Programme and is desirous of and academically capable of pursuing another First-Degree Programme may also be admitted with the prior approval of the University as per the conditions regarding programme requirements specified by the University.
- ix. A Student can also be admitted for an additional major/ second major/ additional minor and on completion of the required credits he/she/they can be awarded a second major/ additional major/ minor. He/she/they may be exempted from minor pathway and general foundation course requirement.
- x. The HEIs can also enrol students in certain courses as per their choice depending upon the availability of infrastructure and other academic facilities from other recognized HEIs who are already registered for a particular programme there either through regular/online/distance mode irrespective of the nature of programme (Govt/ Aided/ Self-finance/ Autonomous). On successful completion of the course the credits may be transferred through the Academic Bank of Credit (ABC), against the unique higher education ID provided by the College at the time of admission.

6. Academic Monitoring and student Support

The academic monitoring and student support shall be in the following manner, namely

- i. College should appoint a Senior Faculty member as Academic Co-ordinator/Nodal officer for the smooth conduct of FYUGP.
- ii. Advisory System: There shall be one Senior Faculty Advisor (SFA) for each department and one Faculty Advisor (FA) for 20 to 30 students of the class to provide advice in all relevant matters. The Head of the Department, in consultation with the SFA, shall assign FA for each student.
- iii. The documents regarding all academic activities of students in a class shall be kept under the custody of the FA/SFA.
- iv. All requests/ applications from a student or parent to higher offices are to be forwarded/recommended by FA/SFA.

- v. Students shall first approach their FA/ SFA for all kinds of advice, clarifications, and permissions on academic matters.
- vi. It is the official responsibility of the institution to provide the required guidance, clarifications, and advice to the students and parents strictly based on the prevailing academic regulations.
- vii. The SFA shall arrange separate or combined meetings with FA, faculty members, parents, and students as and when required and discuss the academic progress of students.
- viii. The FA/SFA shall also offer guidance and help to solve the issues on academic and non-academic matters, including personal issues of the students.
- ix. Regular advisory meetings shall be convened immediately after the commencement of the semester and immediately after announcing the marks of the Continuous Comprehensive Assessment (CCA).
- x. The CCA related results shall be uploaded on the College portal only after displaying the same on the department notice board/other official digital platforms of the college at least for two working days.
 - i. Any concern raised by the students regarding CCA shall be looked into in the combined meetings of advisors, HoD, course faculty, and the students concerned.
 - ii. If the concerns are not resolved at the advisor's level, the same can be referred to the properly constituted department-level grievance redressal committees
 - iii. The HOD shall ensure the proper redressal of the concerns raised by the students regarding CCA.
 - iv. If the students raise further concerns about the issue, the Principal shall refer the issue to the College-level grievance committee with proper documents and minutes of all the committees.
- xi. The FA/SFA shall be the custodian of the minutes and action taken reports of the advisory meetings. The SFA shall get the minutes and action taken reports of advisory meetings approved by the Head of Department and the Principal. It shall be the duty of the HoD and the Principal to produce them before the Governing body of the College as and when required.
- xii. The Principal shall inform/forward all regulations, guidelines, communications, announcements, etc. issued by the University regarding student academic and other matters to the HODs/ SFA for information and timely action.
- xiii. It shall be the official responsibility of the Principal to extend the required administrative and financial support to the HODs, SFAs and FAs to arrange necessary orientation programmes for students regarding student counselling, the prevailing College norms,

regulations, guidelines and procedures on all academic and other College related matters.

- xiv. An integrated educational planning and administration software will be made available by the College to manage the academic information of all students. Which include student admissions and registration, managing student personal and academic information, course registrations, attendance management, all process related to assessments including regular & online examinations, grading, publishing of results, supplementary examinations, LMS, stakeholders' feedback, etc.
- xv. Faculty, staff, students, and parents shall be allowed to access this software system over a highly secure authenticated mechanism from within the campus and outside the campus

7. Course Registration

- i. Each department shall publish well in advance the relevant details of courses offered, such as the name, academic level, expected outcomes, time slot, and course faculty members.
- ii. Students shall be allowed to visit and interact with respective faculty members during the first week of each semester, to gather more information about the courses and the availability of seats.
- iii. Based on consultations and advice from the faculty adviser, each student shall complete course registration within one week from the commencement of each semester.
- iv. The number of credits that a student can take in a semester is governed by the provisions in these Regulations, subject to a minimum of 16 and a maximum of 30 Credits.
- v. A student can opt out of a Course or Courses registered, subject to the minimum Credit/Course requirement, if he/she/they feel that he/she/they has registered for more Courses than he/she/they can handle, within 30 days from the commencement of the semester. An option can be given to the student to convert this course as audit course if he/she/they wishes to do so.
- vi. The college shall publish a list of the students registered for each course including audit course, if any, along with the chosen Programmes, repeat/reappearance courses, if any, and shall forward the same to the university.
- vii. The higher education institutions shall admit candidates not only for programmes, but also for courses.

8. Re-admission and Scheme Migration

- i. Students who opt out before the completion of the third year shall be provided with a 'Course cum Credits Certificate' after the successful completion of a semester as proof for re-entry to another institution.
- ii. Students who have successfully completed a particular programme pathway maybe permitted to take an additional minor or second major.

- iii. Those students who are opting for a second major are eligible for getting certain credit transfer/ credit exemption from their previous minor programs of study, subject to the prior recommendation of the BoS that, those credits are relevant for the present major programme of study.

9. Duration of Programmes, Credits Requirements and Options

- i. Students will be offered the opportunity to take breaks during the programme and resume after the break, but the total duration for completing the FYUG programme shall not exceed 7 years.
- ii. Students who wish to complete the undergraduate programmes faster may do so by completing different courses equivalent to the required number of credits and fulfilling all other requirements in N-1 semesters, where N is the number of semesters in the FYUGP.
- iii. Provided further that the students may complete the undergraduate programme in slower pace, they may pursue the three years or six semester programme in 4 to 5 years (8 to 10 semesters), and four years, or eight semester programme in 5 to 6 years (10 to 12 semesters) without obtaining readmission.
- iv. For students who crossed 6 semesters at a slower space, the requirement of 16 credits per semester from the institutions where they enrolled may be relaxed.

10. Credit Structure

The proposed number of credits per course and the credit distribution of them for the FYUG Programmes are given below-

- i. An academic year shall consist of 200 working days; one semester consists of 90 working days; and an academic year consists of two semesters.
- ii. Ten working days in a semester shall be used for extracurricular activities. One semester consists of 18 weeks with 5 working days per week. In each semester, 15 days (3 weeks) should be kept aside for End Semester Evaluation (ESE) and CCA.
- iii. The maximum number of available weeks for curriculum transactions should be fixed at 15 in each semester. A minimum of 5 teaching or tutorial hours could be made available for a day in a 5-day week.
- iv. A course that includes one hour of lecture/ tutorial or two hours of lab work/practical work/fieldwork/practicum per week is given one credit hour.
- v. One credit in a semester should be designed for 15 hours of lectures/ tutorials or 30 hours of lab work/ practical work/ field work/ practicum and 30 hours of learner engagement in terms of course-related activities such as seminar preparation, assignment submission, etc.

- vi. A one-credit seminar or internship or studio activities or field work/ projects or community engagement and service will have two-hour engagements per week (30 hours of engagement per semester).
- vii. A course can have a combination of Lecture (L)/ Tutorial (T)/ Practicum or Practical (P)/ & Others (O) credits.
- viii. Minimum credit for one Course should be 2 (Two), and the maximum credit should be 4 (Four).
- ix. All Discipline Specific Major/Minor Courses shall be of 4 (Four) credits.
- x. For all Discipline Specific Major/Minor Courses, there may be practical/ practicum.
- xi. All Courses under the Multi-Disciplinary, Ability Enhancement, Value Addition and Skill Enhancement categories are of 3 credits. Practical/Practicum credits can also be included in this category.
- xii. Summer Internship, Apprenticeship, Community Outreach activities, etc. may require sixty hours (or as appropriate) of engagement for acquiring one credit.
- xiii. A student shall be able to opt for a certain number of extra credits over and above the requirements for the award of a degree.
- xiv. Maximum number of credits that a student can earn per semester shall be restricted to 30. Hence, a student shall have the option of acquiring credits to a maximum of 180 credits for a 3-year (6-semester) UG programmes and 240 credits for a 4-year (8-semester) programmes.
- xv. Each faculty member shall offer a maximum of 16 credits per semester. However, those who are offering both practical and theory courses shall offer a maximum of 12-16 credits per semester.
- xvi. For a four-credit theory course, 60 hours of lecture/ tutorial class shall be assured as a mandatory requirement for the completion of that course.

11. Course Structure of the SACA-UGP Programmes

The SACA-UGP consists of the following categories of courses and the minimum credit requirements for pathway option-one shall be as follows:

Sl. No.	Categorization of Courses for all Programmes	Minimum Number of Credit Required	
		3-yearUG	4-yearUG
1	Major	68	88
2	Minor	24	24+12*
3	Multi-Disciplinary Courses (MDC)	9	9

4	Skill Enhancement Courses (SEC)	9	9
5	Ability Enhancement Courses (AEC)	12	12
6	Value Addition Courses (VAC)	9	9
7	Summer Internship, field-based learning etc.	2	2
8	Research Project/Dissertation		12**
	Total Credits	133	177

*The students can acquire advanced/capstone level courses with 12 credits from their DSC/ DSE/ Minor courses depending upon their pathway choice. The Minor courses can be of level 300 or above.

** The students pursuing the 4-year honours with research have to complete a capstone project with 12 credits and for the 4-year honours degree students have to complete a project with 12 credits. Those honours students who are not doing capstone project shall do three courses at the level 400 or above or three vocational training courses or internships for 12 credits.

- i. 20% syllabus of each course will be prepared by the teacher as 'Teacher Specific Content' and will be evaluated under CCA.
- ii. In case of MDC, SEC, VAC courses coming under 3rd & 4th semester, college should make necessary arrangements to give adequate preference to courses designed by language departments. MDC in the 3rd semester can be Kerala Specific Content.

12. Academic Levels of Pathway Courses

Semester	Difficulty level	Nature of Course
1&2	100-199	Foundation level or introductory courses
3&4	200-299	Intermediate level courses
5&6	300-399	Higher level courses
7&8	400-499	Advanced/Capstone level courses

13. Signature Courses

- i. With a prior recommendation of BoS and the approval of academic council, each faculty member can design and offer at least one signature course in every semester, which may be offered as DSE/SEC/VAC.
- ii. College may publish a list of their signature courses in DSE/ SEC/ VAC offered by their faculty members with a prior recommendation of BoS and the approval of Academic

Council.

- iii. College may empanel distinguished individuals who have excelled in their field of specialization like science and technology, industry, commerce, social research, media, literature, fine arts, civil services etc. as adjunct faculty as per the UGC guidelines with the approval of the University/College. With a prior recommendation of BoS and the approval of academic council, the adjunct faculty can offer SEC/VAC as signature course.
- iv. Adhoc/ Guest faculty/ Visiting faculty/ Visiting Scholars can also offer DSE/SEC/ VAC as signature courses with a prior recommendation of BoS and the approval of academic council.
- v. The faculty concerned may design the particular course and it should be forwarded to the BoS after the approval of department council.
- vi. The examinations and evaluation of the signature courses designed by the faculty shall be conducted by the faculty themselves and an external expert faculty chosen by the college from a panel of experts submitted by the faculty and recommend by the BoS concerned.

14. Programme Pathways and Curriculum Structure

Students who have joined for any programme under these regulations shall have the option to choose the following pathways for their UG degree and Honours programme.

- i. **Degree with single Major:** A student pursuing the FYUG programme in a specific discipline shall be awarded a Major degree if he secures at least 50% of the total credits in the specific discipline required for the award of the Degree in that Discipline. Example: Physics Major/Economics Major/Commerce Major
- ii. **Degree Major with Minor:** If a student pursuing the FYUG Programme is awarded a Major Degree in a particular discipline, he/she/they are eligible to be awarded a Minor in another discipline of his choice, if he earns a minimum of 32 credits (approximately 25% of credit required for the three-year programme) from 8 pathway courses in that discipline.
Example: Physics Major with Chemistry Minor/ Chemistry Major with English Minor/ Commerce Major with Economics Minor/ English Major with Functional English Minor/Hindi Major with Malayalam Minor etc.
- iii. **Major with Multiple Disciplines of Study:** This pathway is recommended for students who wish to develop core competencies in multiple disciplines of study. In this case, the credits for the minor pathway shall be distributed among the constituent disciplines/ subjects. If a student pursuing FYUG Degree Programme is awarded a major Degree in a particular discipline, he/she/they are eligible to get mentioned his core competencies in other disciplines of his choice if he has earned 12 credits from the pathway courses of

that discipline.

Example: Physics Major with Minors in Chemistry and Mathematics, Economics Major with Minors in History and English, Commerce Major with Minors in Economics and Statistics.

- iv. **Interdisciplinary Major:** For these programme pathways, the credits for the major and minor pathways shall be distributed among the constituent disciplines/subjects to attain core competence in the inter disciplinary programme.

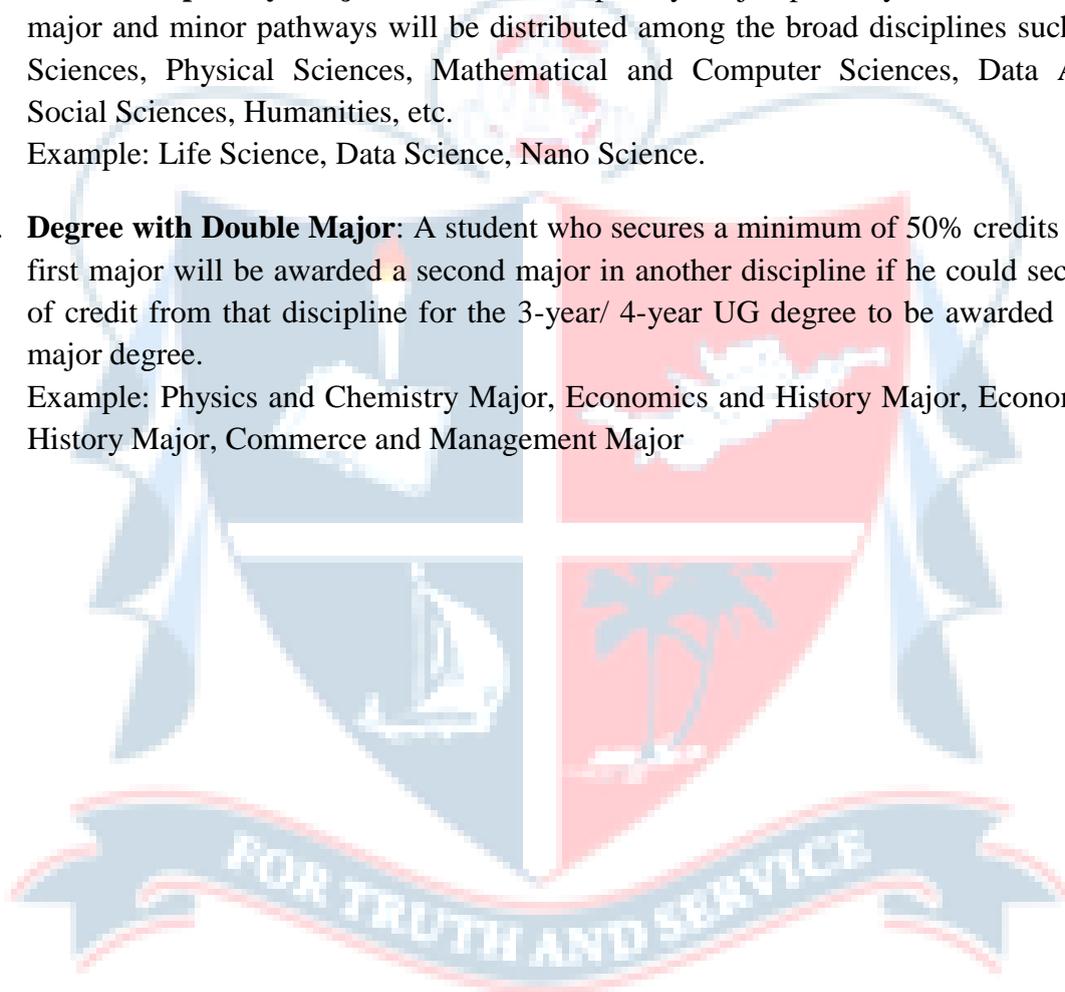
Example: Econometrics Major, Global Studies Major, Biostatistics Major.

- v. **Multi-Disciplinary Major:** For multidisciplinary major pathways, the credits for the major and minor pathways will be distributed among the broad disciplines such as Life Sciences, Physical Sciences, Mathematical and Computer Sciences, Data Analysis, Social Sciences, Humanities, etc.

Example: Life Science, Data Science, Nano Science.

- vi. **Degree with Double Major:** A student who secures a minimum of 50% credits from the first major will be awarded a second major in another discipline if he could secure 40% of credit from that discipline for the 3-year/ 4-year UG degree to be awarded a double major degree.

Example: Physics and Chemistry Major, Economics and History Major, Economics and History Major, Commerce and Management Major



Pathway Option1-Degree Major or Major with Multiple Disciplines of Study

Course Components	No. of Courses											Total	
	Semester 1	Semester 2	Semester 3	Semester 4	Internship of 2 Credits	Semester 5#	Semester 6#	Total	Remarks	Semester 7	Semester 8		Total
DSCA (4 Credit/ Course)	1(P)	1(P)	3 (2P)	3 (2P)			5	4	17	7 Out of 17 can be opted as DSE	3	2	22
DSCB&C (4 Credit/ Course)	2(P)	2(P)	1(P) (BorC)	1(P) (CorB)					6		3		9
Multidisciplinary Courses (MDC) (3 Credit/ Course)	1(P)	1(P)	1*						3	*Cannot opt from DSC			3
Ability Enhancement Courses (AEC) (3 Credit/ Course)	1 (English) 1 (OL)	1 (English) 1 (OL)							4				4
Skill Enhancement Courses (SEC) (3 Credit/ Course)				1*			1**	1**	3	*Cannot opt from DSCA **From DSCA only			3
Value Addition Courses (VAC) (3 Credit/ Course)			1*	1*				1**	3	*Cannot opt from DSCA **From DSCA only			3
Project/ Dissertation 12 credits for Honours with Research & 8 for Honours												12 (1 DSC /DSE for Honours)	
Total Courses	6	6	6	6			6	6	36		6	2+1	
Total Credits	21	21	22	22		2	23	22		Total Credits 133	24	20	Total Credits 177
Total Hours per Week	25	25	25	25		25	25		Exit option available	25	25		

Pathway Option 2 – Major with Minor

Course Components	No. of Courses												
	Semester 1	Semester 2	Semester 3	Semester 4	Internship of 2 Credits	Semester 5#	Semester 6#	Total	Remarks	Semester 7	Semester 8	Total	
DSCA (4Credit/ Course)	1(P)	1(P)	3 (2P)	3 (2P)			4	3	15	7 Out of 15 can be opted as DSE	3	2	22
DSCB (4Credit/ Course)	2(P)	2(P)	1(P)	1(P)			1	1	8	1 Out of 8 can be opted as DSE	3		11
Multidisciplinary Courses (MDC) (3Credit/ Course)	1(P)	1(P)	1*						3	*Cannot opt from DSC			3
Ability Enhancement Courses (AEC) (3Credit/ Course)	1 (English) 1 (OL)	1 (English) 1 (OL)							4				4
Skill Enhancement Courses (SEC) (3Credit/ Course)				1*			1**	1**	3	*Cannot opt from DSCA **From DSCA only			3
Value Addition Courses (VAC) (3 Credit/ Course)			1*	1*				1**	3	*Cannot opt from DSCA **From DSCA only			3
Project/ Dissertation 12 credits for Honours with Research & 8 for Honours												12 (1DSC/ DSE for Honours)	
Total Courses	6	6	6	6			6	6	36		6	2+1	
Total Credits	21	21	22	22		2	23	22		Total Credits 133	24	20	Total Credits 177
Total Hours per Week	25	25	25	25		25	25		Exit option available	25	25		

Pathway Option 3 – Double Major

Course Components	No. of Courses											Total	
	Semester 1	Semester 2	Semester 3	Semester 4	Internship of 2 Credits	Semester 5#	Semester 6#	Total	Remarks	Semester 7	Semester 8		
DSC A (4 Credit/ Course)	1(P)	1(P)	2(2P)	2(1P)			4	3	13	7 Out of 13 can be opted as DSE	3	2	18
DSC B (4 Credit/ Course)	2(P)	2(P)	2(1P)	2(2P)			1	1	10	2 Out of 10 can be opted as DSE	3		13
Multidisciplinary Courses (MDC) (3 Credit/ Course)	1(P)	1(P)	1*						3	*Cannot opt from DSC			3
Ability Enhancement Courses (AEC) (3 Credit/ Course)	1 (English) 1 (OL)	1 (English) 1 (OL)							4				4
Skill Enhancement Courses (SEC) (3 Credit/ Course)				1			1	1	3				3
Value addition Courses (VAC) (3 Credit/ Course)			1	1				1	3				3
Project/Dissertation 12 credits for Honours with Research & 8 for Honours												12 (1 DSC/DSE for Honours)	
Total Courses	6	6	6	6			6	6	36		6	2+1	
Total Credits	21	21	22	22		2	23	22		Total Credits 133	24	20	Total Credits 177
Total Hours per Week	25	25	25	25		25	25		Exit option available	25	25		

15. Guidelines for Acquiring Credit from Other Institutions/Online/Distance Mode

- i. A student shall register to a minimum of 16 credit per semester from the college/ department where he/ she/ they is officially admitted for a particular programme. However, students enrolled for a particular programme in one institution can simultaneously enrol for additional credits from other HEIs within the University or outside the University subject to a maximum of 30 credits per semester including the 16 institutional credits.
- ii. The College shall publish a list of courses that are open for admission for students from other institutions well in advance before the commencement of each semester.
- iii. Each BoS shall prepare and publish a list of online courses at different levels before the commencement of each semester offered in various online educational platforms recognized by the academic council of the College, which can be opted by the students for acquiring additional credits.
- iv. Each BoS shall prepare and publish a list of allied/relevant pathway courses before the commencement of each semester offered by other Board of Studies that can be considered as pathway courses for major/minor for their disciplines at different levels.
- v. At the end of each, the semester College will include the credit acquired by the student through online courses in their semester grade cards subject to a maximum of 30 credits.

16 Attendance

- i. A student shall be permitted to register for the end-semester evaluation of a specific course to acquire the credits only if he/ she has completed 75% of the prescribed classroom activities in physical, online, or blended modes, including any other activities as specified by the faculty coordinator of that particular course.
- ii. A student is eligible for attendance as per the existing university and government orders which includes participation in a meeting, or events organized by the college or the university, a regularly scheduled curricular or extracurricular activity prescribed by the college or the university. Due to unavoidable or other legitimate circumstances such as illness, injury, family emergency, care-related responsibilities, bad or severe weather conditions, academic or career-related interviews, students are eligible for authorized absence. Apart from this, all other eligible leave such as maternity leave, and menstrual leave shall also be treated as authorized absences.
- iii. The condonation facility can be availed as per the College norms

17. Workload

- i. The workload of a faculty who offers only lecture courses during an academic year shall be 32 credits.
- ii. The workload of a faculty offering both practical courses and theory courses may be between 24-32 credits per academic year.
- iii. An academic year shall consist of two semesters.

- iv. To protect the existing language workload, college should make necessary arrangements to give adequate preference to those courses designed by language departments coming under MDC, SEC and VAC of 3rd & 4th semester.
- v. Programme wise workload calculation will be as per the FYUGP workload ordinance 2024.
- vi. The teachers given the administrative responsibilities in the department and college level may give a relaxation in their workload as specified in the UGC regulations 2018.

18. Credit Transfer and Credit Accumulation

- i. College will establish a digital storage (DIGILOCKER) of academic credits for the credit accumulation and transfer in line with ABC.
- ii. The validity of credits earned shall be for a maximum period of seven (7) years or as specified in the university/UGC regulations.
- iii. The students shall be required to earn at least 50% of the credits from the College.
- iv. Students shall be required to earn the required number of credits as per any of the pathway structure specified in this regulation for the award of the degree

19. Outcome Based Approach

The curriculum will be designed based on Outcome Based Education (OBE) practices. The Graduate Attributes (GA) and Programme Outcomes (PO) are provided in appendix-1.

The OBE based syllabus template is provided in appendix-2.

20. Assessment and Evaluation

- i. The assessment shall be a combination of Continuous Comprehensive Assessment (CCA) and an End Semester Evaluation (ESE).
- ii. 30% weightage shall be given for CCA. The remaining 70% weight shall be for the ESE.
- iii. Teacher Specific Content will be evaluated under CCA.
- iv. CCA will have two subcomponents: Formative Assessment (FA) and Summative Assessment (SA). Each of these components will have equal weightage and must be conducted by the course faculty/course coordinator offering the course.
- v. FA refers to a wide variety of methods that teachers use to conduct in-process evaluations of student comprehension, learning needs, and academic progress during a lesson, unit, module or course. FA is to encourage students to build on their strengths rather than fixate or dwell on their deficits. FA can help to clarify and calibrate learning expectations of students. FA will help students become more aware of their learning needs, strengths, and interests so they can take greater responsibility for their educational

growth. FA will be the prerogative of the course faculty/course coordinator based on specific requirement of the student.

- vi. Suggested methods of FA are as follows: (any one or in combination could be followed as decided by the course faculty/course coordinator)
 - a. Practical assignment
 - b. Observation of practical skills
 - c. Viva voce
 - d. Quiz
 - e. Interview
 - f. Oral presentations
 - g. Computerized adaptive testing
 - h. In-class discussions
 - i. Group tutorial work
 - j. Reflection writing assignments
 - k. Home assignments
 - l. Self and peer Assessments
 - m. Any other method as may be required for specific course/student by the Course faculty/course coordinator
- vii. Summative Assessments (SA) are used to evaluate student learning, skill acquisition, and academic achievement at the conclusion of a defined instructional period- typically at the end of a project, unit, module, course or semester. SA may be class tests, assignments, or project, used to determine whether students have learned what they were expected to learn. It will be based on evidence, collected using single or multiple ways of assessment. The systematically collected evidence should be kept in record by course faculty/course coordinator and the marks should be displayed on the college notice board/ other official digital platforms of the college before the end semester examinations
- viii. The method of SA will be as follows: (any one as decided by the course faculty/course coordinator)
 - a. Written test
 - b. Open book test
 - c. Laboratory report
 - d. Problem based assignments
 - e. Individual project report
 - f. Case study report

- g. Team project report
 - h. Literature survey
 - i. Standardized test
 - j. Any other pedagogic approach specifically designed for a particular course by the course faculty/course coordinator.
- ix. A student may repeat SA only if there are any compulsive reasons due to which the student could not attend the assessment
 - x. The prerogative of arranging a CCA lies with the course faculty/course coordinator with the approval of SACA-UGP Academic Committee based on justified reasons
 - xi. The course faculty/ course coordinator shall be responsible for evaluating all the components of CCA. However, the university may involve any other person (External or Internal) for evaluation of any or all the components as decided by the Vice-Chancellor/Pro-Vice Chancellor from time to time in case any grievances are raised.
 - xii. Written tests shall be precisely designed using a variety of tools and processes (e.g., constructed responses, open-ended items, multiple-choice), and the students should be informed about the evaluation modalities before the commencement of the course.
 - xiii. The course faculty may provide options for students to improve their performance through continuous assessment mechanism.
 - xiv. There shall be theory and practical examinations at the end of each semester.
 - xv. Regarding evaluation, one credit may be evaluated for 25 marks in a semester; thus, a 4-credit course will be evaluated for 100 marks; and 2-credit courses for 50 marks. However, for tabulation purpose course with 1-credit will be evaluated for 50 marks and will be converted to 25 marks
 - xvi. Odd semester examinations will be conducted by the institution and will be evaluated at the institution level. However, even semester examinations will be conducted and evaluated by internal and external faculty.
 - xvii. Individual Learning Plans (ILPs) and/ or specific assessment arrangements may be put in place for differently abled students. Suitable evaluation strategies including technology assisted examinations/alternate examination strategies will be designed and implemented for differently abled students.
 - xviii. Distribution of CCA & ESE will be as given below

Credit	CCA	ESE
4	30	70
3	25	50
2	15	35

21. Practical Examination

- i. The end semester practical examination will be conducted and evaluated by the institution.
- ii. There shall be a CCA of practical courses conducted by the course faculty course coordinator.
- iii. The scheme of evaluation of practical courses will be as given below:

Components for the Evaluation of Practical Courses	Weightage
CCA of practical/practicum.	30%
ESE conducted under the supervision of internal examiner	70%

- iv. Those who have completed the CCA alone will be permitted to appear for the ESE.
- v. For grievance redressal purposes, the university shall have the right to call for all the records of CCA.
- vi. Duration of Examination
Questions shall be set as per the defined Outcome. The question setter shall ensure that there will be Time and Mode (T & M) flexibility for all External Examinations. BoS can recommend the T&M from the following list.

Mode	Time (in Hours)	
	Minimum	Maximum
Written Examination	1	2
Multiple Choice	1	1.5
Open Book	1	2
Any Other Mode	1	2

22. Evaluation of Project/Dissertation

The evaluation of project work shall be CCA with 30% and ESE 70%. The scheme of evaluation of the Project is given below

Project type	Maximum Marks	CCA	ESE
Research Project of Honours with Research (12 credits)	200	60	140

Project of Honours (8 credits)	100	30	70
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23. Evaluation of Internship

The evaluation of internship shall be done by a committee constituted by the Department Council. The scheme of CCA and ESE is given below:

Components of Evaluation of Internship	Weightage	Marks for Internship 2 Credits / 50Marks
CCA	30%	15
ESE	70%	35

The department council may decide any mode for the completion of the Internship. If in case evaluation is not specified in any of the selected internship programme, institution can adopt a proper evaluation method as per the weightage specified in the table above

24. Letter Grades and Grade Points

A Mark system is followed for evaluating each question. For each course in the semester, letter grades and grade points are introduced in a 10-point indirect grading system as per the guidelines given below,

- i. The Semester Grade Point Average (SGPA) is computed from the grades as a measure of the student's performance in a given semester. The SGPA is based on the grades of the current term, while the Cumulative Grade Point Average (CGPA) is based on the grades in all courses taken after joining the programme of study.
- ii. Based on the marks obtained, the weighted grade point will be mentioned in the student's grade cards.

Letter Grade	Grade Point	Percentage of Marks (Both Internal & External Marks 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	Above 75% and below 85%	
B+ (Good)	7	Above 65% and below 75%	First Class
B (Above average)	6	Above 55% and below 65%	
C (Average)	5	Above 45% and below 55%	Second Class

P(Pass)	4	Above 35% and below 45% Aggregate (external and internal put together) with a minimum of 30% in external	Third Class
F(Fail)	0	Below an aggregate of 35% or Below 30% in external evaluation	Fail
Ab (Absent)	0		Fail

- iii. When students take audit courses, they may be given pass (P) or fail (F) grade without any credits

25. Computation of SGPA and CGPA

The following method is recommended to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- i. The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undertaken by a student in the semester, i.e.

$$SGPA(S_i) = \frac{\sum(C_i \times G_i)}{\sum C_i}$$

Where S_i is the SGPA in the i^{th} semester, C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

$$SGPA = \frac{\text{Sum of the credit points of all the courses in a semesters}}{\text{Total Credits in that semester}}$$

Illustration–Computation of SGPA

Semester	Course	Credit	Letter Grade	Grade point	Credit Point (Credit Grade)
I	DSC A	4	A	8	4x8=32
I	DSC B	4	B+	7	4x7=28
I	DSC C	4	B	6	4x6=24
I	MDC	3	B	6	3x6=18
I	AEC 1	3	O	10	3x10=30
I	AEC 2	3	C	5	3x5=15
	Total	21			147
	SGPA				147/21=7

- ii. The CGPA is also calculated in the same manner considering all the courses undertaken by a student over all the semesters of a programme i.e.

$$\text{CGPA} = \frac{\sum(C_i \times S_i)}{\sum C_i}$$

Where S_i is the SGPA in the i^{th} semester, C_i is the total number of credits in the i^{th} semester.

$$\text{CGPA} = \frac{\text{Sum of the credits of all the courses in six/eight semesters}}{\text{Total Credits in Six(133)/Eight(177) semesters}}$$

- iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

26. Committees to be Constituted for the Implementation and Monitoring of SACA-UGP

- i. There shall be a college level SACA-UGP Academic Co-ordinator/Nodal Officer, academic committee and SACA-UGP department committee in each department.
- ii. The tenure of the college level committees will be 4 years

SACA-UGP Academic Committee

- i. The Principal (Chairman)
- ii. Academic Co-ordinator/Nodal Officer (Convenor)
- iii. All the Heads of Departments in the college
- iv. Four teachers of the college representing different discipline nominated by the college council by rotation
- v. Not less than four experts/academicians from outside the college representing areas such as Industry, Commerce, Education, Sciences etc., to be nominated by the college council preferably from the alumni of the college
- vi. Three nominees of the affiliating University (not less than the designation of associate professor in a college/university department)

Functions of SACA-UGP Academic Committee

- i. Scrutinize, approve, and recommend to the University all the proposals submitted by the department committee with regard to the SACA-UGP such as, academic pathway,

allowed syllabi enrichment/update, details of elective courses, Online courses, blended teaching, courses offering to the students of other HEIs, panel of examiners, summative and formative evaluation tools proposed by the concerned course faculty, new courses and syllabus proposed by the faculty members as signature courses etc. The Academic Committee can differ on any proposal, and it shall have the right to return the matter for reconsideration to the concerned Department committee or reject it, after giving sufficient reasons to do so.

- ii. Scrutiny of all documents related to Teacher Specific Content.
- iii. Recommend to the College Governing Body for starting innovative programmes using the flexibility and holistic nature of the SACA-UGP curriculum framework

SACA-UGP Department Committee

- i. Head of the Department concerned (Chairman)
- ii. The entire faculties of the Department
- iii. Two subject experts from outside the college to be nominated by the MGU-UGP Academic Committee
- iv. One representative from industry/ corporate sector/ allied area relating to placement
- v. One meritorious alumnus of the department to be nominated by the department council
- vi. The department council of the SACA-UGP, may with the approval of the principal of the college, co-opt:
 - (a) Experts from outside the college whenever special courses of studies are to be formulated.
 - (b) Other faculty members of the same Faculty within the college

Functions of SACA-UGP Department Committee

- i. Prepare teacher specific content of syllabi for various courses keeping in view the objectives of the SACA-UGP and submit the same for the approval of the academic committee
- ii. Scrutinize the signature course content and its evaluation techniques.
- iii. Suggest methodologies for innovative teaching and evaluation techniques.
- iv. Suggest panel of examiners to the academic committee.
- v. Coordinate research, teaching, extension and other academic activities in the department/college.

27. Proposed Options for Higher Studies for the Students of SACA-UGP

The following higher studies options at the level of post-graduation/research was described by UGC in the national higher education qualification framework;

- i. The two-year master programme will continue (with an option of having the second year devoted entirely to research) for those who have completed a 3-year UG programme under the SACA-UGP regulations.
- ii. For students who have completed a 4-year honours degree could complete their master programme within one year by acquiring the required credits as per the Post Graduate curriculum framework requirement.
- iii. For enrolling in a PhD programme the candidate should have acquired a master degree or a 4-year honours degree with research.

28. Power to Remove Difficulties

If any difficulty arises in giving effect to the provisions of these Regulations, the Principal may by order make such provisions not inconsistent with the Act, Statutes, Ordinances or other Regulations, which appears to him to be necessary or expedient for removing the difficulty. Every order made under this rule shall be subject to ratification by the Governing body.

29. Modifications to the Regulations

Not with standing anything contained in these Regulations, any amendments or modifications issued or notified by the University Grants Commission or the State Government, from time to time, shall be deemed to have been incorporated into these Regulations and shall constitute an integral part thereof.

Appendix-1

Graduate Attributes (GA) of St. Albert's College (Autonomous)

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that, higher education qualifications are awarded on the basis of demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and academic standards expected. The expected learning outcomes are used as reference points that would help formulate graduate attributes, qualification descriptors, programme outcomes and course outcomes which in turn will help in curriculum planning and development, and in the design, delivery and review of academic programmes. The graduate attributes of St. Albert's College (Autonomous) are:

GA1: Critical thinking and Analytical reasoning

Capability to analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories to develop knowledge and understanding; critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.

GA2: Scientific reasoning and Problem solving

Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective; capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

GA3: Multidisciplinary / interdisciplinary / trans disciplinary Approach

Acquire interdisciplinary / multidisciplinary / transdisciplinary knowledge base as a consequence of the learning they engage with their programme of study; develop a collaborative – multidisciplinary / interdisciplinary / transdisciplinary-approach to formulate constructive arguments and rational analysis for achieving common goals and objectives.

GA4: Intra and Interpersonal skills

Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team; lead the team to guide people to the right destination, in a smooth and efficient way.

GA5: Digital literacy

Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

GA6: Global citizenship

Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

GA7: Social Competency

Ability to contemplate on the impact of research findings on conventional practices, and a clear understanding of responsibility towards societal needs, and reaching the targets for attaining inclusive and sustainable development.

GA8: Equity, Inclusiveness and Sustainability

Appreciate equity, inclusiveness and sustainability and diversity; acquire ethical and moral reasoning and values of unity, secularism and national integration to enable to act as dignified citizens; able to understand and appreciate diversity (caste, ethnicity, gender and marginalization), managing diversity and use of an inclusive approach to the extent possible.

GA9: Lifelong Learning

Ability to acquire knowledge and skills, including learning how to gain knowledge, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of workplace through knowledge / skill development/ reskilling.

Programme Outcomes (PO)**PO1: Critical thinking and Analytical reasoning**

Capability to analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories to develop knowledge and understanding; critical sensibility to lived experiences, with self-awareness and reflexivity of both the self and the society.

PO2: Scientific reasoning and Problem solving

Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective; capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO3: Multi-disciplinary/interdisciplinary/transdisciplinary Approach

Acquire interdisciplinary/multidisciplinary/transdisciplinary knowledge base, as a result of the learning they engage within their programme of study; develop a collaborative-multidisciplinary/interdisciplinary/transdisciplinary-approach to formulate constructive arguments and rational analysis for achieving common goals and objectives.

PO4: Communication Skills

Ability to express thoughts and ideas effectively in writing and in speech; communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

PO5: Leadership Skills

Ability to work effectively and lead respectfully with diverse teams; setting direction, formulating an inspiring vision, building a team that can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.

PO6: Social Consciousness and Responsibility

Ability to contemplate on the impact of research findings on conventional practices, and a clear understanding of responsibility towards societal needs and reaching the targets for attaining inclusive and sustainable development.

PO7: Equity, Inclusiveness and Sustainability

Appreciate equity, inclusiveness and sustainability and diversity; acquire ethical and moral reasoning and values of unity, secularism and national integration to enable to act as dignified citizens; able to understand and appreciate diversity (caste, ethnicity, gender and marginalization), managing diversity and use of an inclusive approach to the extent possible.

PO8: Moral and Ethical Reasoning

Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour.

PO9: Networking and Collaboration

Acquire skills to be able to collaborate and network with educational institutions, research organisations and industrial units in India and abroad.

PO10: Lifelong Learning

Ability to acquire knowledge and skills, including “learning how to learn”, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of workplace through knowledge/skill development/reskilling.



Syllabus IndexName of the Major Subject: **Industrial Fisheries****Semester: 1**

Course Code	Title of the Course	Type of the Course	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
24SACIFH1DA101	Exploring the Blue World	DSC A	4	5	3	0	2	0
24SACIFH1MD101	Ocean Fantasy	MDC	3	4	2	0	2	0

L — Lecture, T — Tutorial, P — Practical/ Practicum, O — Others

Semester: 2

Course Code	Title of the Course	Type of the Course	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
24SACIFH2DA101	Introduction to Fisheries Science	DSC A	4	5	3	0	2	0
24SACIFH2MD101	Ornamental Fisheries	MDC	3	4	2	0	2	0

Semester: 3

Course Code	Title of the Course	Type of the Course	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
24SACIFH3DA101	Finfish and Shellfish Taxonomy	DSC A	4	5	3	0	2	0

24SACIFH3DA102	Inland and Marine Fisheries	DSC A	4	4	4	0	0	0
24SACIFH3DB101	Introduction to Capture Fisheries	DSC B	4	5	3	0	2	0
24SACIFH3DE101	Introduction to Hatchery Technology of Finfish	DSE 1	4	5	3	0	2	0
24SACIFH3MD101	Value Added Fishery Products	MDC	3	3	3	0	0	0
24SACIFH3VA101	Health benefits of seafood	VAC	3	3	3	0	0	0

Semester: 4

Course Code	Title of the Course	Type of the Course	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
24SACIFH4DA101	Finfish and Shellfish Biology	DSC A	4	5	3	0	2	0
24SACIFH4DA102	Introduction to Fish Harvest Technology	DSC A	4	5	3	0	2	0
24SACIFH4DB101	Introduction to Fish Processing and Value Addition	DSC B	4	5	3	0	2	0
24SACIFH4DE101	Introduction to Hatchery Technology of Shellfish	DSE 2	4	5	3	0	2	0
24SACIFH4SE101	Fish Feed Technology	SEC	3	3	3	0	0	0
24SACIFH4VA101	Waste management in seafood processing	VAC	3	3	3	0	0	0

Semester: 5

Course Code	Title of the Course	Type of the Course	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
24SACIFH5DA101	Freezing and Canning Technology	DSC A	4	5	3	0	2	0
24SACIFH5DA102	Fishery By products	DSC A	4	4	4	0	0	0
24SACIFH5DE101	Fish Packaging Technology	DSE 3	4	4	4	0	0	0
24SACIFH5DE102	Value Addition of Seafood	DSE 4	4	4	4	0	0	0
24SACIFH5DE103	Principles of Fisheries Management	DSE 5	4	4	4	0	0	0
24SACIFH5SE101	Commercial Ornamental Fish Breeding and Culture	SEC	3	4	2	0	2	0

Semester: 6

Course Code	Title of the Course	Type of the Course	Credit	Hours/ week	Hour Distribution /week			
					L	T	P	O
24SACIFH6DA101	Seafood Microbiology	DSC A	4	5	3	0	2	0
24SACIFH6DA102	Seafood Quality Assurance and Management	DSC A	4	4	4	0	0	0
24SACIFH6DE101	Fisheries Economics and Extension	DSE 6	4	4	4	0	0	0

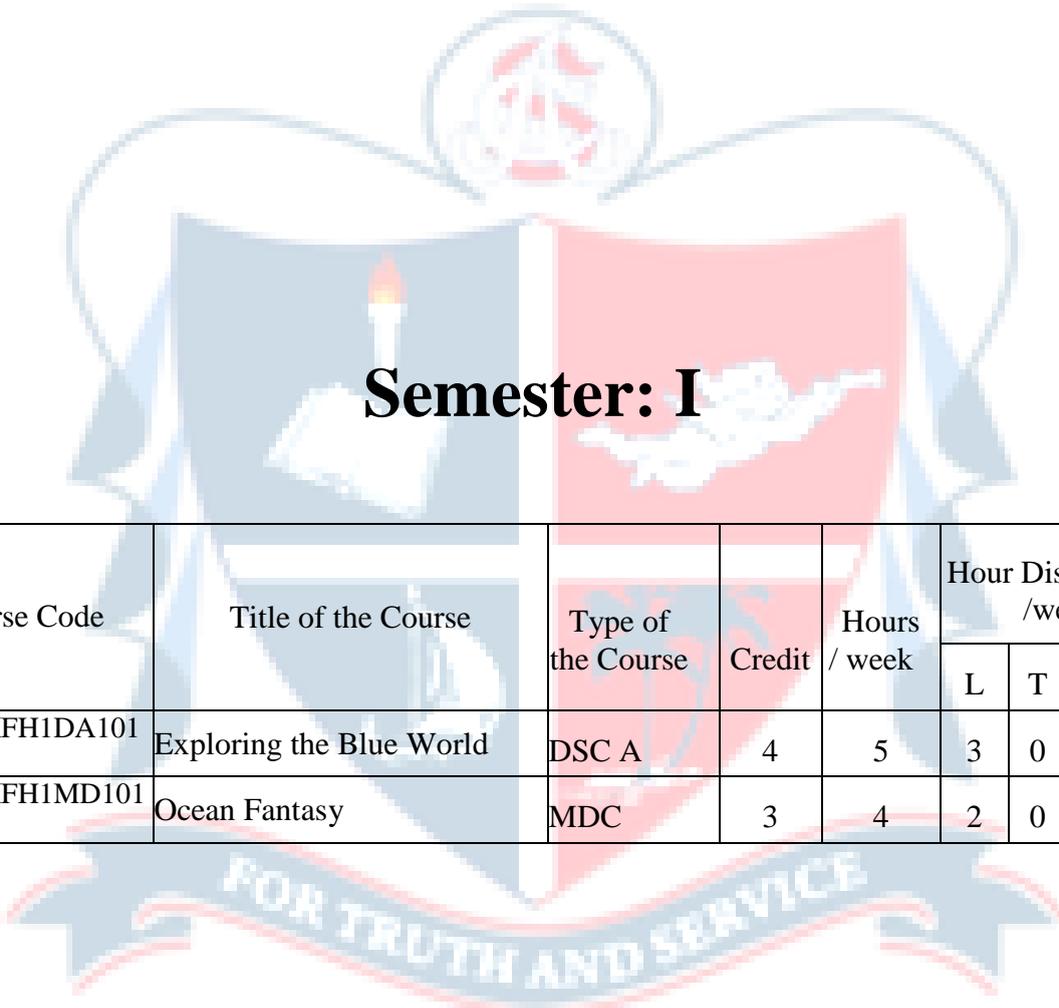
24SACIFH6DE102	Aquatic Animal Health Management	DSE 7	4	5	3	0	2	0
24SACIFH6SE101	Fish Farm Practices	SEC	3	4	2	0	2	0
24SACIFH6VA101	Sustainable Fisheries Management	VAC	3	3	3	0	0	0

Semester: 7

Course Code	Title of the Course	Type of the Course	Credit	Hours/week	Hour Distribution /week			
					L	T	P	O
24SACIFH7CC101	Fisheries Administration and Legislation	DCC	4	4	4	0	0	0
24SACIFH7CC102	Fisheries Marketing and Seafood Trade	DCC	4	4	4	0	0	0
24SACIFH7CC103	Fish Genetics and Biotechnology	DCC	4	5	3	0	2	0
24SACIFH7CE101	Oceanography	DCE	4	4	4	0	0	0
24SACIFH7CE102	Fish farm Engineering and Aquaculture Techniques	DCE	4	4	4	0	0	0
24SACIFH7CE103	Fishery Ecology	DCE	4	4	4	0	0	0

Semester: 8

Course Code	Title of the Course	Type of the Course	Credit	Hours/ week	Hour Distribution /week			
					L	T	P	O
24SACIFH8CC101	Biostatistics and Computer Application	DCC	4	5	3	0	2	0
24SACIFH8CC102	Research Methodology in Fisheries	DCC	4	5	3	0	2	0
24SACIFH8CE101	Seafood toxins and pollutants	DCE	4	5	3	0	2	0
24SACIFH8CE102	Fish Stock Assessment and Management	DCE	4	5	3	0	2	0
24SACIFH8CE103	Disaster Management in Fisheries	DCE	4	5	3	0	2	0
	Project		12					



Semester: I

Course Code	Title of the Course	Type of the Course	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
24SACIFH1DA101	Exploring the Blue World	DSC A	4	5	3	0	2	0
24SACIFH1MD101	Ocean Fantasy	MDC	3	4	2	0	2	0



Department of Fisheries and Aquaculture
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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Exploring the Blue World					
Type of Course	DSC A					
Course Code	24SACIFH1DA101					
Course Level	100					
Course Summary	The course is designed to produce an overview on the water resources and the fascinating life that it supports. The course also provides information on the vast opportunities in the fields of marine careers and the management activities adopted to conserve the fisheries resources.					
Semester	I	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities (1.6, 3.5)	75
Pre-requisites, if any	Students with varied backgrounds in science or arts may find the course relevant to their academic interests and professional aspirations.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Explain the different types of water resources and the different properties of water.	U	1
2	Identify the major forms of life in the water, their major characteristics and the interconnectedness among the biotic components of the water.	A	1
3	Outline the fascinating phenomenon exhibited by different life forms water.	U	1

4	Summarize the role of water as a non-living energy resource.	U	1
5	Examine the thrilling career opportunities in water.	An	7
6	Explain the role of major research institutes in water resource management and conservation of fisheries resources.	U	6
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Water Resources and Fascinating life in water		21 Hours	
	1.1	Water resources – Oceans, rivers, lakes, wetlands	2	1
	1.2	Properties of water – Physical: temperature, colour, odour, total dissolved solids and total suspended solids, Chemical: major inorganic and organic constituents, dissolved gases, DO, COD, BOD, acidity and alkalinity	2	1
	1.3	Major inland water types.	2	1
	1.4	Major oceans of the Earth and Oceanic zones - pelagic, benthic, euphotic, aphotic divisions	2	1
	1.5	Salient features of reservoir limnology	2	1
	1.6	Activity: Field visit to different water bodies	2	1
	1.7	Life forms in the water bodies - Definition and examples of phytoplankton, zooplankton, benthos and nekton. Ecological succession and pyramids - Marine food chains and food webs	2	2
	1.8	Animal interactions - Symbiosis, commensalism, parasitism, prey-predator relationship, host parasite relationship.	2	2
	1.9	Mechanism of Bioluminescence in marine organisms	2	3

	1.10	Boring and fouling organisms. Harmful Algal Blooms (HABs)	2	3	
	1.11	Poisonous fishes. Exotics	1	3	
2	Natural resources from water, Water Resource Management and Conservation of fisheries resources			14 Hours	
	2.1	Living natural resources	3	4	
	2.2	Non-Living natural resources	3	4	
	2.3	Overexploitation of water resources. Activities of major institutes associated with water resource management and research.	4	6	
	2.4	Threats to biodiversity. Conservation of biodiversity – <i>in situ</i> conservation (marine parks and sanctuaries) and <i>ex situ</i> conservation (tissue culture, gene banks)	4	6	
3	Exploring the career paths in water			10 Hours	
	3.1	Insight into exciting careers in “Water”	2	5	
	3.2	Aquaculture worker, Aquarist, Hydrologist	2	5	
	3.3	Scuba diving Instructor and underwater film maker	2	5	
	3.4	Marine scientist, marine life rescue, Ocean engineering, marine mammal trainer, marine archaeology	2	5	
	3.5	Activity: Invited lectures from established aquaculturists and marine professionals	2	5	
4	Practical			30 Hours	
	4.1	Determination of physico-chemical characteristics of water bodies.	6	1	
	4.2	Collection and identification of phytoplankton.	4	1	
	4.3	Collection and identification of zooplankton.	4	1	
	4.4	Collection and identification of benthos.	4	1	
	4.5	Collection and identification of nekton.	4	1	

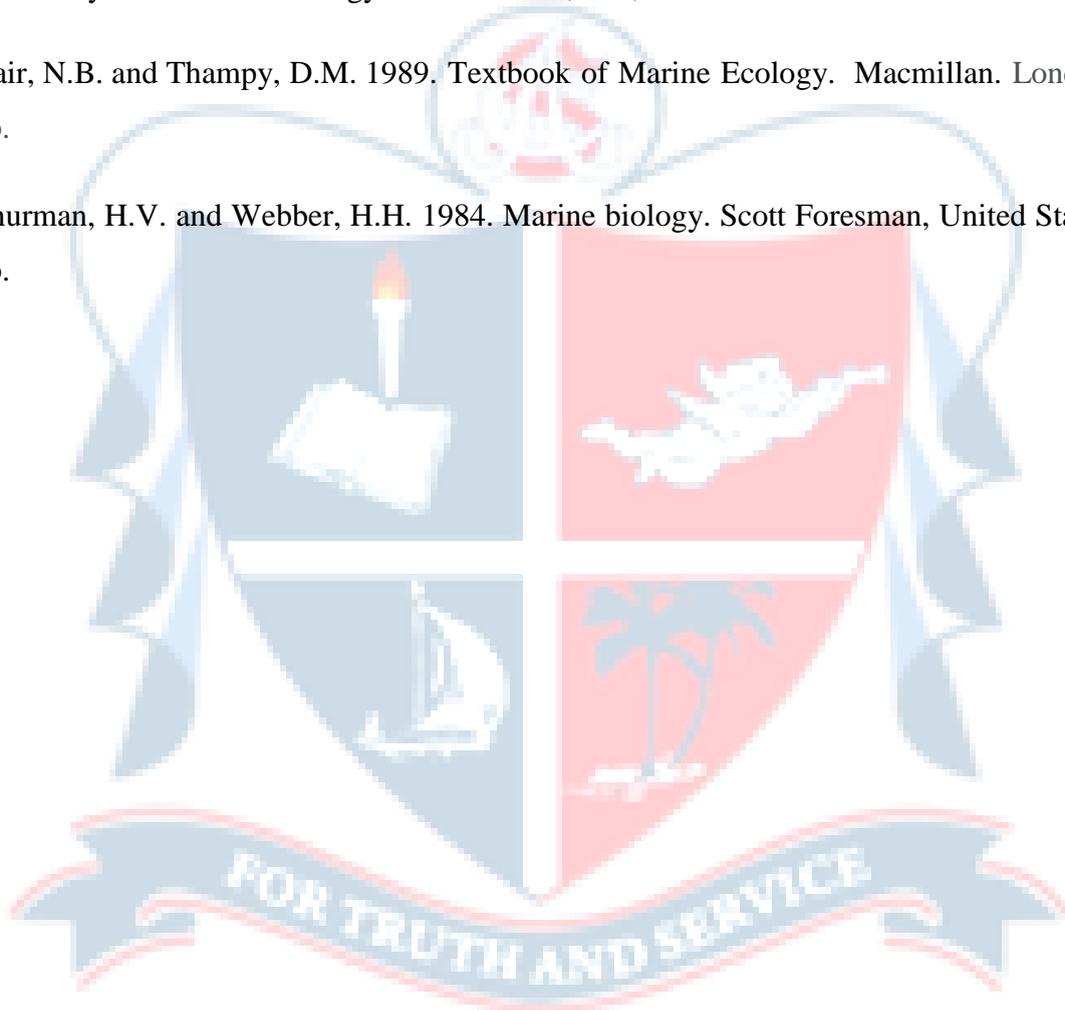
	4.6	Visit to Oceanographic Institutes and familiarization of equipment used in oceanographic research.	5	3
	4.7	Demonstration of scuba diving.	3	3
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

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St. Albert's College (Autonomous)
Ernakulam**

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Ocean Fantasy					
Type of Course	MDC					
Course Code	24SACIFH1MD101					
Course Level	100					
Course Summary	The course is designed to provide an overview on the origin of oceans and the fascinating life that it supports. The course also provides information on the vast opportunities offered by the ocean in the fields of marine careers and the management activities adopted to conserve the fisheries resources.					
Semester	I	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2		1	Activities (1.4, 2.6)	60
Pre- requisites, if any	Students should possess a basic knowledge in general sciences.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Explain the evolution of oceans, its zonation and the underlying factors that affect the physical properties of water.	U	1
2	Identify the major forms of life in the oceans, their major characteristics and their associations with one another ecologically.	A	1
3	Outline the fascinating phenomenon exhibited by different life forms in the ocean.	U	1

4	Summarize the role of oceans as a non-conventional form of energy resource offering mineral wealth.	U	1
5	Examine the thrilling opportunities offered by the oceans to explore marine careers.	An	7
6	Explain the role of oceanic research institutes in management and conservation of fisheries resources.	U	6
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

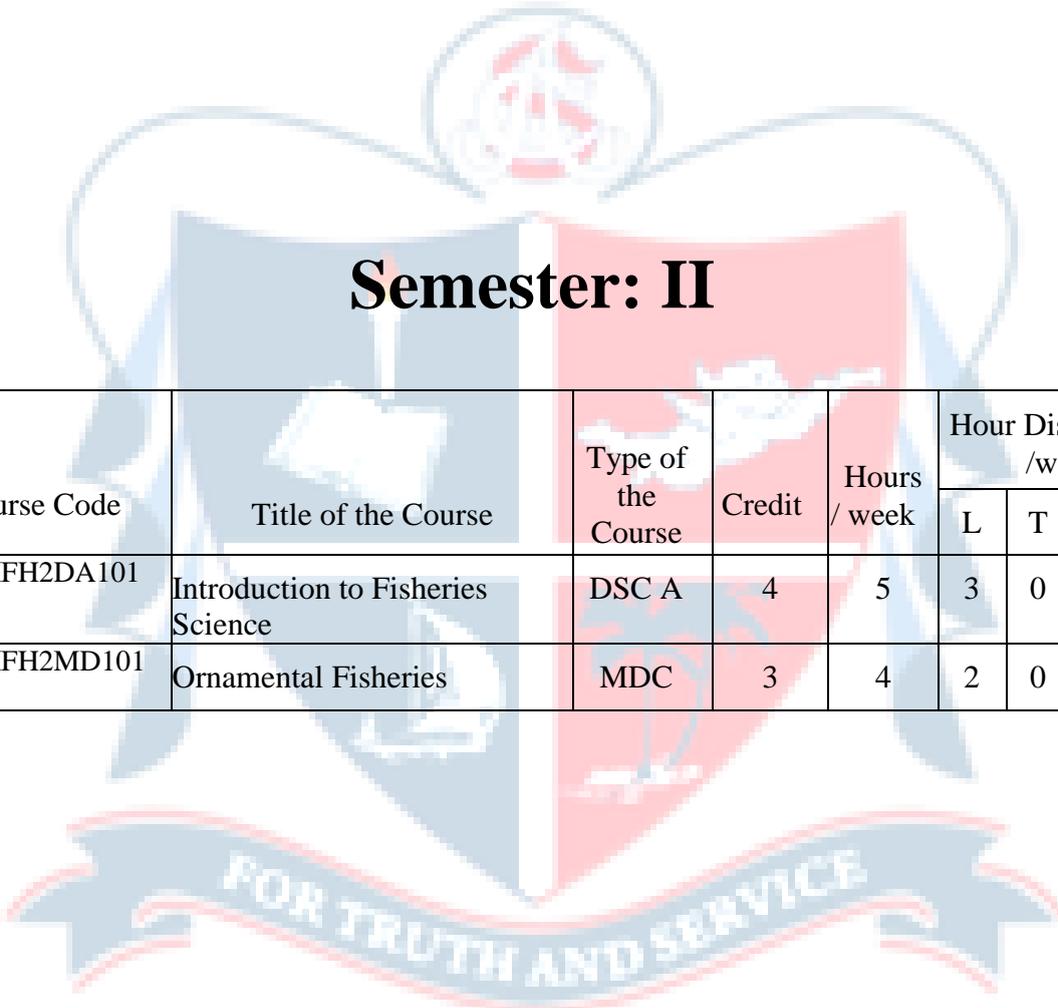
Module	Units	Course description	Hrs	CO No.
	Introduction to ocean and ocean life		19 Hours	
1	1.1	Origin of oceans	1	1
	1.2	Principal oceans of the Earth.	1	1
	1.3	Important physical properties of ocean – colour, depth, weather, waves, swell, tides.	2	1
	1.4	Activity: Preparation of 3-D models of the oceanic zones	2	1
	1.5	Definition and examples of phytoplankton, zooplankton, benthos and nekton.	2	2
	1.6	Mechanism of Bioluminescence in marine organisms	2	3
	1.7	Poisonous fishes. Harmful Algal Blooms (HABs)	3	3
	1.8	Introduction to animal associations: Symbiosis, commensalisms, parasitism, prey-predator relationship, host parasite relationship.	2	3
	1.9	Conservation of habitats, marine parks and sanctuaries. Conservation programmes for endangered species, <i>ex situ</i> and <i>in situ</i> conservation.	4	6
	Careers and Research in Marine Science		11 Hours	
	2.1	Careers in marine science	1	5
	2.2	Ocean engineering, marine mammal trainer, marine archaeology	1	5

2	2.3	Scuba diving Instructor and underwater film maker	1	5
	2.4	Marine scientist, marine life rescue	1	5
	2.5	Activities of major institutes associated with oceanographic study and research.	5	6
	2.6	Activity: Invited lectures from established marine professionals	2	5
3	Practical		30 Hours	
	3.1	Collection and identification of phytoplankton.	5	1
	3.2	Collection and identification of zooplankton.	5	1
	3.3	Collection and identification of benthos.	5	1
	3.4	Collection and identification of nekton.	5	1
	3.5	Visit to Oceanographic Institutes and familiarization of equipment used in oceanographic research.	7	3
	3.6	Demonstration of scuba diving.	3	3
4	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 15 Marks Practical – 10 Marks
	B. Semester End Examination Theory MCQ (15 out of 15) 15 X 1=15 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Total - 35 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 10 Marks Record = 3 Marks Viva = 2 Marks Total – 15 Marks

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Semester: II

Course Code	Title of the Course	Type of the Course	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
24SACIFH2DA101	Introduction to Fisheries Science	DSC A	4	5	3	0	2	0
24SACIFH2MD101	Ornamental Fisheries	MDC	3	4	2	0	2	0



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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	An Introduction to Fisheries Science					
Type of Course	DSC A					
Course Code	24SACIFH2DA101					
Course Level	100					
Course Summary	This course provides an overview of the fundamental concepts and principles in fisheries science. Topics covered include fish biology, ecology, fisheries management, conservation, and the role of fisheries in global food security and opportunities in fisheries.					
Semester	II	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities (3.1, 3.2, 3.3, 3.4, 4.2)	75
Pre-requisites, if any	Students should possess basic knowledge in fisheries.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Develop knowledge in the history and the importance of fisheries in global economy	U	1
2	Demonstrate a working knowledge of the foundational concepts of biology, including cellular, ecological and evolutionary biology	U, A, S	1,2
3	Knowledge of the types of fishing crafts and gear in India as well the traditional, motorized and mechanized fishing vessels.	U	1
4	Adept in the principles of management and the scientific techniques of management, define and use newly acquired terms and concepts related to fisheries and fisheries management, Clear understanding of human resource management in the fisheries business environment.	U, A	2,3

5	Explain and compare the different approaches, techniques and measures employed to manage fish stocks in a sustainable manner.	U, A	6
6	Understand the importance of economics in aquaculture development and relate the socio-economics impacts with rural development.	U	1
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Fisheries Ecology, Fish Biology & Classification			
	1.1	Definition and scope of fisheries science, Historical development of fisheries science, Importance of fisheries in global economies, Present status and opportunities in Fisheries.	5	1
	1.2	Ecosystem dynamics and fish populations, Trophic relationships in aquatic ecosystems, Fisheries and biodiversity.	5	2
	1.3	Introduction to of fish anatomy and physiology, Brief on Classification of commercially important fish and shellfish species, Life history strategies and adaptations.	5	2
2	Aquaculture Practices, Post-harvest methods and Fishing Technology			
	2.1	Extensive culture, Semi-intensive culture, Intensive culture, monoculture, polyculture, composite fish culture, pen-culture, cage culture, raceway culture, integrated fish culture, Rack culture, raft culture, open system, closed system. Activity: Visit fish farms	5	2
	2.2	Ornamental fish culture, Brief on Sustainable aquaculture practices, Role of aquaculture in meeting global food demand. Activity: Visit ornamental fish farm and submit record	5	2
	2.3	Introduction to fishing methods, Introduction to Fishing craft: Traditional and modern fishing craft, Classification of fishing gear: Active and Passive fishing gear Activity: Visit to harbour and boat building yard	5	3
	2.4	Major fish preservation techniques, Fish products, by products and value-added products. Activity: Visit Fish Processing Plants	5	4
3	Fisheries Resource Management and Economics			
	3.1	Overfishing and depletion of fish stocks, Habitat degradation and loss, Conservation measures and sustainable practices:	5	5

		Trawl ban, closed season, Mesh size regulation, MPA, Quota management, fish sanctuaries, marine parks.		
	3.2	Fisheries administration: state level, Fisheries research and educational Institutions. Activity: Institutional visit	3	5
	3.3	Role of fisheries in local and global economies, Market dynamics and trade in fish products, GDP	2	6
4	Practical			
	4.1	Identification of commercially important species	4	2
	4.2	Identify life cycle of finfish	4	2
	4.3	Identify fish scales (Cycloid, Ctenoid and Placoid)	6	2
	4.4	Demonstration of aquaculture practices (Any 2)	6	2
	4.5	Identification of tradition fishing gear	4	3
	4.6	Identification of modern fishing gear	4	3
	4.7	Identification of fishing craft	2	3
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	<p>Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks</p>
	<p>B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks</p>

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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Ornamental Fisheries					
Type of Course	MDC					
Course Code	24SACIFH2MD101					
Course Level	100					
Course Summary	<p>Course provides knowledge on diversity of ornamental fish and plants, history and development of aquarium keeping and ornamental fish culture, principles of setting up and management of aquaria, breeding biology of various ornamental fishes, commercial farming techniques, seed production, packing and transportation of ornamental fishes, feeding and nutrition of ornamental fishes, prophylaxis and quarantine and disease management, live feed culture and formulation of feeds, water quality management, preparation of artificial sea water and diseases and health management, and application of modern biological and biotechnological tools for genetic improvement. Besides this, practical training imparted on aquarium keeping and ornamental fish culture would provide them with opportunities for seeking self-employment in this sector.</p>					
Semester	II	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2		1	Activities (1.1,1.2)	60
Pre-requisites, if any	Students should possess a basic understanding on ornamental fishes					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Illustrate the design, construction and setting up of home and public aquaria.	U	2
2	Illustrate the breeding, larval rearing of freshwater and marine ornamental fishes in addition to water quality management.	U	2
3	Develop skill on the handling and transport of aquarium fishes and other ornamental organism for trade and research purposes.	AP	2

4	Develop technical know-how for ornamental fish nutrition and disease management.	AP	1, 2
5	Illustrate the importance of ornamental fish culturing in relation with entrepreneurship development.	U, AP	10
6	Demonstrate skills to develop commercial units for ornamental fish production.	U	2 & 10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Introduction to Aquarium			
	1.1	Introduction to aquarium. Design and construction of public fresh water and marine aquaria. Aquarium accessories Activity - Construction of an aquarium	4	1
	1.2	Setting up of fresh water aquarium – under gravel filter, pebbles, plants, drift wood. Setting up of Marine aquarium. Ornamental objects and selection of fishes. Preparation of artificial sea water Activity – Setting up of aquarium	4	1
	1.3	Aquascaping	2	1
	1.4	Trade regulations and Wildlife act in relation to ornamental fishes.	1	5
	1.5	Prerequisites for the establishment of ornamental fish breeding and culture unit for entrepreneurship development	2	5
	1.6	Socio-economic upliftment of women through ornamental fish farming.	2	5
2	Freshwater and marine Ornamental Fishes			
	2.1	Freshwater ornamental fishes –varieties, Marine ornamental fishes–varieties and their habitats. Indigenous ornamental fishes. Method of collection of live fish and transportation.	4	2
	2.2	Brood stock management; breeding and larval rearing of live bearer – Guppy, Brood stock management; breeding and larval rearing of egg layers –Gold fish	4	2
	2.3	Aquarium fish feeds – Live feeds, Dry and wet feeds. Common parasites infesting ornamental fishes. Bacterial, viral, fungal diseases of ornamental fishes, symptoms and treatments.	4	2 & 3
	2.4	Other ornamental organisms – anemones, worms, lobsters,	1	2 & 3

		shrimps, octopus, starfish and Fresh water ornamental plants.		
	2.5	Breeding of marine ornamental fishes (clown and damsel fishes) and larval rearing.	2	3
3	Practical			
	3.1	Fabrication of all-glass aquarium demonstration	6	1
	3.2	Setting-up and maintenance of aquarium	6	1
	3.3	Introduction to Aquarium accessories and equipments.	2	1
	3.4	Setting-up and maintenance of marine aquarium	5	1
	3.5	Identification of common Live bearing ornamental fishes	1	2
	3.6	Identification of Egg laying ornamental fishes	2	2
	3.7	Identification of major marine ornamental fishes	2	2
	3.8	Conditioning and packing of ornamental fishes	1	3
	3.9	Conduct a captive breeding program for any one of the ornamental fishes following the standard protocols (Egg scatterer, Fish with parental care or Live bearer)	5	2
4	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 15 Marks Practical – 10 Marks
	B. Semester End Examination Theory MCQ (15 out of 15) 15 X 1=15 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Total - 35 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 10 Marks Record = 3 Marks Viva = 2 Marks Total – 15 Marks

References

1. Ramachandran, A. (2002). Manual on breeding, farming and management of ornamental fishes. School of Industrial Fisheries, Cochin, India.
2. Biswas, SP., Das, JN., Sarkar, UK and Lakra, WS (2007). Ornamental Fishes of North East India: An Atlas. ICAR, National Bureau of Fish Genetic Resources, Lucknow, India.
3. Dick Mills (1998). Aquarium Fishes, Dorling Kindersly Ltd., London.
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2. Training Manual on Freshwater Ornamental Fish Breeding and Aquascaping Techniques (2019), Haridas, H. et al, ICAR-Central Island Agricultural Research Institute, Port Blair, India.
3. The Simple Guide to Freshwater Aquariums" by David E. Boruchowitz.

Semester: III

Course Code	Title of the Course	Type of the Course	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
24SACIFH3DA101	Finfish and Shellfish Taxonomy	DSC A	4	5	3	0	2	0
24SACIFH3DA102	Inland and Marine Fisheries	DSC A	4	4	4	0	0	0
24SACIFH3DB101	Introduction to Capture Fisheries	DSC B	4	4	3	0	2	0
24SACIFH3DE101	Introduction to Hatchery Technology of Finfish	DSE 1	4	5	3	0	2	0
24SACIFH3MD101	Value Added Fishery Products	MDC	3	3	3	0	0	0
24SACIFH3VA101	Health benefits of seafood	VAC	3	3	3	0	0	0



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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Finfish and Shellfish Taxonomy					
Type of Course	200					
Course Code	24SACIFH3DA101					
Course Level	DSC A					
Course Summary	This course provides a comprehensive study of the morphology and taxonomy of finfish and shell fish, emphasizing the structural diversity, classification, and identification of species. Students will gain theoretical knowledge and practical skills in finfish/shellfish morphology and taxonomy through lectures, laboratory work, and field experiences.					
Semester	III	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities	75
Pre-requisites, if any	Students from diverse backgrounds, including biology, environmental science, chemistry, geology, or related disciplines, may find this course relevant to their academic interests and career goals.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Understand the fundamental principles of taxonomy	U	1
2	Analyse the role of morphological characteristics in classical taxonomy and its integration with modern molecular approaches	An, A	1,2
3	Develop skill in using dichotomous keys for the accurate identification of the selected commercially important fish species. Manifest skill in differentiating morphological features of fish specimens belonging to different families	C,S	1,2
4	Understand and develop fundamental skills in identification of bivalve molluscs	E	1,4,5

5	Understand and Develop fundamental skills in identification of gastropod molluscs	S	3
6	Understand and Develop fundamental skills in identification of major crustaceans	E,C	1,3
*Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
vi. Principles of taxonomy - Conventional and modern taxonomic techniques			15 hours	
1	1.1	Basic principles of biological classification	1	1
		Kinds of classification- Phenetic, natural, cladistics, evolutionary and omnispersive classification	1	1
	1.3	Concept of species; Kinds of species-allopatric, sympatric, insular, panmictic and apomictic, and polytypic species. hierarchy. Levels of taxonomy, Alpha, Beta and Gamma taxonomy	2	1
	1.4	International Code of Zoological Nomenclature; kinds of names- tautonyms, synonymy, homonymy. Typification, type and its kinds - primary types eg:holotype, lectotype and paratype, syntype, neotype	2	1
	1.5	Collection, preservation, labeling and curation methods	3	2
	1.6	Morphology, morphometric and meristic characters of fishes	3	2
	1.7	Molecular techniques in finfish and shellfish classification- Karyotyping, DNA barcoding technique- DNA isolation, DNA quantification, DNA amplification, DNA sequencing, Electrophoresis (any fish/ mollusc); Metabarcoding.	3	2
vii. Taxonomy of finfishes			15 Hours	
	2.1	Classification of Super class Agnatha with examples (include systematic position and general/specific characters)	2	3
	2.2	Classification of Super class Gnathostomata -Grade Pisces with examples (include systematic position and general/specific characters)	2	3

	2.3	Classification of Class Chondrichthyes (Subclass Elasmobranchii and Holocephali) with examples (include systematic position and general/specific characters)	2	3
	2.4	Classification of Class Osteichthyes (Subclass Dipnoi, Crossopterygii and Actinopterygii) with examples (include systematic position and general/specific characters)	3	3
	2.5	Classification of Actinopterygii (Infraclass Chondrostei, Holostei and Teleostei) with examples (include systematic position and general/specific characters)	3	3
	2.6	General characters of Orders/Families of Commercially important species (Clupidae, Scombridae, Siluridae, Carangidae, Leiognathidae, Sciaenidae, Trichiuridae, Nemipteridae, Serranidae, Harpodontidae, Aridae).	3	3
viii. Bivalves, Gastropod, cephalopod & crustacean morpho-taxonomy 15 Hours				
	3.1	Systematic position of bivalve molluscs	1	4
	3.2	ix. Morphological characteristics of bivalves x. Activity: Identify a bivalve from your neighborhood aquatic system	2	4
	3.3	Taxonomy of selected commercially important bivalves (<i>Crassostrea spp.</i> , <i>Perna spp.</i> , <i>Pinctada spp.</i> , <i>Scallops</i>)	2	4
	3.4	Classification of gastropod and cephalopod molluscs	1	5
	3.5	<ul style="list-style-type: none"> Morphological characteristics of gastropods and cephalopod (<i>Xancus</i>, <i>Sepia</i>, <i>Loligo</i>, <i>Octopus</i>, <i>Nautilus</i>) Activity: Identify a gastropod and cephalopod from your neighborhood aquatic system 	4	5
	3.6	Classification & systematics of crustaceans	2	6
	3.7	<ul style="list-style-type: none"> Morphological characteristics of major crustacean groups-<i>P. indicus</i>, <i>Scylla serrata</i> and <i>Panilurus homarus</i> Activity: Identify a crustacean from your neighborhood aquatic system 	3	6
Practical 30 Hours				
4	4.1	Dichotomous Key Identification of selected fish species	5	1,2,3
	4.2	Identification of fishes up to species level	5	1,2,3

	4.3	Identification of larvae of cultivable fishes (Carps).	5	1,2,3
	4.4	Dichotomous Key Identification of commercially important bivalves	5	1,4
	4.5	Identification of larval stages of molluscs	5	1,5
	4.6	Identification of larval stages of crustaceans	5	1,6

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	<p>Mode of Assessment</p> <p>A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks</p> <hr/> <p>B. Semester End Examination</p> <p>Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks</p> <p>Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks</p>

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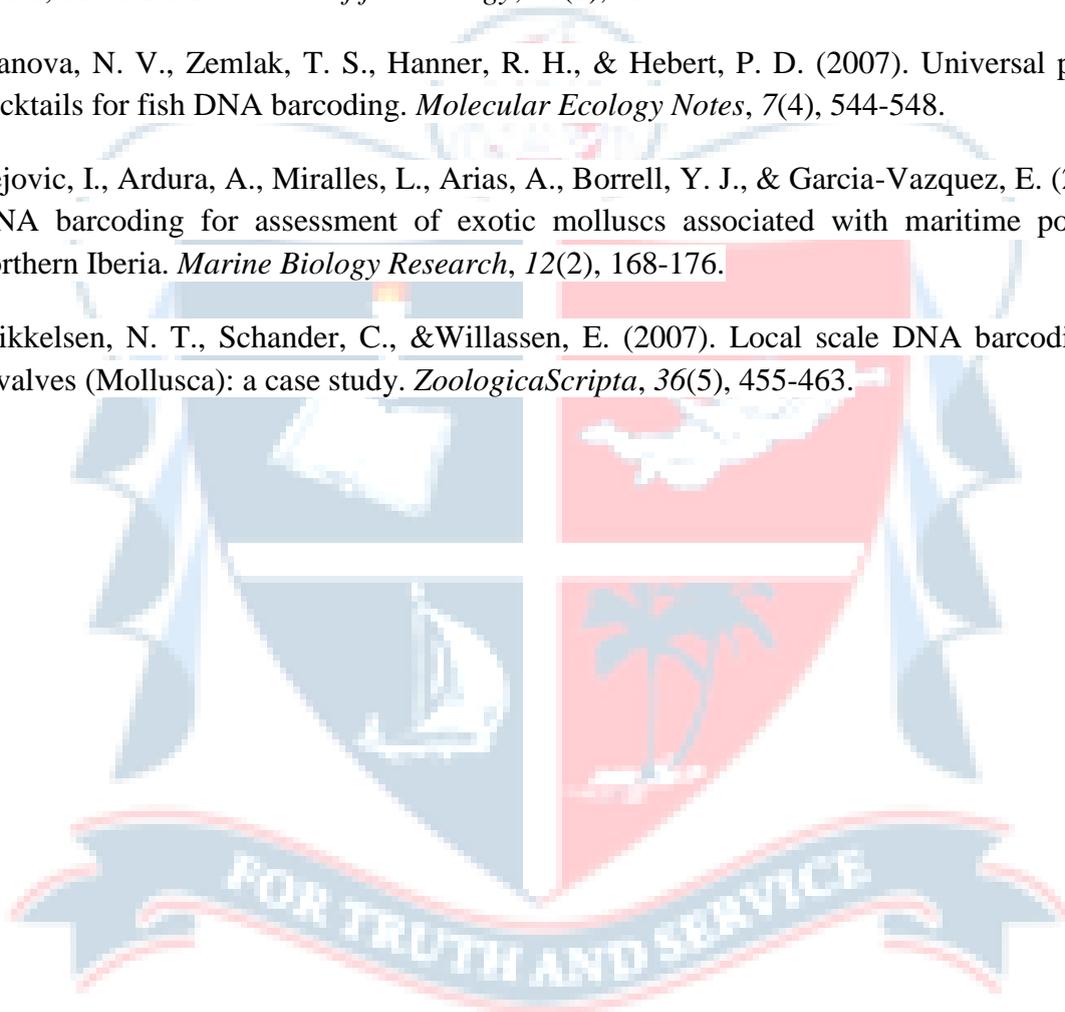
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Department of Fisheries and Aquaculture St. Albert's College (Autonomous) Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Inland and Marine fisheries					
Type of Course	DSC A					
Course Code	24SACIFH3DA102					
Course Level	200					
Course Summary	The course introduced to study the basics of marine and inland waters of the world and India, their fish fauna; global fish production trends; major fish producing countries and ecosystems; detailed account on pelagic, demersal, deep sea, riverine, lacustrine, reservoir, wetlands and estuarine fisheries, including crafts and gears; The students will get practical training on collection and identification of marine and inland fishery resources, demonstration of craft and gears and biometric studies through the visits to fish landing centres					
Semester	III	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4			Activities (1.4,1.6,2.3, 2.6,4.3)	60
Pre- requisites, if any	Students should possess basic knowledge in fish processing.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Students are able to understand the different types of inland fisheries resources of the world and India	U	1,2
2	Acquire knowledge regarding the present status of marine fisheries	A	1,2
3	Categorize and estimate the species wise landing pattern of pelagic fishery resources of India	An, C	1,2

4	Categorize and estimate the species wise landing pattern of demersal fishery resources of India	An,C	1,2
5	Formulate deep sea fishing policy of India	C,S	1,2,6
6	Evaluate the present status of crustacean and molluscan fishery resources of India	E	1,2
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Inland fishery resources			
	1.1	Major inland waters of the world and India, their fish fauna; global inland fish production trends; major inland fish producing countries and ecosystems.	3	1
	1.2	Major river systems of India and Kerala and their fisheries. Current status, trend, and fishing methods of riverine fisheries	2	1
	1.3	Classification of reservoirs, present productivity levels and fishery potentials. Problems and prospects of reservoir fisheries in India. Measures to increase their production and economic management of reservoirs	3	1
	1.4	Estuarine fisheries resources of India, Fisheries of major estuarine systems in India and Kerala. Fishing methods, recent statistics of catches, problems encountered in fisheries development of major estuaries <i>Activity: Collection and identification of fishes from rivers, reservoirs, lakes, estuaries and wetlands</i>	6	1
	1.5	Lacustrine fisheries: Fish fauna of natural lakes. Management and conservation of fisheries of lakes	2	1
	1.6	Flood-plain capture fishery- present status of their exploitation and future prospects. Bheel fisheries resources of India: Open and closed bheels <i>Activity: Classify the different types of crafts and gear used in inland fishing</i>	5	1
2	Marine fishery resources			
	2.1	Introduction to marine fisheries of the world; Major fishing zones of world and India. Global marine fish production trends. FAO status	3	2
	2.2	Introduction to marine fisheries of India. Pelagic, demersal	2	2

		and deep-sea fishery resources		
	2.3	Pelagic fisheries of India: sardines, mackerels, anchovies, white baits, tuna, seer fish, carangids, ribbonfish, shads and other clupeids, barracudas, Bombay duck, pomfrets, mullets <i>Activity- Visit- Marine fish landing Centre, Collection and identification of commercially important marine fin fishes.</i>	6	3
	2.4	Features and trends in the production of pelagic fisheries. Conservation of pelagic fish stock	2	3
	2.5	Demersal fisheries of India: Elasmobranchs (sharks, rays and skates), perches, threadfin breams, groupers, snappers, Bull's eye, flat fishes, sciaenids, eels.	5	4
	2.6	Features and trends in production of demersal fisheries. Conservation of demersal fish stock <i>Activity: Classify the different types of crafts and gear used in marine fishing</i>	4	4
3	Deep sea fishery resources			
	3.1	History of deep-sea fishing. Oceanic and deep-sea fisheries of India. Potential resources.	2	5
	3.2	Deep sea fishing policy of India	2	6
4	Crustacean and molluscan fishery resources			
	4.1	Crustacean fishery of India: Penaeid and non-penaeid shrimp fisheries.	3	6
	4.2	Lobster fishery, Crab fishery	2	6
	4.3	Molluscan fishery of India: Mussel fishery, Oyster fishery, Clam fishery. Cephalopod fishery, Gastropod fishery <i>Activity: Collection and identification of commercially important shellfishes</i>	8	6
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 30 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Essay (2 out of 3) 2 X 10 = 20 Marks Total – 70 Marks

Recommended Books for Transaction hours

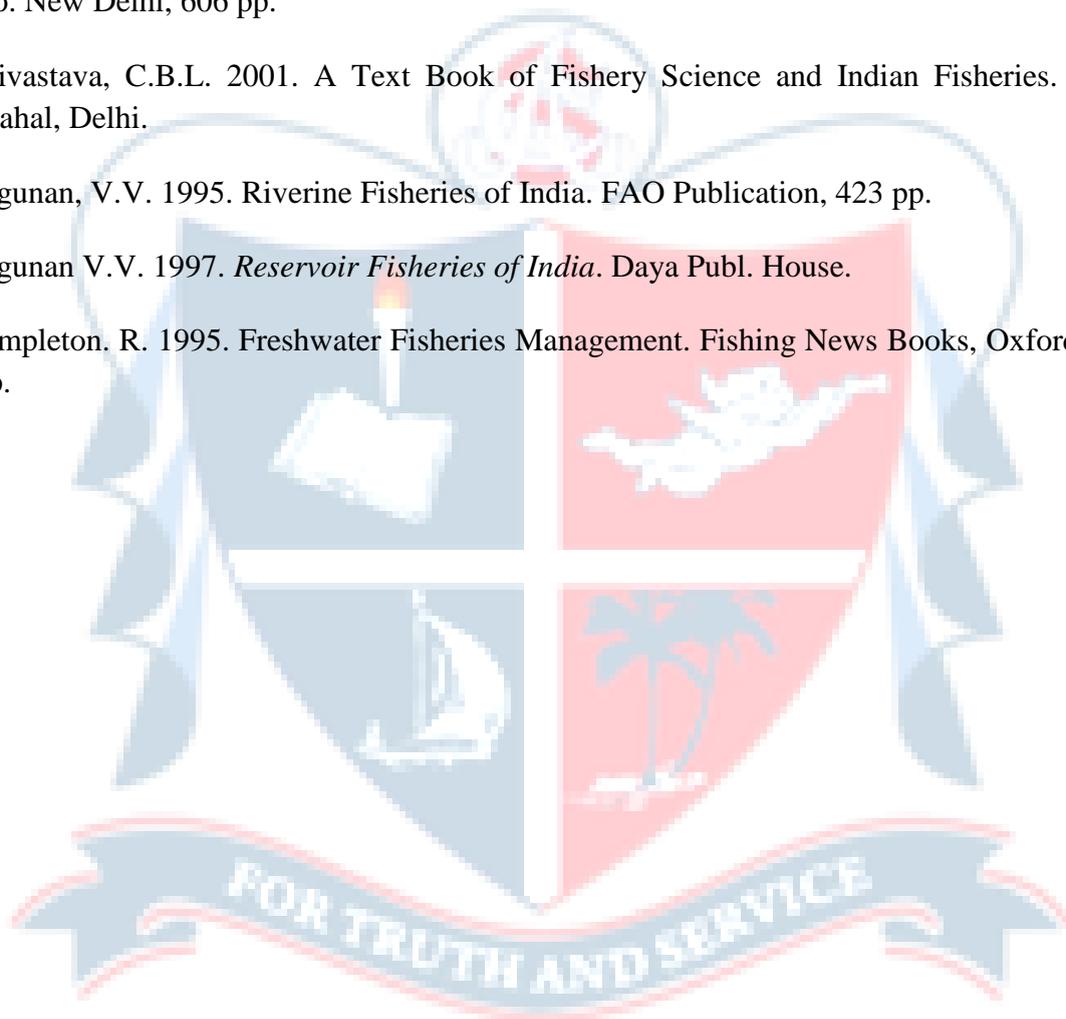
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2. Bal, D.V. & K.V. Rao 1984. Marine Fisheries. Tata McGraw Hill Publ. Co. Ltd., New Delhi, 470 pp.
3. ICAR 2011. Handbook of Fisheries and Aquaculture. ICAR, New Delhi, 1116 pp

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Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Introduction to Capture Fisheries					
Type of Course	DSC B					
Course Code	24SACIFH3DB101					
Course Level	200					
Course Summary	This course offers a comprehensive overview of inland and marine fisheries, focusing on the biological, ecological, and economic aspects of fish populations in freshwater and marine environments. The course covers key concepts in fish biology, habitat diversity, fishing methods, resource management, and sustainability issues, tailored to both inland and marine ecosystems.					
Semester	III	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities	75
Pre- requisites, if any	Students with varied backgrounds in science or arts may find the course relevant to their academic interests and professional aspirations.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Understand the different types of riverine and cold water resources of India	U	1,2
2	Acquire knowledge regarding the present status and Problems and development of cold water fisheries in India	U	1,2
3	Explain the ecological features of reservoirs and lakes. Classification of reservoirs and development of reservoir fisheries in India.	U	1,2

4	Classify estuaries and explain capture fisheries resident and migrant species. Knowledge in fisheries of brackish water lake and backwaters.	U	1,2
5	Acquire knowledge regarding the marine fishery resources and present status of marine fisheries	U	1,2
6	Evaluate the present status of capture fishery resources of India	A	1,2
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Riverine and Cold water fisheries		10 hrs	
	1.1	Major river system in India. Fishing methods, representative ichthyofauna, and recent catch statistics.		1
	1.2	Problems encountered in fisheries development of major rivers.		1
	1.3	Cold water fisheries resources of India. Ecological characters of cold water bodies of India.		1
	1.4	Representative species of fishes of cold water bodies of India.		1
	1.5	Present status, Prospect, Problems and development of cold water fisheries in India.		2
2	Reservoir and Lacustrine fisheries		20 hrs	
	2.1	Definition and ecological features of reservoirs and lakes. Classification of reservoirs, present productivity levels and fishery potentials.		3
	2.2	Problems and prospects of reservoir fisheries in India. Measures to increase their production and economic management of reservoirs		3
	2.3	Major reservoirs and lakes in India with emphasis on capture fisheries.		3
	2.4	Development of reservoir fisheries in India.		3
3	Estuarine and Marine fisheries		15 hrs	

	3.1	Definition and classification of estuaries, capture fisheries resident and migrant species, fishing methods, recent catch statistics.		4
	3.2	Fisheries of brackish water lake and backwaters. Problem of brackish water fishery.		4
	3.3	Marine capture fishery resources at inshore, offshore and deep sea. EEZ, PFZ and continental shelf, maritime states in India.		5
	3.4	Biology and fisheries of Oil sardine, Hilsa, Pomfret, Bombay duck, Mackerel, ribbon fish, sole fish, eel, catfishes, prawns, lobsters, mollusks.		5
	3.5	Deep sea fishing policies of India. Problems of overfishing. Conservation and management of marine fishery resources.		5
4	Practical		15 hrs	
	4.1	Identification of freshwater fish	2	6
	4.2	Identification of brackish water fish	2	6
	4.3	Identification of marine fish fish	2	6
	4.4	Identify the catching methods in inland fishery	2	6
	4.5	Identify the catching methods in marine fishery	2	6
	4.6	Visit to nearest marine landing centres	5	6
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks

	<p>Practicals</p> <p>Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks</p> <p>Record = 3 Marks</p> <p>Viva = 2 Marks</p> <p>Total – 20 Marks</p>
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Recommended Books for Transaction hours

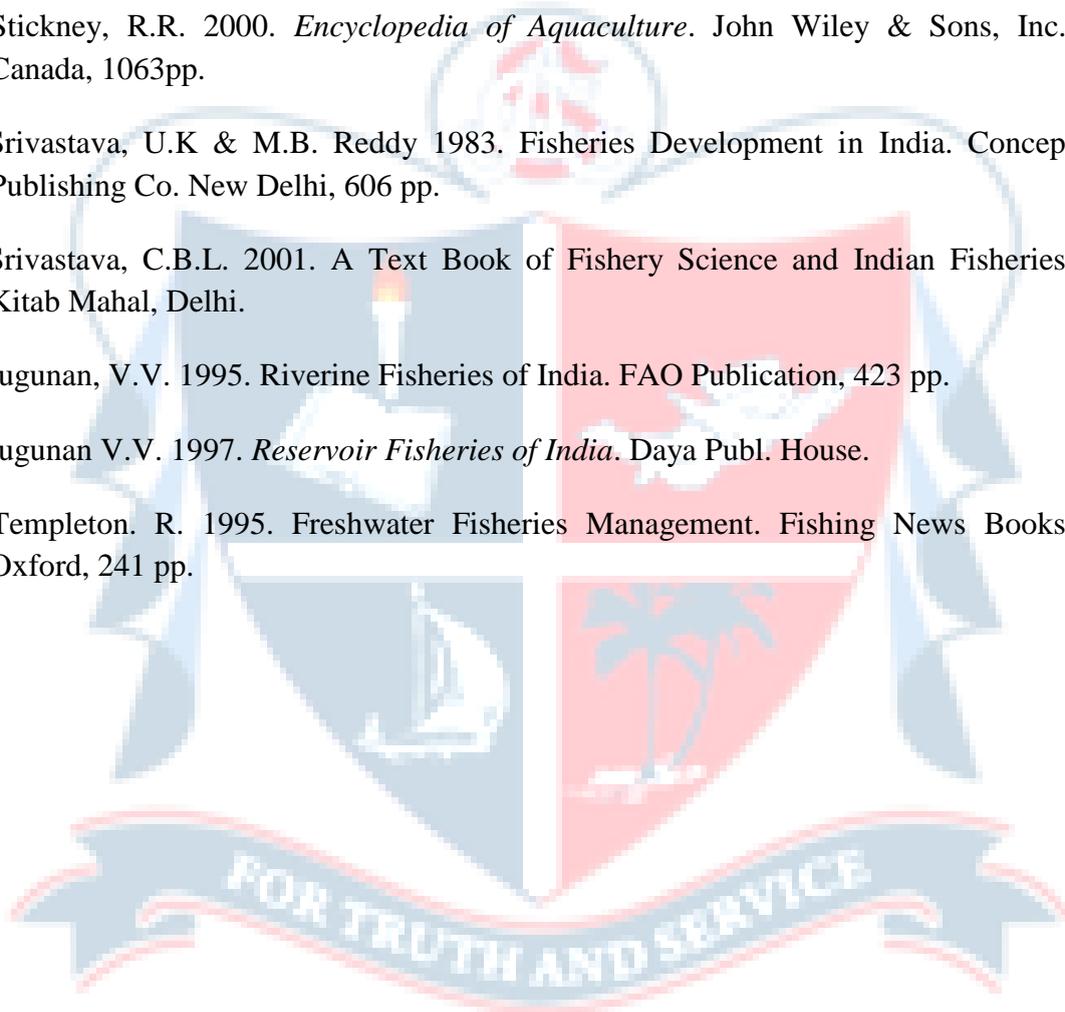
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31. Sharma A.P. 2012. *Management issues in Inland Fisheries and Aquaculture*. Narendra Publishing House, Delhi, 243pp.
32. Stickney, R.R. 2000. *Encyclopedia of Aquaculture*. John Wiley & Sons, Inc., Canada, 1063pp.
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36. Sugunan V.V. 1997. *Reservoir Fisheries of India*. Daya Publ. House.
37. Templeton. R. 1995. *Freshwater Fisheries Management*. Fishing News Books, Oxford, 241 pp.





Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Introduction to Hatchery Technology of Finfish					
Type of Course	DSE					
Course Code	24SACIFH3DE101					
Course Level	200					
Course Summary	This course provides an insight into infrastructure facilities mandatory for a hatchery including varieties of tanks for rearing fish and fish larvae, incubators, other equipments and trained manpower. Seed production fishes involve the process of production of fish seeds in controlled condition. It involves broodstock management, induced breeding methods, nursery rearing and live feed culture. The aim of seed production is to produce fishes with significant characteristics such as fast growth, disease resistance and so on by artificial propagation methods.					
Semester	III	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities (1,3 ,2,1,3.2, 3.3, 5.1)	75
Pre- requisites, if any	Students should possess basic knowledge in fisheries.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Explain different types of seed production and breeding methods.	U	1
2	Formulate different criteria for designing a hatchery and the selection of equipments.	C	1,2
3	Analyze different steps and procedures involved in the preparation and management of nursery and rearing systems of fish breeding.	AN	1

4	Prepare the criteria for the selection of broodstock and broodstock management	U	1
5	Develop an Insight of natural breeding of finfishes and sexual maturity of different types of food fishes.	A, S	1
6	Develop fundamental skills in setting up of a fish hatchery	A, S	1, 2
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Seed production techniques and hatchery management			
	1.1	Fish seeds-different types of fish seeds- yolksac larvae, prolarvae, eggs, fry, fingerlings. Embryonic development in fishes, seed counting, Seed collection methods, Transportation of fish seed. use of anaesthetics, Quality assessment of seeds. Current trends in seed production.	3	4
	1.2	Selection criteria for broodstock and brood stock management, sex determination, Quarantine and disease management in hatcheries	3	1
	1.3	Methods of breeding- Induced breeding- Hypophysation, stripping, synthetic hormone analogues- Breeding in hatching hapa, structure of hatching hapa, Bundh breeding techniques-dry bundh, wet bundh, modern bundh.	3	1
	1.4	Criteria for the selection and construction of a hatchery. General design of hatcheries. Sources of water, Water quality monitoring and management. Different parts of a hatchery, larval rearing unit, broodstock unit, Live feed culture.	3	2,6
	1.5	Equipments and infrastructure facilities - Mechanical and biological filters, Incubators. Ancillary facilities in a hatchery- electricity, pump, laboratory etc . Hatchery protocols, Economics of seed production Activity: Visit a hatchery	3	2
2	Seed production and hatchery technology of major freshwater fishes and air breathing fishes			
	2.1	Seed production and larval rearing of Indian major carps and exotic carps. Seed production of minor carps.	3	3,5

	2.2	Production of common carp seeds by different methods- Sundanese, Tjimindi, methods followed in China and India. Induced breeding of carps, types of carp hatcheries.	4	1,2
	2.3	Introduction to air breathing fishes. Respiratory adaptations of air breathing fishes. Seed production and nursery rearing of air breathing fishes- <i>climbing perch</i> , <i>Murrels- Channa sp.</i>	4	3,5
	2.4	Seed production and hatchery management of airbreathing catfishes- <i>Clarias sp</i> , <i>Heteropneustes sp</i> , <i>Pangasius sps</i>	4	3,5
3	Seed production and hatchery technology of major brackishwater and marine fishes			
	3.1	Seed production of mullets, Tilapia, milkfish, pearl spot, seabass. Activity: visit a brackishwater fish farm	8	3,5
	3.2	Methods used for the seed production of marine fishes, Seed production and hatchery technology of marine fishes - cobia, Grouper, silver pompano.	7	3,5
4	Practical			
	4.1	Demonstrate induced breeding- methods of fish handling during injection, injection methods, stripping	6	1
	4.2	Culture of live feed for hatchery	6	3,5
	4.3	Estimation of water quality in a hatching unit	6	6
	4.4	Identification of fish larval stages	6	1,3,5
	4.5	Demonstrate packaging of fish seed and brood fishes for transportation	6	2,6
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15

	Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks
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Recommended Books for Transaction hours

ARUP KUMAR SADHU & CHIRANJIB CHAKRABORTY	Biology, hatchery and culture technology of tiger prawn and giant freshwater prawn
CHAKRABARTI, N M	Biology, culture and production of Indian major carps _ a review

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Department of Fisheries and Aquaculture St. Albert's College (Autonomous) Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Value Added Fishery Products					
Type of Course	MDC					
Course Code	24SACIFH3MD101					
Course Level	200					
Course Summary	This course explores the various value added products generated in the fishing industry and focuses on value addition through processing techniques, creating sustainable practices, and developing innovative products from fishes.					
Semester	III	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3			Activities	30
Pre- requisites, if any	Students should attain knowledge regarding value added product development in Seafood sector.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Identify fishery value added products and understand market trends, present status and distribution of value-added seafood products and consumer preferences.	U, An	1,4
2	Identify different value added products and challenges faced by value addition sector in seafood chain.	E, An	1,2,6
3	Explain the technical preparation of fish mince based products with special emphasis on surimi production.	E,U	1,2,5
4	Explain the preparation, packaging and storage as well as quality evaluation of coated fishery products.	U, I	1, 6

5	Summarize the preparation of a number of other value added products and diversified products	A,S	1,8,9
6	Apply principles of sensory evaluation to assess product quality and study the characteristics of fish, its nutritional quality and relation to spoilage.	C,A	4,5,10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Value Addition in Seafoods			
	1.1	Overview of Value added products; Present market trends and consumer preferences, Scope of value addition.	3	1
	1.2	Types of value added products. Limitations and challenges of value addition Significance and advantages of value addition in the seafood industry.	3	2
2	Fish Mince Based Products and Coated Fishery products			
	2.1	Definition of Fish mince and Surimi. Raw materials used for surimi. Production of fish mince and Surimi including Flow chart Analog and fabricated products from fish mince.	4	3
	2.2	Equipments used for surimi preparation. Different methods in assessing quality of surimi. Define cryoprotectants. Role of different cryoprotectants in surimi production.	4	3
	2.3	Definition of coated fishery products and its preparation. Battered and breaded fishery products and its applications. Packaging, storage and quality evaluation of coated products.	4	4

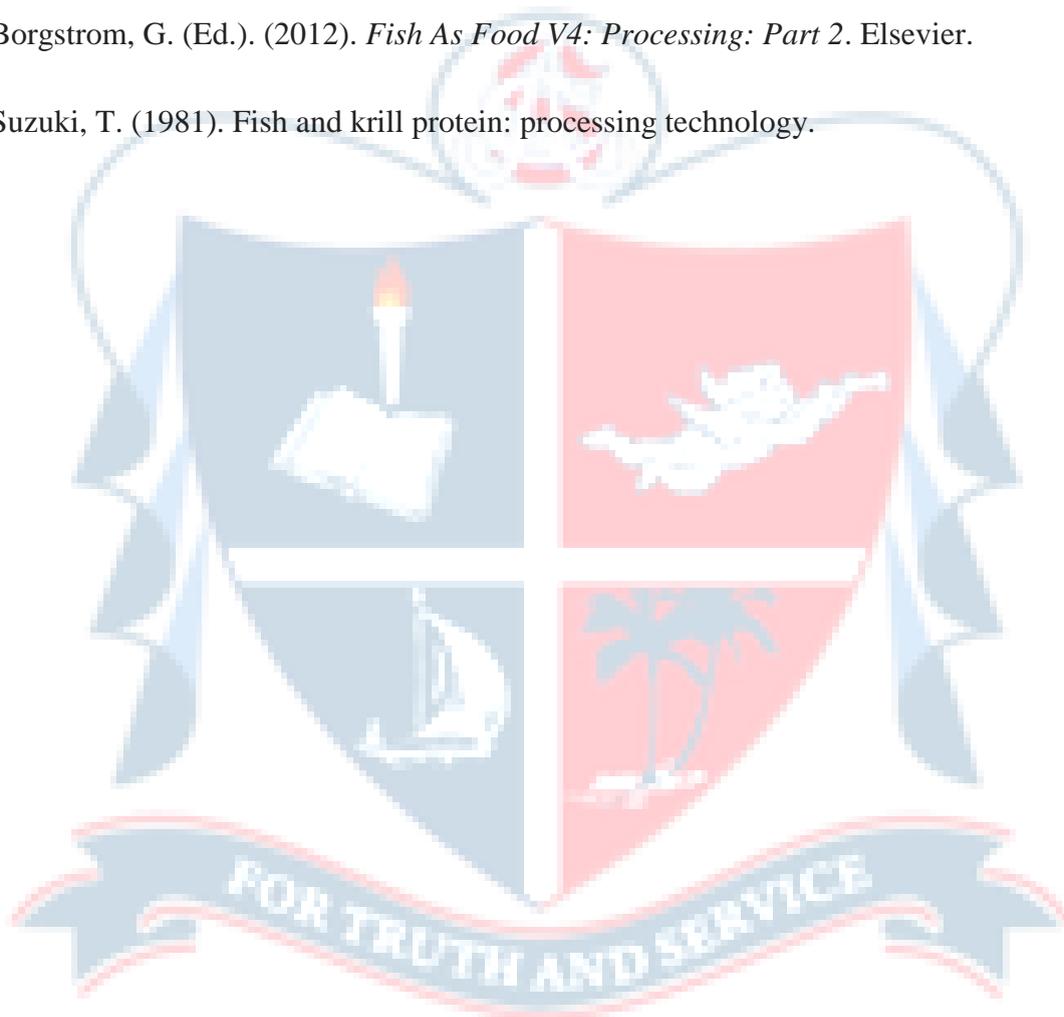
Value Added products and Quality control				
3	3.1	Preparation of value added products : Skewered shrimp, Nobashi, Sashimi, Fish Sauce, Surimi analogue products, Seafood sausage, Fish loins/ Fish steaks, Cooked salad shrimp, Sushi.	3	5
	3.2	Preparation of Diversified Products : Fish/prawn pickle, prawn chutney powder, fish curry, fish soup powder, fish wafers, fillets, mussel products, marinated products.	3	5
	3.3	Quality control and safety in value added products Fish as raw material for processing Factors affecting quality of fresh fish: intrinsic and extrinsic factors.	3	6
	3.4	Spoilage in thermal processed products – Quality evaluation of thermal processed products Curing and drying of fish – Spoilage in dry fish products	3	6
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1=20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Total – 50 Marks

References

1. Govindan, T. K. (1985). *Fish processing technology*. Oxford & IBH.
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**Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam**

Programme	BSc. (Honours) Industrial Fisheries						
Course Name	Health Benefits of Seafood						
Type of Course	VAC						
Course Code	24SACIFH3VA101						
Course Level	200						
Course Summary	This course explores the nutritional aspects of fish consumption and its role in promoting human health. Topics covered include the nutritional composition of fish, health benefits, safety considerations, and sustainable practices in fisheries.						
Semester	III		Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	45	
		3			Activities		
Pre- requisites, if any	Students should possess basic knowledge in human nutrition.						

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Understand the importance of fish nutrition in human health	U	1
2	Explain the nutritional composition of various fish species, including proteins, omega-3 fatty acids, vitamins, and minerals and Evaluate and communicate the cardiovascular benefits of omega-3 fatty acids found in fish.	U, A	2
3	Evaluate the importance of fish consumption during pregnancy and its impact on fetal development. Discuss the role of fish nutrients in breastfeeding and early childhood development.	E	6
4	Develop recommendations for promoting sustainable and healthy fish consumption at individual and community levels. Formulate	An	6

	strategies for raising awareness about the nutritional benefits of fish and sustainable seafood choices.		
5	Identify potential contaminants in fish, such as mercury and pollutants, and discuss their health implications.	An	1, 2
6	Examine global patterns of fish consumption, considering cultural, economic, and regional differences. Assess the role of fish in addressing global food security challenges.	C	2, 10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Nutritional Composition and Health Benefits of Fish Composition			
	1.1	Importance of nutrition, Importance of fish in human nutrition, Essential nutrients present in fish, Composition of fish, Historical perspectives on fish consumption.	5	1
	1.2	Protein, essential amino acid, essential fatty acid, Carbohydrate, omega-3 fatty acids, vitamins, and minerals in fish, Variability in nutrient content among fish species, Processing effects on nutritional value. Activity: Cooking Demonstrations: prepare different fish dishes, emphasizing culinary techniques that retain the nutritional value of fish.	13	2
	1.3	Cardiovascular benefits of omega-3 fatty acids, Cognitive and neurological benefits, Role in preventing chronic diseases.	5	2
2	Fish and Human Development			
	2.1	Importance of fish consumption during pregnancy, Impact on fetal development, Breastfeeding and fish intake.	5	3
	2.2	Fish in traditional diets, Culinary techniques for preparing fish, Global perspectives on fish consumption.	5	4
	2.3	Contaminants in fish: Physical, Chemical and Biological. Guidelines for safe fish consumption	5	5
3	Global Perspectives, Future Trends and Challenges in Fish Nutrition			
	3.1	Fish consumption patterns around the world Addressing nutritional challenges through fish Activity: field trip to fish market/ processing plant to observe fish handling, availability, processing and storage.	7	6
4	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1=20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Total – 50 Marks

References

1. Jenny M. Ong and Mahabubur Rahman, Seafood and Health
2. Susan Raatz and Douglas Bibus, Fish and Fish Oil in Health and Disease Prevention
3. Eugene J. Balon and Milan H. Scheer, Seafood Nutrition: Facts, Issues, and Marketing of Nutrition in Fish and Shellfish
4. Akoh C.C. and Min D.B. Omega-3 Fatty Acids: Chemistry, Nutrition, and Health Effects
5. George E. Inglett and Trung T. Nguyen, Fish as Food: Nutrition, Sanitation, and Utilization
6. Cesarettin Alasalvar and Fereidoon Shahidi, Handbook of Seafood Quality, Safety, and Health Applications
7. Ioannis S. Bozariis and Christina N. Sikorski, Seafood Processing: Technology, Quality and Safety
8. Donald B. McCormick and Makoto Meguro, Fish and Fish Oil in Health and Disease Prevention
9. John E. Halver and Ronald W. Hardy, Fish Nutrition

Semester: IV

Course Code	Title of the Course	Type of the Course	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
24SACIFH4DA101	Finfish and Shellfish Biology	DSC A	4	5	3	0	2	0
24SACIFH4DA102	Introduction to Fish Harvest Technology	DSC A	4	4	4	0	0	0
24SACIFH4DB101	Introduction to Fish Processing and Value Addition	DSC B	4	5	3	0	2	0
24SACIFH4DE101	Introduction to Hatchery Technology of Shellfish	DSE 2	4	5	3	0	2	0
24SACIFH4SE101	Fish Feed Technology	SEC	3	3	3	0	0	0
24SACIFH4VA101	Waste management in seafood processing	VAC	3	3	3	0	0	0



Department of Fisheries and Aquaculture St. Albert's College (Autonomous) Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Finfish and Shellfish Biology					
Type of Course	DSC A					
Course Code	24SACIFH4DA101					
Course Level	200					
Course Summary	The course imparts an in-depth knowledge on the anatomy, physiology and behavior of finfish and shellfish species. The course would also give an insight into the behavioral adaptations of these aquatic organisms.					
Semester	IV	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities (1.6)	75
Pre- requisites, if any	Students should possess a general awareness on the characteristics of finfish and shellfish					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Outline the general characteristics of finfish and shellfish.	U	1
2	Understand the mechanism of sense organs in fishes, crustaceans and molluscs in detecting the different range of stimuli.	U	1
3	Explain the foundational concepts of physiological processes of fish.	U	10
4	Analyze the gut contents and the food and feeding habits of fish.	An	1
5	Identify the length-weight relationship to indicate the taxonomic differences and events in the life history of fish	Ap	10
6	Classify the parental care in fishes.	U	1

***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)**

COURSE CONTENT**Content for Classroom transaction (Units)**

Module	Units	Course description	Hrs	CO No.
1	Introduction, Food and Growth and Migration		20 Hours	
1	1.1	General characteristics of fishes (type: mullet, shark), crustaceans (<i>Penaeus monodon</i>) and molluscs (freshwater mussel)	1	1
	1.2	Different types of fins and scales in fish. Appendages of shrimps.	1	1
	1.3	Buoyancy in fishes - mechanisms. Colouration. Bioluminescence.	2	1
	1.4	Sense organs in fishes (Organs of smell, Taste buds, Lateral line system, Ampulla of Lorenzini), crustaceans (ommatidium, statocysts) and molluscs (statocysts).	2	2
	1.5	Specialized organs in fishes - electric organs, poison glands.	1	1, 2
	1.6	Activity: Collection and identification of commercially important fish and shrimp species	1	1
	1.7	Food and feeding habits of fishes – herbivores, carnivores and omnivores. Structural modifications in relation to feeding habits.	2	4
	1.8	Digestive system and digestion in fishes (type: mullet, shark), crustaceans (<i>Penaeus monodon</i>) and molluscs (freshwater mussel).	2	3
	1.9	Methods of gut content analysis – Qualitative and Quantitative (numerical, volumetric, gravimetric). Gastro somatic index, relative gut length). Food analysis indices - simple (Index of fullness, Forage ratio) and compound (Index of preponderance, Index of Relative Importance).	2	4
	1.10	Age and growth in fish – Methods employed for the study of growth - scales and otoliths. Introduction to population dynamics. Peterson's method. Length Frequency Analysis. Growth Parameters - Von Bertalanffy growth equation. Tagging and Marking.	2	3
	1.11	Length - weight relationships. Condition factor/ Ponderal index, Relative Condition Factor.	2	5
	1.12	Migration in fishes and its significance.	2	3

Internal organs and physiological activities		16 Hours	
2.1	Respiratory system and mechanism of respiration in fishes (type: mullet, shark), crustaceans (<i>Penaeus monodon</i>) and molluscs (freshwater mussel. Adaptations for air breathing in fishes.	3	3
2.2	Cardiovascular system and mechanism of circulation in fishes (type: mullet, shark), crustaceans (<i>Penaeus monodon</i>) and molluscs (freshwater mussel).	3	3
2	2.3 Excretion and osmoregulation – Structure of teleost kidney, osmoregulation in freshwater teleost, marine teleost and elasmobranch.	2	3
2.4	Gonochorism, Sexual dimorphism in fishes and crustaceans (type: shrimp, prawn and crab).	2	3
2.5	Structure of ovary and testis in fishes.	2	3
2.6	Maturity stages in fishes. Fecundity and Gonado- somatic index.	2	3
2.7	Parental care - Oviparous, Viviparous and Ovo-viviparous.	2	6
Endocrinology and hormones		9 Hours	
3.1	Endocrine organs in fishes - pituitary gland or Hypophysis, Thyroid Gland, Adrenal gland, Corpuscles of Stannius, Ultimobranchial Glands, Urohypophysis, Pancreatic islets, Pineal gland	4	3
3.2	Endocrine organs in crustaceans – X organ- sinus gland complex, Y Organ, Chromatophores, Pericardial organ, Mandibular organ.	3	3
3	3.3 Endocrine control on ecdysis or moulting. Moulting and moulting stages, metamorphosis in crustaceans.	2	3
Practical		30 Hours	
4.1	Morphometric measurements of fish	3	1
4.2	Meristic characteristics of fish	3	1
4.3	Types of scales - placoid, cycloid and ctenoid	2	1
4	4.4 Mounting of appendages of shrimps	2	1
4.5	Dissection and display of alimentary canal of fish	2	3
4.6	Dissection and display of alimentary canal of shrimp	2	3
4.7	Methods of gut content analysis – Numerical/ Volumetric/ Gravimetric.	3	4

	4.8	Gastro somatic index and relative gut length estimation.	3	4
	4.9	Estimation of Length - weight relationships in fishes.	3	5
	4.10	Identifying the secondary sexual characteristics (sexual dimorphism) in fishes, shrimps, prawns and crabs.	3	3
	4.11	Fecundity estimation in fishes.	2	3
	4.12	Estimation of Gonado Somatic Index	2	3
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

References

1. Parihar Rahul P. 2014. A Handbook of Fish biology and Indian Fisheries, Central Publishing House, India. 441 pp.
2. Amita Sarkar. 2005. Text Book of Crustacea. Discovery Publishing House, New Delhi. 568 pp.
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7. Hoar, W.S. and D.J. Randall (eds), 1969. Fish physiology. Vol. 1. Excretion, ion regulation and metabolism. New York, Academic Press, 465 pp.
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10. Tandon, K.K. & M.S. Johal, 1996. Age and Growth in Indian Freshwater Fishes. New Delhi, Narendra Publishing House. 232 pp.
11. Winston F. Ponder, David R. Lindberg, Juliet M. Ponder. 01 Nov 2019, *Introducing Molluscs from: Biology and Evolution of the Mollusca* CRC Press. 924 pp.
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Department of Fisheries and Aquaculture St. Albert's College (Autonomous) Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Introduction to Fish Harvest Technology					
Type of Course	DSC A					
Course Code	24SACIFH4DA102					
Course Level	200					
Course Summary	<p>The course on fish harvest technology provides a comprehensive overview of the tools, techniques, and technologies used in modern fishing practices. Students gain insights into various types of fishing vessels, their design, and the technological advancements that have shaped the industry. The curriculum explores sustainable fishing practices, emphasizing the importance of responsible and ethical approaches to marine resource utilization. Additionally, students learn about navigation systems, gear technology, and safety protocols essential for efficient and secure fishing operations.</p>					
Semester	IV	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1		75
Pre-requisites, if any	Students should possess knowledge regarding the crafts and gears used in fishing industry.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PO No
1	Identify the principles and factors influencing the design of fishing craft, including hull design, stability, and propulsion systems.	U,A,K	2
2	Develop a strong foundation in various fishing gear technologies and understand their applications in different fishing environments.	U, A,	2
3	Apply safety protocols and regulations relevant to fishing operations and ensuring the well-being of both crew members and marine ecosystems.	A, S	3,6

4	Explain the importance of sustainable fishing methods and resource management and the impact of fishing practices on marine ecosystems.	A,E,I	3,4
5	Examine the impact of biological fouling, importance of anti-fouling strategies and methods for corrosion prevention and protection.	A,,E	2,3,4,6
6	Apply skills in utilizing modern technologies in fishing operations and data collection tools, enhancing their ability to adapt to the evolving technological landscape of the fishing industry.	A, S	7
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Module	Units	Course description	Hrs	CO No.
Fishing Crafts & Gear technology		18 Hrs		
1	1.1	Introduction: History & development of fishing crafts. Traditional fishing crafts of India: Inland & marine waters. Mechanisation of fishing vessels.	2	1
	1.2	Classification of fishing crafts based on construction - traditional and commercial fabrication, dimension, nature of fishing, depth of operation etc. catamaran, canoe, Nava, Satpati, etc. Trawlers, gill netters, purse seiners, long liners, trollers, deep sea vessels.	5	2
	1.3	History and development of fishing gears; hand picking use of animals, lines and nets etc. classification of fishing gears of world and India. Factors that determine selection of fishing gears. Gears used in relation to fish and fishing area.	5	2
	1.4	Modern commercial fishing methods- trawling – classification (bottom trawling, mid water trawling, stern trawling, side trawling, twin trawling, bull trawling and out rigger trawling). Purse seining – classification (single boat purse seining, two boat purse seining); lampara net fishing; Gill netting (drift gill netting; pelagic mid water, bottom set gill netting).	6	2

		Line fishing (hand lining, vertical line, long line, pole and line and tuna long line) Squid jigging Trolling. Selective fishing – active fishing and passive fishing		
2	Craft and gear building materials		12 Hrs	
	2.1	Boat building materials - Various types of boat building materials: wood, steel, Ferro cement, aluminum & fiberglass; their preparation, seasoning, preservation & their advantages & disadvantages. Choice of construction material; comparison of mechanical properties. Boat design - Important terminologies of fishing vessel & related to fabrication: keel, hog keel, waterline, designed waterline, water plane, GRT, depth, draft, stem, stern etc.	6	1
	2.2	Fishing gear materials - natural and synthetic, yarn numbering systems. Types of knots, knotless netting, meshes, braiding, shaping, creasing, baiting, fly-meshing, tailoring; Mounting of webbing – different methods, hanging coefficient, take up ratio.	6	2
Navigation, Seamanship and Electronic equipments			15 Hrs	
3	3.1	Introduction ; Navigation charts and types. Navigational equipments : Magnetic compass, Gyrocompass, Sextant, Aneroid Barometer, Chronometer, Logs. Application of electronics in navigation.	5	6
	3.2	Navigation and Communication : Distress-Urgency-Safety Calls, Transmission Procedure, Control of Distress Traffic, Distress Signals, International Code of Signals (Signal flags). Modern Techniques: Pilotage, Celestial Navigation, Radio Navigation, Radar Navigation, Satellite Navigation.	5	3,6
	3.3	Rope work, Ship handling and anchoring procedures, First Aid and Safety; Fire fighting procedures, Response to Emergency	2	3

	3.4	Electronic equipments : GPS navigator, Echosounder, Net sonde, SONAR, gear monitoring equipments and Remote sensing.	3	6
4	PRACTICALS		30 Hours	
	1	Basic principles of gear design and construction Mesh size measurements Shape Cutting i. Baiting ii. Creasing iii. Tailoring iv. Fly Meshing Hanging Coefficient Mounting – Different methods.	10	3
	2	Mending of nets	8	3
	3	Preparation of glossary on fishing craft and gear (around 100 terms)	4	1,2
	4	Navigation - Identification of Signal Flags	8	4
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

References

Baranov, F.I. 1976. Selected Works on Fishing Gear, Commercial Fishing Techniques, Vol.1, Israel Programme for scientific translations, Keter Publishing House Ltd. Jerusalem, 631p.

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Sreekrishna Y & Shenoy L. 2001. Fishing Gear and Craft Technology. ICAR

Brandt AV. 1984. Fish Catching Methods of the World. Fishing News Books.

Suggested Readings

Hameed, M. S., & Boopendranath, M. R. (2000). Modern fishing gear technology. Daya Books

Devadasan, K., & Boopendranath, M. R. (2009, February). Fishing craft and gear for small pelagics. In National Conference on Marine Fisheries and Fisheries Harbour Infrastructure (pp. 7-8).

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Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Introduction to Fish Processing and Value Addition					
Type of Course	DSC B					
Course Code	24SACIFH4DB101					
Course Level	200					
Course Summary	This course provides students with a comprehensive understanding of the principles, methods, and applications of processing technologies in the fisheries industry and the products obtained from the fish. Emphasizing both theoretical and practical aspects, students will explore the science behind these preservation techniques and value addition.					
Semester	IV	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities	75
Pre-requisites, if any	Students with varied backgrounds in science or arts may find the course relevant to their academic interests and professional aspirations.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Explain the spoilage of fish, handling of fish on landing centre and chilling of fish.	U	2
2	Explain various fish preservation methods	U	1
3	Explain the principles of freezing and canning process, its application in preserving fishery products.	U	2
4	Identify different value added products and challenges faced by the value addition sector in the seafood chain.	E, An	1,2

5	Explain the technical preparation of fish mince based products with special emphasis on surimi production.	E, U	1,2
6	Apply principles of sensory evaluation to assess product quality and study the characteristics of fish, its nutritional quality and relation to spoilage.	C, A	2, 10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Introduction		10 hrs	
	1.1	Spoilage in fish- Physical, chemical, microbiological, Need to prevent fish spoilage, methods to retard or prevent spoilage.	2	1
	1.2	Importance of hygiene and sanitation in fish handling. Quality of water and ice in fish handling and processing.	2	1
	1.3	Principles of chilling, types of chilling, chilled sea water storage, chill storage of fish: physical, chemical and sensory changes during chill storage, cold shock.	2	2
	1.4	Different types of ice used in the seafood industry and their merits.	2	2
	1.5	Overview of Value added products; Present market trends and consumer preferences, Scope of value addition.	2	4
2	Common Seafood Preservation Techniques		20 hrs	
	2.1	Principles of smoking, drying and salting of fish, Traditional drying / curing methods.	2	2
	2.2	Different types of drying and spoilage of dried products.	3	2
	2.3	Different types of Smoking: Cold, hot smoking, electrostatic smoking and spoilage of smoked products.	4	2
	2.4	Fundamental principles involved in chilling and freezing of fish and fishery products.	4	3
	2.5	Thermal processing (Cooking, Sous-vide, Canning), Principles involved in canning of fish. Spoilage of canned products.	4	3

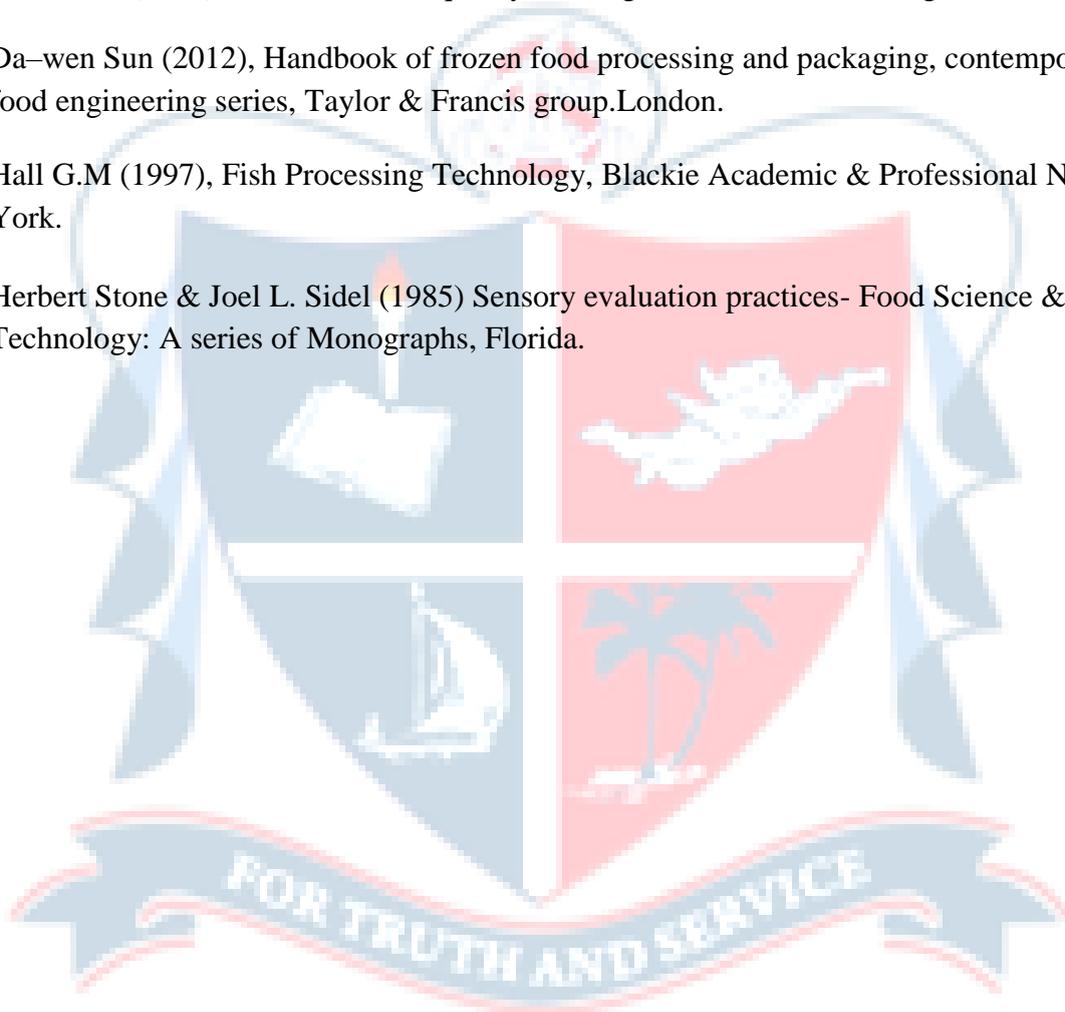
	2.6	Principles of freeze drying. AFD and its merits. Introduction to extrusion technology	3	3
3	Value Addition, Coated and Fish Mince Based Products 15 hrs			
	3.1	Definition of Fish mince and Surimi. Raw materials used for surimi. Production of fish mince and Surimi including Flow chart, Analog and fabricated products from fish mince.	3	5
	3.2	Equipment used for surimi preparation. Different methods in assessing the quality of surimi.	3	5
	3.3	Definition of coated fishery products and its preparation. Battered and breaded fishery products and its applications.	3	4
	3.4	Preparation of value added products : Skewered shrimp, Nobashi, Sashimi, Fish Sauce, Surimi analogue products, Seafood sausage, Fish loins/ Fish steaks, Cooked salad shrimp, Sushi.	3	4
	3.5	Preparation of Diversified Products : Fish/prawn pickle, prawn chutney powder, fish curry, fish soup powder, fish wafers, fillets, mussel products, marinated products.	3	4
	Practical 15 hrs			
	4.1	Sensory evaluation of fish	2	6
	4.2	Fish filleting	2	
	4.3	Preparation of fish steaks	2	5
4	4.4	Fish / prawn pickling	2	5
	4.5	Preparation of fish cutlet/ Prawn fry	2	5
	4.6	Frozen storage studies.	2	3
	4.7	Examination of canned fishery products. a. Can seams b. Testing Sterility	3	3
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

References

1. Alasavar .C Taylor. T. (2002), Seafood -quality, Technology and Nutraceutical applications, SpringerVerlagBerlin.
2. Balachandran, K. K. 2001. Post-harvest technology of fish and fish products. Daya Publishing House, New Delhi.
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13. Da-wen Sun (2012), Handbook of frozen food processing and packaging, contemporary food engineering series, Taylor & Francis group.London.
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Department of Fisheries and Aquaculture
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Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Introduction to hatchery technology of shellfish					
Type of Course	DSE					
Course Code	24SACIFH4DE101					
Course Level	200					
Course Summary	This course provides students with a comprehensive understanding of the principles, methods, and applications of freezing and canning technologies in the fisheries industry. Emphasizing both theoretical and practical aspects, students will explore the science behind these preservation techniques, their impact on fish quality, and the role they play in meeting global demands for processed fish products.					
Semester	IV	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities (2.2)	75
Pre- requisites, if any	Students should require a minimum knowledge on physiology, anatomy and behaviour of different shellfishes.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Classify the natural shellfish seed resources and acquires knowledge on their collection techniques	U	1,4
2	Develops knowledge on the breeding techniques and seed production of shellfishes.	A	1,2,4
3	Explain seed production technology of shrimps and other cultivable crustaceans and molluscs.	U	1,2,6
4	Formulate the hatchery management of commercially important shellfishes	C	5,9,10

5	Identify broodstock, eggs and larval stages of shellfishes	U	2,10
6	Develops skill in culturing live feeds and feed manufacture.	A	5,10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Natural seed resources and reproductive biology of shellfishes			
	1.1	History, constraints and current status of natural seed resources, site selection and collection methods of shellfishes, Major species of shrimps, crabs and lobsters. Major species of mussels. edible oysters, Pearl oyster, clams, scallops, Abalone and cephalopods	2	1
	1.2	Life cycle of important shellfishes; Crustaceans (shrimp, Crab, Lobster) Molluscs (Mussel, Oyster, Clam) Shellfishes as engineer of the ecosystem : the role played by them in balancing the ecosystem.	4	1
	1.3	Reproductive mechanisms in prawns, shrimps, crabs, mussels, oysters and clams. Role of environmental factors on reproduction and development of shellfish.	6	2
	1.4	Sexual maturity and breeding seasons of cultivable shellfishes Maturation stages of shrimps and crabs; techniques of eye-stalk ablation. Broodstock availability of crustaceans and molluscs; nutritional requirements; transport; captive rearing; induced spawning; physical and chemical inducing agents.	6	2
2	Seed production of commercially important shellfishes and larval nutrition			
	2.1	Hatchery production of seeds of shrimps (<i>P.monodon</i> , <i>P.indicus</i> , <i>P.vannamei</i>) and freshwater prawn (<i>Macrobrachium rosenbergii</i>) Crabs (<i>Scylla serrata</i>); Lobsters (<i>Panulirus homarus</i> and <i>Thenus orientalis</i>)	8	3
	2.2	Hatchery production of seeds of mussels, edible oysters, Pearl oyster, clams, Abalone. Visit to hatcheries (Shrimp, Prawn and Bivalves).	7	3

	2.3	Culture and use of different live feeds in shellfish hatcheries (<i>Skeletonema</i> , <i>Chaetoceros</i> , <i>Spirulina</i> , <i>Dunaliella</i> , <i>Isochrysis</i> , <i>Azolla</i> , Cladocerans, <i>Artemia</i> etc)	3	6
	2.4	Nutritional requirement of larvae and post larvae; Different live feed products like powdered algae, algal paste, micronized algae, vitamin fortified algal products.	3	5,6
3	Hatchery design and management			
	3.1	Criteria for site selection of shrimp hatchery and nursery ; layouts, Hatchery design and construction; Types of hatchery, Hatchery facilities : Types of tanks	2	4
	3.2	Water quality management in hatcheries; water treatment methods; Biofiltration. Strategies to control diseases in hatcheries, Diagnosis, quarantine procedure, prebiotics, probiotics use in hatcheries. Seed quality testing methods and seed certification. Use of immunostimulants and immune modulators in hatcheries ,SPF and SPR.	3	4
	3.3	Effluent treatment in hatcheries.	1	4
4	Practical			
	4.1	Identification of broodstock and maturity stages of important crustaceans and molluscs	6	2
	4.2	Identification of larval stages of common cultivable crustaceans and molluscs	6	5
	4.3	Water quality monitoring in shellfish hatcheries and nurseries	5	4
	4.4	<i>Artemia nauplii</i> production for feeding shrimp larvae	5	6
	4.5	Identification of different live feeds used in the shellfish hatchery	4	6
	4.6	Preparation of larval feeds and feeding schedule	3	4
	4.7	Different chemicals and drugs used in shrimp/ Prawn hatchery	1	4
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

References

1. Silas, E. G., Mohamed, K. H., Muthu, M. S., Pillai, N. N., Laxminarayana, A., Pandian, S. K., ... & Ahamed Ali, S. (1985). Hatchery production of penaeid prawn seed: *Penaeus indicus*. *CMFRI Special Publication*, 23, 1-41.
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6. Treece, G. D., & Fox, J. M. (1999). *Design, operation and training manual for an intensive culture shrimp hatchery*. DIANE Publishing.

Suggested Readings

1. Thomas PC, Rath SC & Mohapatra KD. 2003. Breeding and Seed Production of Finfish and Shellfish. Daya Publication.
2. Jhingran VG. 1991. Fish and Fisheries of India. Hindustan Publication
3. Pillay, T. V. R. (1990). *Aquaculture: principles and practices*. fishing news books.



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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Fish Feed Technology					
Type of Course	SEC					
Course Code	24SACIFH4SE101					
Course Level	200					
Course Summary	The course Fish Feed Technology offers a holistic exploration of principles, techniques and technologies essential for formulating and producing feeds tailored to aquatic species. Students will gain a comprehensive understanding of the intricacies of feed formulation, manufacturing processes and quality assessment in the context of aquaculture. The course equips them with the knowledge and skills necessary for sustainable and efficient development within the dynamic field of aquaculture, fostering their ability to contribute effectively to the industry's growth.					
Semester	IV	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3			Activities	45
Pre- requisites, if any	Students should have the basic knowledge of different kinds of fish feed.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Demonstrate knowledge on feed formulation, culture techniques of live feeds, conventional and non- conventional feed ingredients.	U	1
2	Develop aquafeed formulation skills using Pearson's method and quadratic equations.	A	2
3	List the anti-nutritional factors present in feed ingredients. Demonstrate mitigation strategies for these factors in order to enhance the nutritional quality of feed	R, U	2

4	Develop various types dry and non-dry feeds using conventional and non-conventional ingredients	A	1
5	Explain the design considerations for feed mills, including the layout and key equipment.	U	1,2
6	Develop skills related to common issues encountered in feed manufacturing units, applying appropriate control measures and solutions to ensure smooth operations.	A	2,10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Introduction To Feed Formulation and Types of Feed			
	1.1	General principles, Conventional and Non-conventional feed. Different steps in feed formulation. Pearson's method, Quadratic equation and criterions for aquafeed formulation. Activity: Preparation of dry feed using Pearson's method.	6	1,2
	1.2	Anti-nutritional Factors in feed ingredients, mitigation measures and Feed Additives	3	3
	1.3	Types of Feed: Dry (pellets, flakes, powdered, micro-encapsulated, micro-bound and micro-coated diets). Non-dry (Moist and Wet Diet), Farm made feeds, Experimental Diets, Reference Diets, Purified diets, Semi Purified Diets.	6	4
	1.4	Compact pellet feed, floating and slow sinking pellet feeds. Physical and Chemical Properties of dry feed: Particle size, Texture, Density, Moisture content, Protein content, Fat/Lipid content, Carbohydrate content, Ash content.	6	4
2	Feed Mill Layout, Design and Equipment			
	2.1	Introduction to feed technology, feed mill equipment and Feed mill design.	2	5
	2.2	Introduction to Hammer mills, Vertical batch mixer and Horizontal batch Mixers	3	5
	2.3	Introduction to conveying systems, Vacuum Coaters, Fat sprayers, Pelletizers and Driers, Crumblers, Packaging.	3	5
	2.4	Problems of Feed manufacturing units and Control measures.	2	5
3	Feed Quality and Efficiency and Live Feeds			

	3.1	Effect of processing on the nutritional value of feeds. Quality control in fish feed manufacturing- Quality control procedures, Raw materials, Finished products.	3	2
	3.2	Feed Conversion Ratio, Feed Conversion Efficiency, Protein Efficiency Ratio, Net Protein Utilization.	3	2
	3.3	Importance of live feed. Different live feeds used in hatchery and their culture techniques- Microalgae, Cladocerans, Copepods, Rotifers and Artemia. <i>Activity:</i> Live feed production mass culture- Micro algae	8	2,3
4	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1=20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Total – 50 Marks

References

1. Paul, B. N., Adhikari, S. and Mandal, R. N. 2017. ICAR- CIFA Training Manual No. 65. Training Programme on Application and Practices of Fish feed in Aquaculture.
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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Waste management in seafood processing					
Type of Course	VAC					
Course Code	24SACIFH4VA101					
Course Level	200					
Course Summary	This course explores the nutritional aspects of fish consumption and its role in promoting human health. Topics covered include the nutritional composition of fish, health benefits, safety considerations, and sustainable practices in fisheries.					
Semester	IV	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3			Activities	45
Pre- requisites, if any	Students should possess basic knowledge in seafood processing and waste management.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Define and classify different types of waste generated in seafood processing. Identify the sources, characteristics, and quantities of seafood processing waste.	U, A	1,2
2	Assess the environmental impact of seafood processing waste on ecosystems and local communities.	A, An	1
3	Apply practical skills in waste reduction, recycling, and proper waste disposal in a simulated seafood processing environment.	A	2
4	Examine methods of energy recovery from seafood processing waste, such as anaerobic digestion or incineration.	An	2
5	Explain local, national, and international regulations governing the disposal and management of seafood	U	1,2

	processing waste. Demonstrate an understanding of permits and compliance requirements.		
6	Reflect on the ethical considerations and social responsibility associated with seafood processing waste management. Formulate strategies for addressing ethical dilemmas in waste management.	A	6,8
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Introduction to Seafood Processing and Waste Management			
	1.1	Seafood processing operations, Types and sources of waste in seafood processing, Environmental and economic impacts of waste in the seafood industry.	4	1
	1.2	Classification of seafood processing waste, Methods for characterizing and quantifying waste. Activity: Case studies on waste generation in different seafood processing facilities	6	1
2	Fish and Human Development			
	2.1	Environmental regulations and compliance	2	3, 4
	2.2	Strategies for minimizing waste at the source, Process optimization for reduced waste generation, Employee training and engagement in waste reduction.	3	2
	2.3	Utilization of solid wastes - collagen, gelatin, extraction of enzymes. Recovery of proteins from liquid wastes.	2	3
	2.4	Shellfish Waste: sources and composition, conventional uses, chitin, chitosan, glucosamine hydrochloride, carotenoids from shellfish waste and its applications, production and use of protein isolates from squilla and shrimp waste. Activity: Visit Fishery Byproduct processing industry	6	3
3	Global Perspectives, Future Trends and Challenges in Fish Nutrition			
	3.1	Anaerobic digestion and biogas production, Different types of liquid waste and solid waste treatment technologies, wash water, Incineration and heat recovery, Feasibility and challenges of energy recovery.	8	4
	3.2	Emerging technologies for waste management, Circular economy approaches in seafood processing, Start-ups and innovations in waste reduction.	4	4

	3.3	Techniques for the identification of environmental aspects. IS/ISO 14000 and its relevance to Environmental, Management System in fisheries industry: Background, policy and planning, implementation, checking and review, International and European Laws for Environmental Protection, National Environmental Laws. Activity: Visit to waste management plants	10	5, 6
4	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1=20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Total – 50 Marks

References

1. Cesarettin Alasalvar and Fereidoon Shahidi, Handbook of Seafood Quality, Safety, and Health Applications
2. FAO
3. Gulab Singh and Nirmal Sinha, Sustainable Seafood Processing
4. Hildegard Heymann and Reinhold Carle, Fishery Products: Quality, safety, and authenticity
5. Ioannis S. Boziaris, Seafood Processing By-Products: Trends and Applications
6. John Pichtel Waste Management Practices: Municipal, Hazardous, and Industrial"
7. Keith W. Waldron, Handbook of Waste Management and Co-Product Recovery in Food Processing
8. Leo M.L. Nollet and Fidel Toldrá, Handbook of Seafood and Seafood Products Analysis

Semester: V

Course Code	Title of the Course	Type of the Course	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
24SACIFH5DA101	Freezing and Canning Technology	DSC A	4	5	3	0	2	0
24SACIFH5DA102	Fishery By products	DSC A	4	4	4	0	0	0
24SACIFH5DE101	Fish Packaging Technology	DSE 3	4	4	4	0	0	0
24SACIFH5DE102	Value Addition of Seafood	DSE 4	4	4	4	0	0	0
24SACIFH5DE103	Principles of Fisheries Management	DSE 5	4	4	4	0	0	0
24SACIFH5SE101	Commercial Ornamental Fish Breeding and Culture	SEC	3	4	2	0	2	0



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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Freezing & Canning Technology					
Type of Course	DSC A					
Course Code	24SACIFH5DA101					
Course Level	300					
Course Summary	This course provides students with a comprehensive understanding of the principles, methods, and applications of freezing and canning technologies in the fisheries industry. Emphasizing both theoretical and practical aspects, students will explore the science behind these preservation techniques, their impact on fish quality, and the role they play in meeting global demands for processed fish products.					
Semester	V	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		2	Activities	75
Pre-requisites, if any	Students should possess basic knowledge in fish processing.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Explain the spoilage of fish, handling of fish onboard and landing centre and chilling of fish.	U	2
2	Explain the principles of freezing and its application in preserving fishery products.	U, A, S	1
3	Demonstrate an understanding of various freezing methods and their advantages/disadvantages.	U	2
4	Describe the canning process for fishery products, including preparation, filling, sealing, and heat processing.	U, A	1, 2
5	Apply the thermal process validation of canned products for consumer safety.	U, A	1
6	Explain the principles and applications of freeze drying.	U, S	1

***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)**

COURSE CONTENT**Content for Classroom transaction (Units)**

Module	Units	Course description	Hrs	CO No.
1	Handling of Fish			
	1.1	Spoilage in fish- Physical, chemical, microbiological, Need to prevent fish spoilage, methods to retard or prevent spoilage. Post mortem changes in fish muscle glycolysis, rigor mortis. Changes in flavor, texture, protein, lipid etc. Melanosis and its prevention, Discoloration in aquatic products. Auto-oxidation- mechanism, role of antioxidants, synergistic and pro-oxidants, factors responsible for lipid oxidation in fish muscle.	4	1
	1.2	Handling of fish onboard fishing vessels, Unit operations, unloading fish. Post-harvest fishery Losses, Methods to reduce losses. Icing, different types of ice.	2	1
	1.3	Handling fish in Landing Centers - Defects, and modification needed.	2	1
	1.4	Principles of chilling, types of chilling, chilled sea water storage, chill storage of fish: physical, chemical and sensory changes during chill storage, cold shock. Different types of ice and their manufacture.	2	1
2	Freezing and Refrigeration			
	2.1	Principle of refrigeration, refrigeration cycle, refrigerants, classification of refrigerants.	2	2
	2.2	Freezing mechanism, freezing time, crystallization, nucleation, super cooling, crystal growth, eutectic point, location of ice crystals in tissue, changes during freezing. Glazing and frozen storage: Physical changes-freezer burn and recrystallization. Chemical changes in fish: lipid hydrolysis, protein denaturation and sensory during frozen storage.	10	2
	2.3	Technological aspects of freezing: methods, Comparison of various freezing methods, selection of a freezing method, product processing, chemical treatment prior to freezing. High pressure freezing.	3	3
	Canning and Freeze Drying			
3	3.1	History and evolution of canning process, Principles of thermal processing, Mechanism of heat transfer, heat resistance of bacteria and spores, decimal reduction time, thermal death time, "Z" and "F" values, heat penetration, cold point, can size, shape, contents etc. Significance of thermal death curve, graphical, formula, nomogram methods - F ₀ value, cook value, D value, integrated F value	8	4

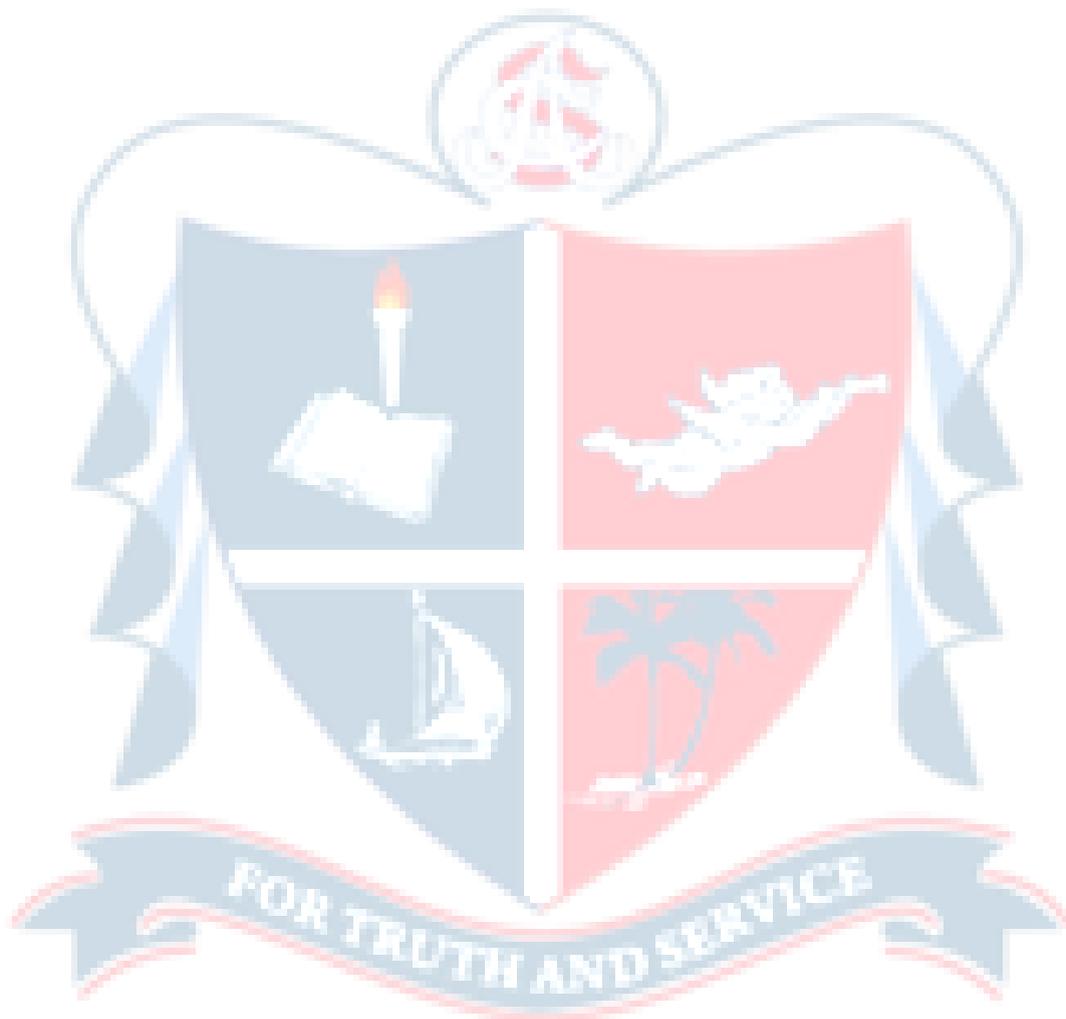
		and their inter-relationship, determination of process time, Acidity classification of foods - definition of canning, absolute sterility, commercial sterility, pasteurization Vs sterilization. Activity: Training in canning processing plant		
	3.2	Types of canning, Canning process, steps involved, process flow, additives, HTST processing and aseptic canning, principles and process details. Can manufacture, lacquers AR and SR lacquers,	2	4
	3.3	Canning machinery and equipment, Canning process of fish/shellfish, Value added canned products (ready to eat), Spoilage of canned food. Examination of cans and seams. Retort Pouch Processing. Process machineries. Shelf-life evaluation. Lamination process. Advantages and disadvantages.	3	5
	3.4	Canning plant location: Practical considerations, canning plant facilities, lay out design. Emerging trends and marketing of canned product.	3	5
	3.5	Principles of freeze drying, application of phase rule, triple point of water, sublimation of ice, accelerated freeze drying (AFD), shelf life and specialties of AFD products, machinery and equipment for freeze drying, process flowchart. Packaging of Freeze-dried products.	5	6
4	Practical			
	4.1	Determination of moisture content in fish and fishery products	5	1
	4.2	Filleting of fish, treatments, glazing, packaging and freezing	5	3
	4.3	Frozen storage studies.	5	3
	4.4	Canning of tables fishes, bivalves and crustaceans in different containers.	5	4
	4.5	Examination of canned fishery products. a. Can seams b. Testing Sterility	5	4
	4.6	Studies on physical, chemical and sensory changes.	5	5
	4.7	On Job Training in fish processing plant		
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	<p>Mode of Assessment</p> <p>A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks</p> <hr/> <p>B. Semester End Examination</p> <p>Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks</p> <p>Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks</p>

References

1. Alasavar .C Taylor. T. (2002), Seafood -quality, Technology and Nutraceutical applications, SpringerVerlagBerlin.
2. Connel J.J (1980), Control of Fish quality. Fishing News Books Ltd., England.
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4. Da-wen Sun (2012), Handbook of frozen food processing and packaging, contemporary food engineering series, Taylor & Francis group.London.
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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Fishery By products					
Type of Course	DSC A					
Course Code	24SACIFH5DA102					
Course Level	300					
Course Summary	The Fishery Byproducts course provides a comprehensive overview of the utilization and management of byproducts generated from fisheries. Students will explore innovative methods for processing and extracting value from fishery byproducts, minimizing waste and environmental impact.					
Semester	V	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4			Activity (1.4, 2.3,4.2)	60
Pre- requisites, if any	Students should possess knowledge regarding Fishery By products					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Understand the science of how these processes enhance the shelf life and quality of fishery products.	U	PO 1
2	Understand the principles of drying, salting, smoking techniques.	U, A, S	PO 1 PO 2
3	Define and explain the procedures for the processing of various byproducts.	A, S	PO 1 PO 2

4	Applying curing techniques to fishery products. Implement quality control measures to ensure the safety, consistency, and sensory attributes of curing products.	A, S	PO 5 PO 6 PO 10
5	Applying Fermented product and Smoked techniques to fishery products.	A, C, S	PO 1 PO 2
6	Explain the principles, types and skill in preparation of Marinades	A, S	PO 10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Curing Technology		18 Hrs	
	1.1	Cured fish products: principle of salting, drying, smoking, pickling. different types of dryers, artificial dryers. source of salts and impurities in salts. Methods of salting, dry/quench/wet and pickling, brine salting,	6	2
	1.2	Use of salt, factors affecting salt uptake by fish, lean and fatty fish, whole, gutted or split open, type and size of salt crystals, source of salts and impurities in salts, effect of impurities on salt penetration, temperature of salting.	6	1
	1.3	Spoilage of dried / cured fish, physical, chemical and microbiological changes, methods to prevent / control spoilage, extension of shelf life.	6	2,4
		Activity : Preparation of dried fish Examination of spoilage of dried / cured fish products		
2	Fermented product and Smoked Fishery Products		13 Hrs	
	2.1	Fermented products: different methods of fermentation, indigenous products and their principles of preservation.	6	3, 4
	2.2	Smoke curing, chemistry of smoke, composition and properties, smoking methods: cold and hot method, use of smoke liquids, production of smoke, type of wood used, methods of smoke generation, carcinogens in smoke, smoke kilns.	7	4
		Activity : Preparation of cured and fermented fish products		
3	Marinades		6 Hrs	

	3.1	Principles; processing of cold, cooked and fried marinades, shelf life and spoilage. Fish and shellfish pickles: production, shelf life. Packaging requirements for dry, cured and fermented products.	8	6
4	Fishery Byproducts		8 Hrs	
	4.1	Fish Meal-dry & wet reduction-grades-uses. Fish Oil-industrial production of fish body oil and liver oil-commercial uses.Fish Protein Concentrate-types, preparation and uses.	4	3
	4.2	Fish maws and Isinglass, Shark fin rays, Chitin, Chitosan, Fish Glue, Beche-de-mer, Pearl essence, Squalene, Fish hydrolases, Fish silage, Glucosamine hydrochloride. Agar, alginic acid and carrageenan.	4	3
		Activity : Preparation of fish silage Extraction of chitin and chitosan		
5	Teacher specific Module			

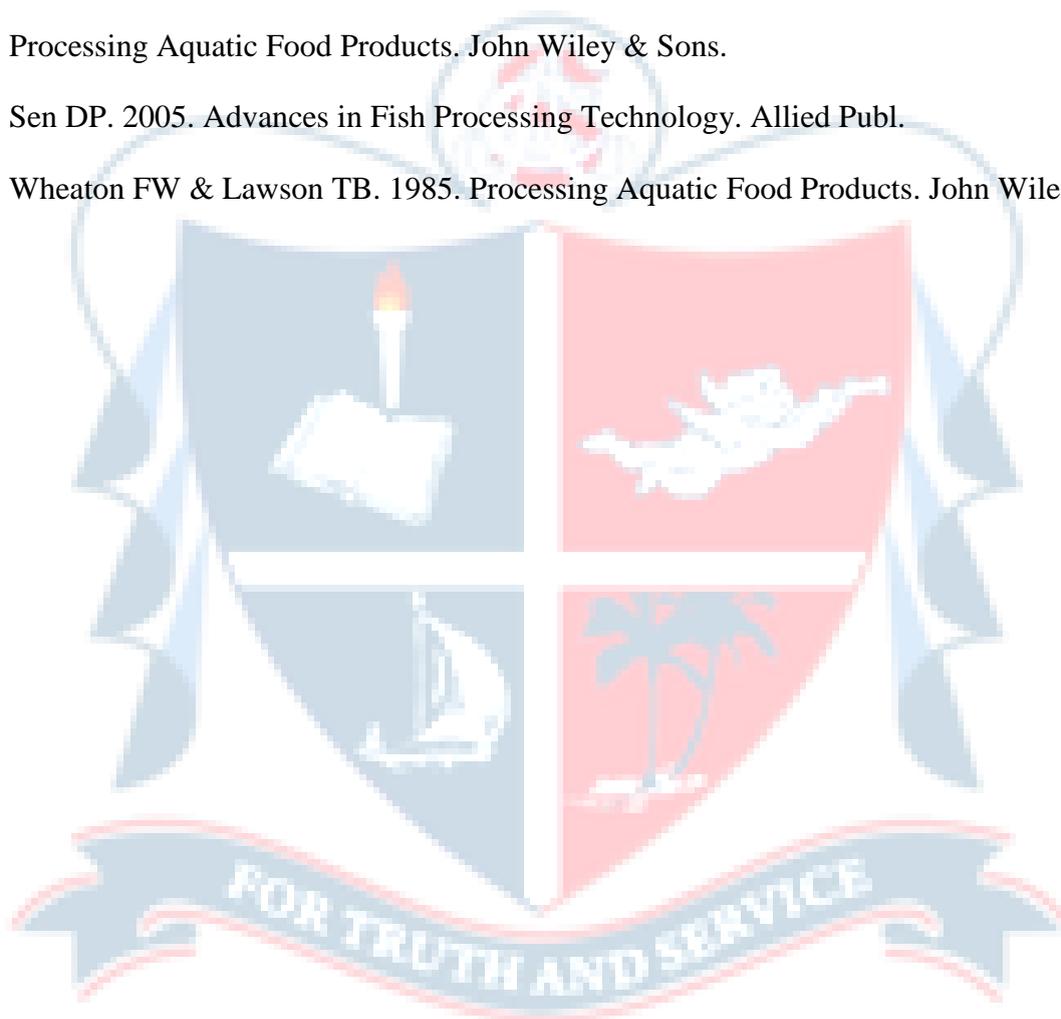
Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 30 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Essay (2 out of 3) 2 X 10 = 20 Marks Total – 70 Marks

Recommended Books for Transaction hours

1. Venugopal V. 2006. *Seafood Processing*. Taylor & Francis.
2. Balachandran KK. 2001. *Post-harvest Technology of Fish and Fish Products*. Daya Publ. House

References

1. Gopakumar K. 2002. Text Book of Fish Processing Technology. ICAR.
2. Hall GM. 1992. Fish Processing
3. Hui YH, Merle DP & Richard JG. 2001. Food Borne Disease Handbook. Seafood and Environmental Toxins.
4. Oefjen G, Wilhelm H & Peter. 2004. Freeze Drying. Wiley-VCH GmbH & Co.
5. Processing Aquatic Food Products. John Wiley & Sons.
6. Sen DP. 2005. Advances in Fish Processing Technology. Allied Publ.
7. Wheaton FW & Lawson TB. 1985. Processing Aquatic Food Products. John Wiley & Son.



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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Fish Packaging Technology					
Type of Course	DSE 3					
Course Code	24SACIFH5DE101					
Course Level	300					
Course Summary	This course delves into the critical aspects of packaging fish and fishery products, focusing on the significance of effective packaging in preserving product quality, ensuring safety, and meeting consumer expectations. Students will explore various packaging materials, techniques, and innovations. Through theoretical discussions, practical exercises, and case studies, students will develop the knowledge and skills required to make informed decisions in the packaging process within the dynamic fisheries industry.					
Semester	V	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4			Activities	60
Pre- requisites, if any	Students should possess basic knowledge in packaging techniques.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Explain the importance of packaging in the fisheries industry and food packaging, its purposes and procedures.	U	1
2	Understand packaging standards for domestic and international trade.	U	1, 2
3	Identify the packaging materials and its resistance.	A, S	1, 2

4	Understanding labelling laws and information requirements for fishery products.	U	5, 6
5	Understand packaging techniques, including Modified atmosphere packaging, controlled packaging and aseptic packaging.	A, S	1, 2
6	Evaluate the physical properties of packaging materials.	E	1
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Food packaging, its purposes and procedures			
	1.1	Food packaging, its purposes and procedures; technological aspects of packaging fishery products; packing of fresh and frozen fish for consumers; packaging for transport, shipping and institutional supplies; packaging standards for domestic and international trade.	5	1
2	Packaging materials			
	2.1	Packaging materials; basic films and laminates, their manufacture and identification; resistance of packaging materials; development of protective packaging for fishery products.	6	3, 4
	2.2	Classification packages, Importance of packaging in seafood processing, Kraft paper, Aluminium foil, corrugated fibre board and various flexible plastic films,	4	2
	2.3	Laminations and Co-extrusions, properties of various packaging materials, Retort pouch packaging, Vacuum Packaging, Polymeric Packaging Materials and their safe use in food contact application.	5	3
3	Packaging and Labelling			
	3.1	Modified atmosphere packaging, controlled packaging and aseptic packaging. Labelling and printing of packaging materials.	5	4
	3.2	Packaging requirements of fresh fish, frozen fish, Canned Fish, Dehydrated Fish and various value-added products etc. Insulated boxes. Accelerated shelf testing.	5	4
4	Testing for packaging materials			
	4.1	Methods of testing for packaging materials for their physical properties; containers and their testing and evaluation; package designs; resistance of packages to	7	5

		hazards in handling; transport and storage.		
	4.2	Emerging trends in biodegradable plastic materials for seafood packaging. Biodegradable films, Bio plastics, materials advantages and disadvantages. Edible coating and innovations for enhanced shelf life of seafood.	8	6
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 30 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Essay (2 out of 3) 2 X 10 = 20 Marks Total – 70 Marks

References

1. Balachandran KK. 2001. Post Harvest Technology of Fish and Fish Products. Daya Publ.
2. Gopakumar K. 1993. Fish Packaging Technology - Materials and Methods. Concept Publ.
3. Da-wen Sun (2012), Handbook of frozen food processing and packaging, contemporary food engineering series, Taylor & Francis group.London.
4. Herbert Stone & Joel L. Sidel (1985) Sensory evaluation practices- Food Science & Technology: A series of Monographs, Florida.
5. Venugopal V.(2006) Sea food processing-Adding value through quick freezing, retortable packaging and Cook-chilling. CRC-Taylor & Francis group.



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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Value-Addition of Seafood					
Type of Course	DSE 4					
Course Code	24SACIFH5DE102					
Course Level	300					
Course Summary	This course is designed to provide students with an in-depth understanding of fishery by-products and the creation of value-added products from these resources. Students will explore the various by-products generated throughout the fisheries supply chain and learn innovative techniques to transform these by-products into high-value products. The course covers theoretical concepts, hands-on experiences, and case studies, preparing students for roles in maximizing resource utilization, reducing waste, and adding value to fisheries products.					
Semester	V	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities (2.1, 3.2, 3.3, 4.1)	75
Pre- requisites, if any	Students should possess basic knowledge in Statistics and Computer.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Identify fishery byproducts and understand market trends, present status and distribution of value-added seafood products and consumer preferences.	U, An	1, 2
2	Identify different value added products and challenges faced by the value addition sector in the seafood chain.	E, An	1,2
3	Explain the technical preparation of fish mince based products with special emphasis on surimi production.	E, U	1,2

4	Explain the preparation, packaging and storage as well as quality evaluation of coated fishery products.	U, I	2
5	Summarize the preparation of a number of other value added products and diversified products	A, S	1,2,10
6	Apply principles of sensory evaluation to assess product quality and study the characteristics of fish, its nutritional quality and relation to spoilage.	C, A	2, 10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Value Addition and Fish Mince Based Products			
	1.1	Overview of Value added products; Present market trends and consumer preferences, Scope of value addition.	3	1
	1.2	Types of value added products. Limitations and challenges of value addition Significance and advantages of value addition in the seafood industry.	3	2
	1.3	Definition of Fish mince and Surimi. Raw materials used for surimi. Production of fish mince and Surimi including Flow chart, Analog and fabricated products from fish mince.	2	3
	1.4	Equipment used for surimi preparation. Different methods in assessing the quality of surimi.	4	3
	1.5	Define cryoprotectants. Role of different cryoprotectants in surimi production.	2	3
2	Coated fishery products, Value Added and diversified products			
	2.1	Definition of coated fishery products and its preparation. Battered and breaded fishery products and its applications.	4	4
	2.2	Packaging, storage and quality evaluation of coated products.	3	4
	2.3	Preparation of value added products : Skewered shrimp, Nobashi, Sashimi, Fish Sauce, Surimi analogue products, Seafood sausage, Fish loins/ Fish steaks, Cooked salad shrimp, Sushi.	3	5
	2.4	Preparation of Diversified Products : Fish/prawn pickle, prawn chutney powder, fish curry, fish soup powder, fish wafers, fillets, mussel products, marinated products.	2	5
3	Quality control and safety in value added products			
	3.1	Fish as raw material for processing: Factors affecting quality of fresh fish: intrinsic and extrinsic factors.	3	6

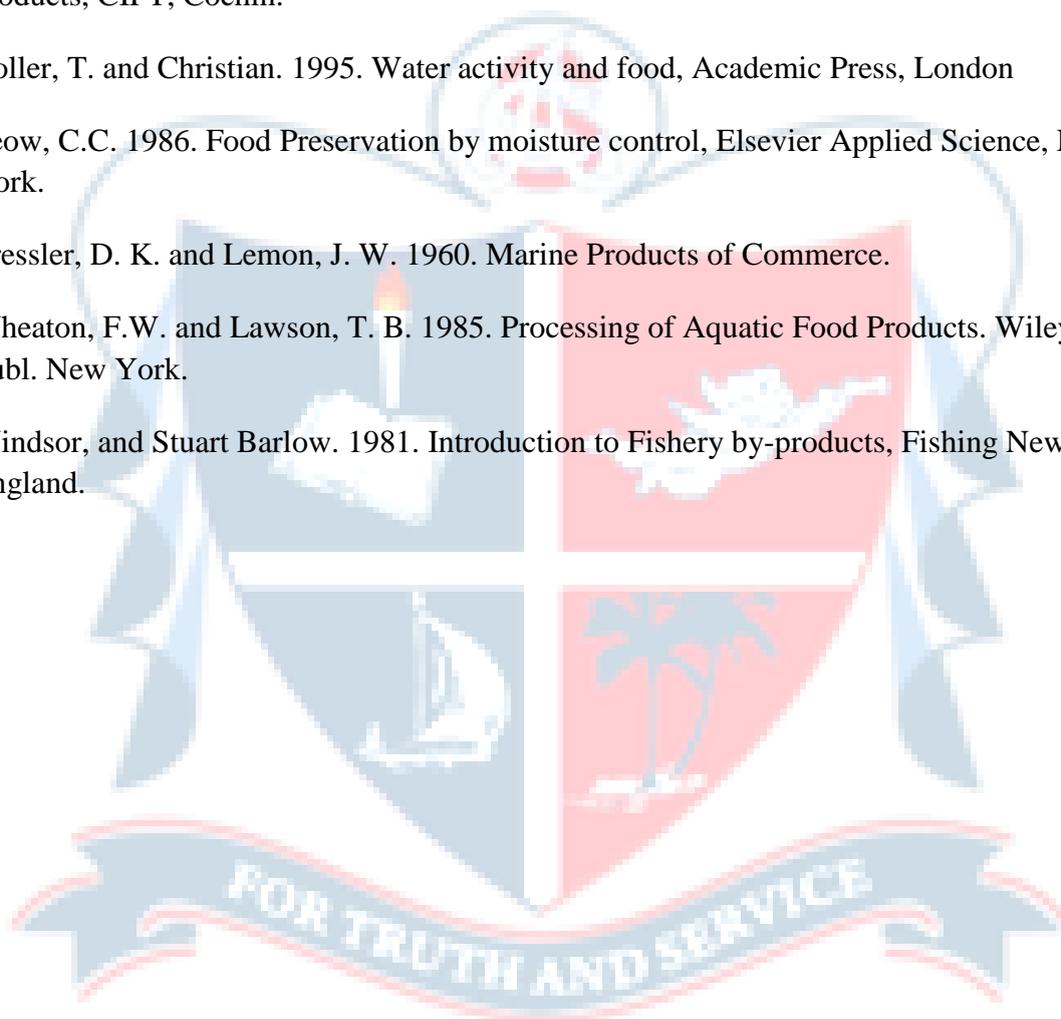
	3.2	Spoilage in thermal processed products – Quality evaluation of thermal processed products Curing and drying of fish – Spoilage in dry fish products.	4	6
4	Practical			
	4.1	Sensory evaluation of fish	4	6
	4.2	Fish filleting	4	5
	4.3	Preparation of fish steaks	4	5
	4.4	Fish / prawn pickling	5	5
	4.5	Preparation of fish cutlet	4	5
	4.6	Preparation of fish fingers	4	5
	4.7	Preparation of fish curry / prawn fry	5	5
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

References

1. Balachandran, K. K. 2001. Post-harvest technology of fish and fish products. Daya Publishing House, New Delhi.
2. Bligh, E. G. 1992. Seafood science and technology, Fishing News Books.
3. Borgstrom, G. 1961. Fish as food Vol. I- IV Academic Press, New York.

4. Gopakumar, K. 2002. Text book of Fish Processing Technology. Indian Council of Agricultural Research, New Delhi.
5. Govindan, T. K. 1985. Fish processing technology. Exford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Johnson, A. H. and Peterson M. S. 1974. Encyclopedia of Food Technology, Vol. 1st and 2nd Edtn. Amerind Publishing Company, Pvt. Ltd, New Delhi.
7. Proceedings on Summer Institute on Non-Traditional diversified fish products & by-products, CIFT, Cochin.
8. Roller, T. and Christian. 1995. Water activity and food, Academic Press, London
9. Seow, C.C. 1986. Food Preservation by moisture control, Elsevier Applied Science, New York.
10. Tressler, D. K. and Lemon, J. W. 1960. Marine Products of Commerce.
11. Wheaton, F.W. and Lawson, T. B. 1985. Processing of Aquatic Food Products. Wiley Publ. New York.
12. Windsor, and Stuart Barlow. 1981. Introduction to Fishery by-products, Fishing News Ltd, England.





Department of Fisheries and Aquaculture St. Albert's College (Autonomous) Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Principles of Fisheries Management					
Type of Course	DSE 5					
Course Code	24SACIFH5DE103					
Course Level	300					
Course Summary	This course provides students with a comprehensive understanding of the principles, strategies, and tools involved in the management of fisheries resources. Students will explore ecological, economic, and social aspects of fisheries, along with the challenges and solutions associated with sustainable fisheries management.					
Semester	V	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4			Activities (3.2, 3.3, 4.1)	60
Pre- requisites, if any	Students should possess basic knowledge in fisheries.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Understand the functions & principles of management and the scientific techniques of management	U	1
2	Knowledge on human resource management in the fisheries business environment and Institutions involved in human resource development in the Fisheries sector.	U	2, 8
3	Expertise in organizational setup and state and central support to the processing industry.	U	1
4	Explain the principles of cooperatives, types of cooperatives, issues and their role in the development of the fisheries sector.	U	1, 2

5	Explain and compare the different approaches, techniques and measures employed to manage fish stocks in a sustainable manner.	A	5, 6, 7
6	Illustrate project formulation techniques and knowledge of information applied in the decision-making processes of fisheries management	A	4, 5
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

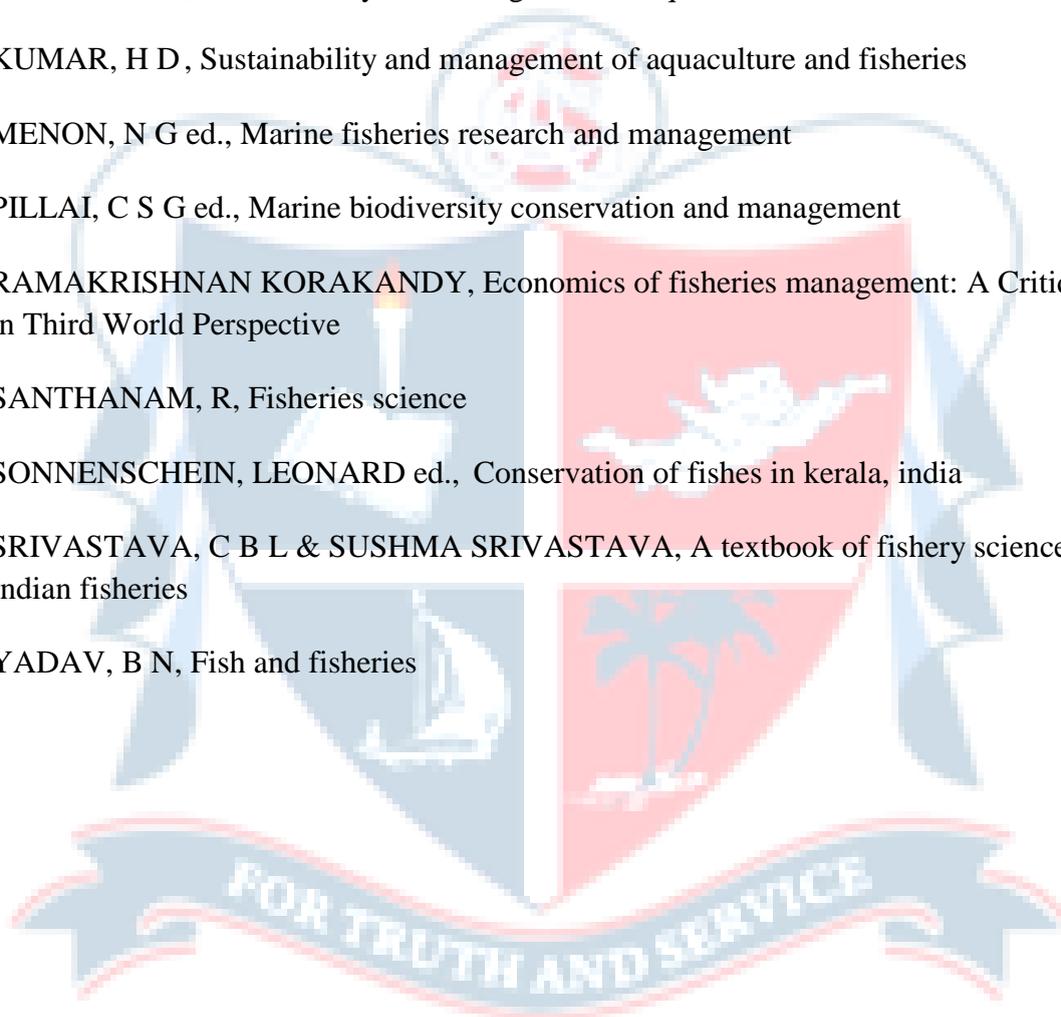
Module	Units	Course description	Hrs	CO No.
1	Introduction to Management			
	1.1	Definitions and approaches, Scope and importance of Management, Management as an art of Science- Comparative Management. Skills of management. Levels of management.	5	1
	1.2	Contributions of F W Taylor and Henry Fayol to the Scientific Techniques of management.	3	1
	1.3	Functions of Managers- Environment Impact management, Functions of Managers- Planning, Organising, Staffing, Directing and Controlling.	2	1
2	Human resource Management			
	2.1	Manpower planning and recruitment- Organisational Development- Training, Motivation, Morale and Productivity, Leadership, Organizational communication, Conflicts and Decision making.	5	2
	2.2	Human resource development and its role in the context of the fisheries sector.	2	2
	2.3	Important Institutions involved in human resource development in the Fisheries sector.	3	3
3	Processing Sector Management			
	3.1	Organizational setup in processing Industries, Organizational setup in State Fisheries Department and its role.	4	3
	3.2	Role of EIA, MPEDA and CIFT in the processing Industry. Activity: Visit to MPEDA/ CIFT	5	3

	3.3	Trade and exports- Export of Marine products- trends and present status - India's share In the International trade of sea foods. Activity: Case study on present status and export of marine products from India	6	3
	3.4	Project formulation, Process identification, Pre-feasibility-technical, Economical and Social feasibility. Socially and financially viable indicators- Cash income , employment generation, rate of Return, DCF, NPV, IRR, and sensitivity analysis. Budgeting appraisal techniques-CPM, PERT, Schedule graphing and Decision making.	5	6
4	Fisheries Resource Management, Cooperatives and Agencies in Fisheries			
	4.1	Methods used in the study of estimation of fish landing. Resource management measures- Conservation and Regulation of Fishing pressure, closed seasons, EEZ, sea ranching, artificial reefs, mesh size regulations, BRD/TED.	5	5
	4.2	Definition, Principles of co-operatives. Role of National Federation of Fishermen cooperatives, National Cooperative development Corporation (NCDC), Matsyafed, FFDA, BFFDA, ADAK, FIRMA, Kerala Fishermen Welfare Fund Board, Kerala State Reservoir Fisheries Project. Activity: Visit to any fisheries cooperative	10	4
	4.3	Problems of Fishery Cooperatives. Cooperatives and their importance in fish production and marketing. Role of NABARD and SIDBI.	5	4
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 30 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Essay (2 out of 3) 2 X 10 = 20 Marks Total – 70 Marks

References

1. AGARWAL, S C, Fishery management
2. BHUWAN CHANDRA JOSHI & ALOK KUMAR UPADHYAY, Textbook of marine fisheries: Fisheries of World Oceans and India in Perspective
3. KRISHNA CHANDRA BADAPANDA, Handbook of fisheries management
4. KUMAR, H D, Sustainability and management of aquaculture and fisheries
5. KUMAR, H D, Sustainability and management of aquaculture and fisheries
6. MENON, N G ed., Marine fisheries research and management
7. PILLAI, C S G ed., Marine biodiversity conservation and management
8. RAMAKRISHNAN KORAKANDY, Economics of fisheries management: A Critique in Third World Perspective
9. SANTHANAM, R, Fisheries science
10. SONNENSCHNEIN, LEONARD ed., Conservation of fishes in kerala, india
11. SRIVASTAVA, C B L & SUSHMA SRIVASTAVA, A textbook of fishery science and Indian fisheries
12. YADAV, B N, Fish and fisheries





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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Commercial Ornamental Fish Breeding and Culture					
Type of Course	SEC					
Course Code	24SACIFH5SE101					
Course Level	300					
Course Summary	Course provides knowledge on diversity of ornamental fish and plants, history and development of aquarium keeping and ornamental fish culture, principles of setting up and management of aquaria, breeding biology of various ornamental fishes, commercial farming techniques, seed production, packing and transportation of ornamental fishes, feeding and nutrition of ornamental fishes, prophylaxis and quarantine and disease management.					
Semester	V	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3			Activities (1.2)	60
Pre- requisites, if any	Students should possess basic knowledge in Statistics and Computer.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Explain the, commercially important ornamental fishes, setting and maintenance of aquariums in addition to water quality management.	U	1 & 10
2	Develop technical know-how for ornamental fish breeding, nutrition and disease management.	AP	10
3	Illustrate the importance of aquarium plants and water quality management	U	2
4	Illustrate the importance of ornamental fish culturing in relation with entrepreneurship development.	U	10

5	Explain the methods of rearing of marine ornamental fishes and invertebrates	U	1
6	Demonstrate skill to develop commercial units for ornamental fish production.	U	2 & 10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Introduction to ornamental fishes			
	1.1	Major ornamental fish species of India. Ornamental plants. Ornamental invertebrates	2	1
	1.2	Construction and setting up of fresh water and marine aquariums. Aquascaping. Aquarium accessories- Different types of aquariums. Activity – Aquascaping, Aquarium construction and setting up.	3	1
	1.3	Marine ornamental fishes – varieties and their habitat. Preparation of artificial sea water. Acclimatization of marine ornamentals to fresh water.	2	5
	1.4	Method of collection of live fish. Breeding of marine ornamental fishes (clown fishes and Damsel fishes). Activity - Visit to marine ornamental fish hatchery	3	5
2	Breeding, Feeding and Nutrition of Ornamental fishes			
	2.1	Breeding and larval rearing of Live bearers	1	2
	2.2	Breeding and larval rearing of egg layers	3	2
	2.3	Indigenous ornamental fishes, Ornamental aquatic plants.	1	2
	2.4	Culture of fish food organisms; Infusoria, Artemia, Rotifers, daphnia and moina Enrichment of live feed,	3	2
	2.5	Major pigments and colour enhancement of ornamental fishes. Preparation of formulated feeds for aquarium fishes.	2	2
	Health management of aquarium fishes			
3	3.1	Water quality management	3	3
	3.2	Common infectious and non infectious diseases of ornamental fishes, symptoms, prophylaxis and treatment	4	2
	3.2	Quarantine measures Packing and transportation of ornamental fishes.	3	2
4	Teacher Specific Module			

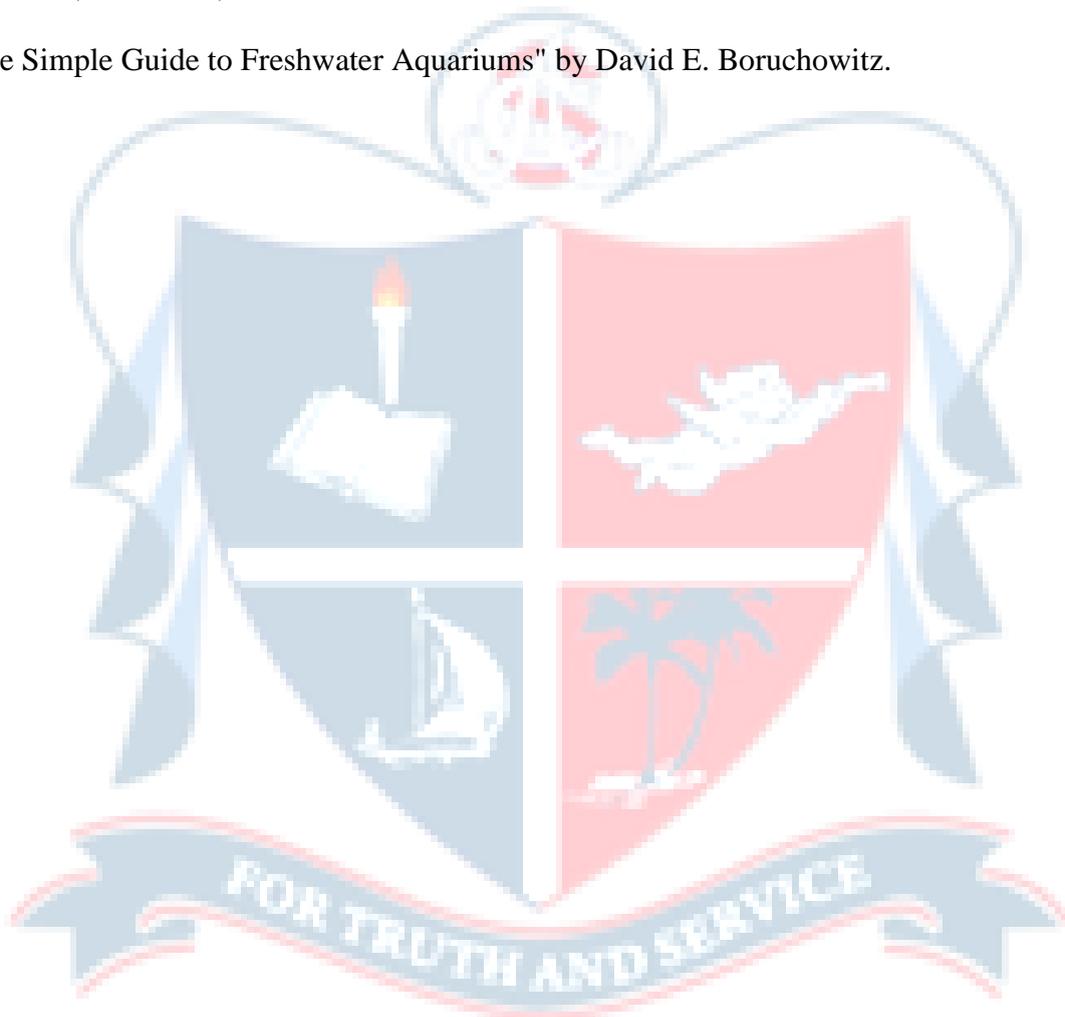
Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1=20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Total – 50 Marks

References

1. John Dawes, 1995. Live bearing Fishes (A guide to their Aquarium care, Biology and Classification) Cassell Pvt., London, 240 pp.
2. Lieske, E, Myers, R. 1996. Coral Reef Fishes, Princeton University Press, Princeton, New Jersey, 400 pp.
3. Nick Dakin, 1996. The Interpet questions & Answers Manual of the Marine Aquarium. Interpet publishing, 206 pp.
4. Walter H. Adey and Karen Loveland, 1998. Dynamic Aquaria Building Living Ecosystems. Academic Press, New Delhi, 498 pp.
5. Sebastian J. Kuravamveli, 2002. The Aquarium Handbook. Amity Aquatech Pvt. Ltd., Cochin – 28.
6. Sundararaj, V. and J.M. Sathish, 2005. Tropical Marine Aquarium. Yegam Publications, Chennai, 144 pp.
7. Greg Jennings, 2006. 500 Freshwater aquarium fish: a visual reference to the most popular species hardcover, Firefly Books, Limited, 528 Pages.
8. Matthew L. Wittenrich, 2007. The Complete Illustrated Breeder's Guide to Marine Aquarium Fishes - Microcosm/TFH (ca), 304 Pages.
9. Vincent Hargreaves, 2007. Complete Book of the Freshwater Aquarium: A Comprehensive Reference Guide to More Than 600 Freshwater Fish And Plants, Plus How to Set Up And Maintain an Aquarium, Thunder Bay Press, 304 Pages.
10. Julian Sprung, et al., 2009. Marine Aquarium Handbook: Beginner to Breeder (3rd Edition), Microcosm, 351 Pages.

Suggested Readings

1. Home Aquarium and Ornamental Fish Culture (2015), Jayashree K. V., Tharadevi C. S., and Arumugam N., Saras Publication, Tamil Nadu, India .
2. Training Manual on Freshwater Ornamental Fish Breeding and Aquascaping Techniques (2019), Haridas, H. et al, ICAR-Central Inland Agricultural Research Institute, Port Blair, India.
3. "The Simple Guide to Freshwater Aquariums" by David E. Boruchowitz.



Semester: VI

Course Code	Title of the Course	Type of the Course	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
24SACIFH6DA101	Seafood Microbiology	DSC A	4	4	4	0	0	0
24SACIFH6DA102	Seafood Quality Assurance and Management	DSC A	4	5	3	0	2	0
24SACIFH6DE101	Fisheries Economics and Extension	DSE 6	4	4	4	0	0	0
24SACIFH6DE102	Aquatic Animal Health Management	DSE 7	4	5	3	0	2	0
24SACIFH6SE101	Fish Farm Practices	SEC	3	4	2	0	2	0
24SACIFH6VA101	Sustainable Fisheries Management	VAC	3	3	3	0	0	0



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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Seafood Microbiology					
Type of Course	DSC A					
Course Code	24SACIFH6DA101					
Course Level	300					
Course Summary	The main thrust of this programme would be hands on laboratory experience in different areas of microbiology. The students admitted in the programme shall be required to take up work on any emerging areas of Fishery microbiology. In addition, they are about to know different spoilage causing microbes which would immensely help them to understand and analyze in depth the problems and challenges existing in this field.					
Semester	VI	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities (2.3)	75
Pre-requisites, if any	Students should possess basic knowledge in Statistics and Computer.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Explain the interactions between microorganisms and fishes and factors influencing their growth and survival.	U	1
2	Explain the significance and incidence of microorganisms in fishery environment.	An	2
3	Describe the characteristics of food born and spoilage causing microorganisms in fishery products and methods for their isolation, detection and identification.	A	1
4	Develop basic knowledge on the general principles of microbiology techniques.	A, S	6

5	Develop understanding about the historical landmarks in the development of microbiology and the classification of microorganisms.	U	8
6	Develop understanding about the role of microorganisms in biogeochemical cycles.	A, S	1
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Introduction			
	1.1	History and development of microbiology – Contributions of Louis Pasteur, Koch and Winogradsky – Diversity of microbial community – General characteristics of bacteria, fungi, viruses, algae and protozoans.	3	5
	1.2	Structure of prokaryotic cell, Structure and function of bacterial cell wall, plasma membrane, capsule, flagella and endospore. Structure of fungi and yeast cell. Structure of virus. Classification of viruses. Life cycle bacteriophages - lytic and lysogenic cycle.	3	2
	1.3	Occurrence, growth, survival, pathogenicity, prevention and risk assessment of common bacteria present in fish.	10	4
2	Isolation and Culture of Microbes			
	2.1	Microflora of aquatic environment. Autotrophic and heterotrophic microorganisms in aquatic environment.	3	2
	2.2	Nutrient regeneration, role of microbes in biogeochemical cycles – Carbon, Nitrogen, Phosphorus and Sulphur cycles.	3	2
	2.3	Autochthonous and allochthonous microorganisms in aquatic environment. Biological hazards associated with fish and fishery products: Marine toxins; mycotoxins, parasites and viruses. Activity: Training in a fish processing plant or in a laboratory of government or private sector research organization to study the isolation, culture and enumeration of microbes in water, ice, fish and fish products, detecting microbes by biochemical tests and molecular methods, assessment of freshness and	4	4

		quality of fresh and processed fish/ shellfish. Submission of a hand written report of the activity.		
3	Microbes of public health concern			
	3.1	Perishability of seafood –Microbial spoilage of fish and shell fish. Nutrition and growth of bacteria – different types of media for isolation of bacteria and fungi.	5	3
	3.2	Spoilage microflora. Prokaryotic growth – characteristic features of bacterial growth curve – Effect of environmental factors on growth.	3	3
	3.3	Intrinsic and extrinsic factors affecting spoilage. Microflora associated with body parts.Bacteria involved in foodborne infections and intoxications– <i>Vibrio parahaemolyticus</i> , <i>V. cholerae</i> , <i>Listeria monocytogenes</i> , <i>Clostridium</i> , <i>Salmonella</i> , <i>Shigella</i> , <i>Staphylococcus</i> , <i>E. coli</i> .	7	3
	3.4	Food borne pathogens. Sources of contamination. Isolation and culture of microorganisms from water and sediment. Different culture techniques	2	3
4	Practical			
	4.1	Experiencing the Equipments of Microbiology Laboratory	2	4
	4.2	Sampling methods for microbiological investigation	3	4
	4.3	Assessment of freshness index of fish by using organoleptic characters.	3	4
	4.4	Examining and familiarization of common possible bacteria in seafood	2	4
	4.5	Staining Procedure of bacteria.	3	4
	4.6	Determination of TPC	3	4
	4.7	Sterilization techniques, Media preparation, Isolation and maintenance of bacteria	4	4
	4.8	Identification of bacteria	4	4
	4.9	Isolation and characterization of bacteria	4	4
	4.10	Freshness Index	2	4
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

Recommended Books for Transaction hours

1. Chichester, CO. and Graham, HD. (Eds.). (2013). Microbial safety of fishery products. Academic Press.
2. Gopakumar, K. (2002). Text Book of Fish Processing Technology. ICAR Publ. New Delhi.
3. Connell J J. (1995). Control of Fish Quality. Fishing News Books.
4. Jeyasekharan, G., Jaya Shakila, R. and Sukumar, D. (2006). Quality and Safety of Sea foods– Text Book. Tamilnadu Veterinary and Animal Sciences University, Chennai.
5. Huss HH, Jakobsen M and Liston J. (1992). Quality Assurance in the Fish Industry. Elsevier Science Publishers, B.V., Amsterdam, Netherlands

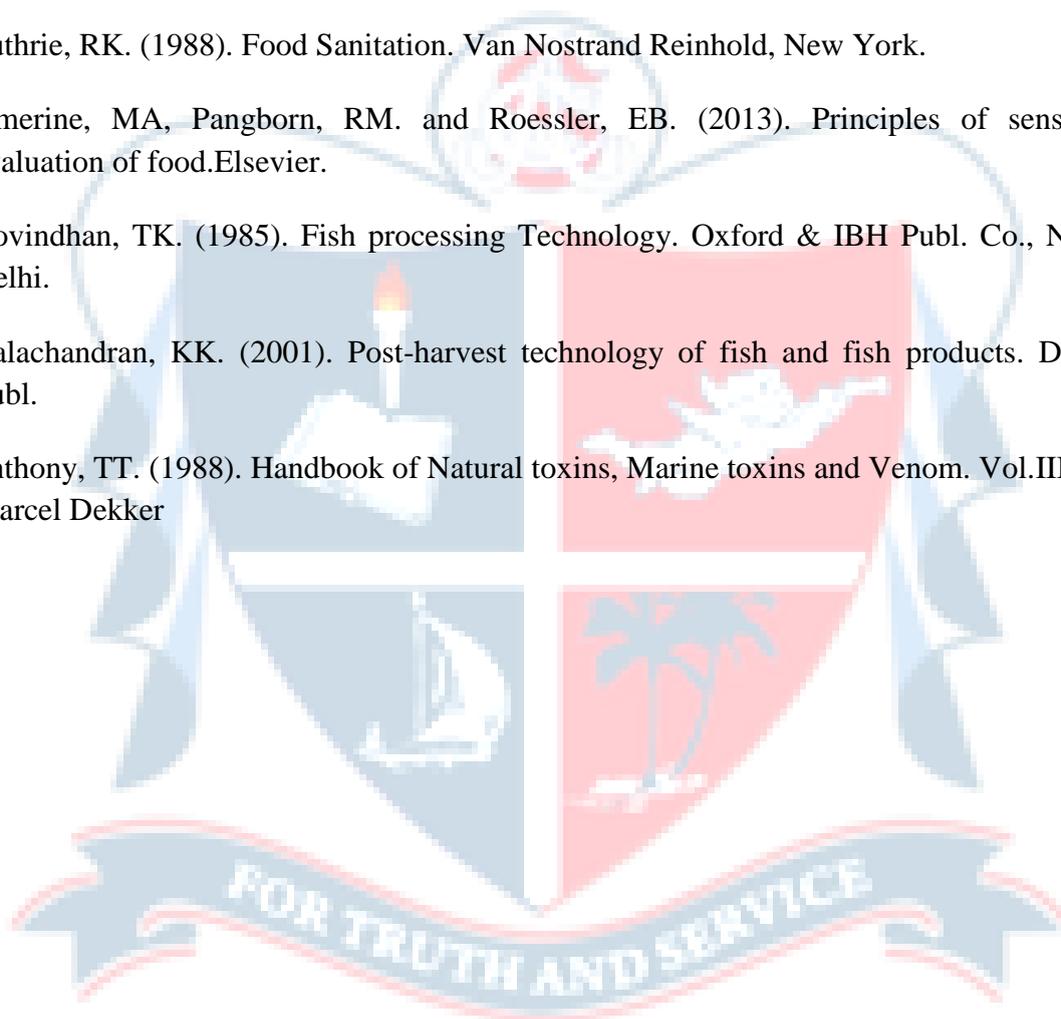
References

1. Surendran, PK, Nirmala T, Narayanan NV. and Lalitha, KV. (2003). Laboratory Manual on Microbiological Examination of Sea food, CIFT, Cochin.
2. Quality Assurance in seafood processing. (2005). CIFT Publ.,Cochin.
3. Huss, HH. (1994). Assurance of Seafood Quality. FAO Fisheries Technical Paper 334, FAO, Rome, Italy.

4. Burgess, et al. (1982). Fish Inspection and Quality Control. Fishing News Books Ltd., UK
5. Bonell, AO. (1994). Quality Assurance in Seafood Processing: A practical Guide. Chapman and Hall, New York.

Suggested Readings

1. Wheaton, FW. and Lawson, TB.(1985). Processing Aquatic Food Products, A Wiley-Inter Science Publication. U.S.A.
2. Guthrie, RK. (1988). Food Sanitation. Van Nostrand Reinhold, New York.
3. Amerine, MA, Pangborn, RM. and Roessler, EB. (2013). Principles of sensory evaluation of food.Elsevier.
4. Govindhan, TK. (1985). Fish processing Technology. Oxford & IBH Publ. Co., New Delhi.
5. Balachandran, KK. (2001). Post-harvest technology of fish and fish products. Daya Publ.
6. Anthony, TT. (1988). Handbook of Natural toxins, Marine toxins and Venom. Vol.III. Marcel Dekker





**Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam**

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Seafood Quality Assurance and Management					
Type of Course	DSC A					
Course Code	24SACIFH6DA102					
Course Level	300					
Course Summary	This course is designed to equip students with a comprehensive understanding of quality assurance principles, management strategies, and certification systems within the fisheries industry. Students will explore the importance of ensuring the quality and safety of fishery products, managing processes to meet industry standards, and obtaining certifications that signify compliance with regulatory and market requirements. Through theoretical discussions, case studies, and practical applications, students will develop the knowledge and skills necessary to implement effective quality assurance measures and navigate certification processes in the dynamic field of fisheries.					
Semester	VI	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4			Activities (1.2, 2.1, 2.2, 4.1)	60
Pre-requisites, if any	Students should possess basic knowledge in fish processing, quality assurance and management.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Knowledge in hazards, quality control measures and their role in product safety and consumer satisfaction.	U	1
2	Skill in sensory evaluation of fish and fish products, taste panel selection and constitution, statistical analysis.	S	2

3	Explain various quality management systems, such as ISO 9001 and HACCP.	U	1
4	Implementation strategies for ensuring continuous improvement in fisheries processes.	A	1, 10
5	Understanding national and international regulatory standards governing fisheries.	U	1
6	Knowledge in ensuring compliance with hygiene, safety, and labelling regulations.	A	6
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

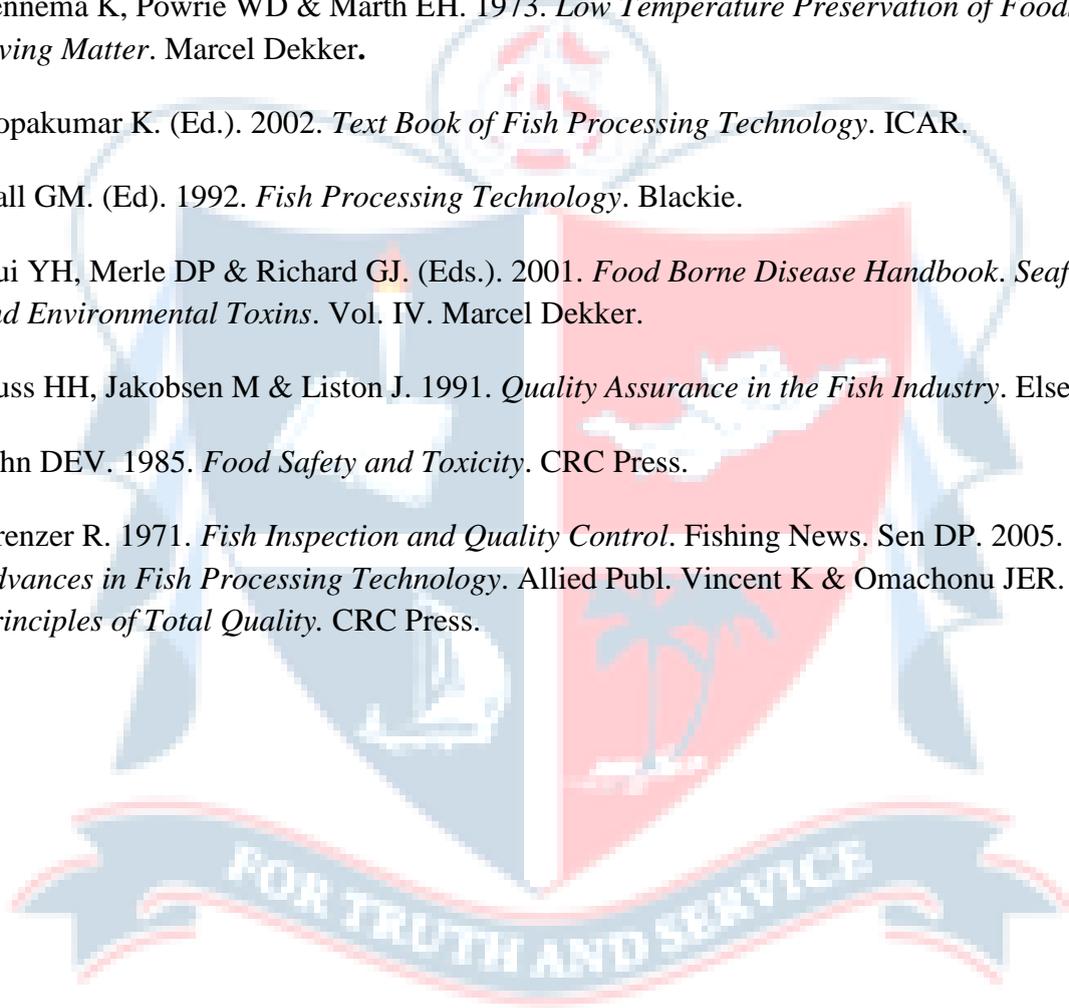
Module	Units	Course description	Hrs	CO No.
1	Quality of seafood			
	1.1	Quality, Quality assurance, Quality management, total quality concept and application in fish trade. Quality assessment of fish and fishery products - physical, chemical, organoleptic and microbiological. Quality standards. Quality Assurance. Food Safety: Definition, Factors affecting Food Safety, Important considerations for Seafood Safety. Hazards in Seafood. Physical, chemical and microbiological. Food borne diseases.	10	1
	1.2	Quality assessment of fish and fishery products - physical, chemical, organoleptic and microbiological quality standards. Sensory evaluation of fish and fish products, basic aspects, different methods of evaluation, taste panel selection and constitution, statistical analysis. Activity: Evaluation of fish / fishery products for organoleptic and microbial quality.	10	2
2	Inspection and quality assurance			
	2.1	Fish inspection in India, process water quality in fishery industry, product quality. Water quality and standards. Activity: Check the quality of water and ice	6	3
	2.2	Total quality management; Good Manufacturing Practices, Good Laboratory Practices, Quality Management systems QSS. Quality Circles, SQC, ISO System, Codex Alimentarius	10	3, 4

		commission. HACCP, Principles, Implementation. Plan Documentation, types of record. Auditing, Surveillance; Audit, Mock audit, third party quality certifying audit, Auditors and Lead auditors. Certification procedures, certifying bodies, Accrediting bodies, international bodies. Activity: Preparation of HACCP plan		
3	National and International standards			
	3.1	ISO 9000: 2000 series of quality assurance systems, <i>Codex alimentarius</i> , USFDA and EU regulations for fish export trade, IDP and SAT formations in certification of export worthiness of fish processing units, regulations for fishing vessels, pre-processing and processing plants, EU regulations. ISO 22000:2006.	8	5
4	Factory sanitation and hygiene			
	4.1	National and international requirements, SSOP, Sanitary and Phytosanitary measures. Food laws in India, integrated food law. FSSI. Activity: Evaluation of sanitary conditions in fish processing units.	8	6
	4.2	National and international laws and regulations- regulatory agencies- International standards-ISO 9000 series of quality systems-WTO, SPS and TBT regulations. Traceability issues in seafood production chain- Methods, good traceability practice, principle methods for the validation of traceability.	8	6
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 30 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Essay (2 out of 3) 2 X 10 = 20 Marks Total – 70 Marks

References

1. Anthony TT. 1988. *Handbook of Natural Toxins. Marine Toxins and Venom*. Vol. III. Marcel Dekker.
2. Balachandran KK. 2001. *Post Harvest Technology of Fish and Fish Products*. Daya Publ. House.
3. Connell JJ. 1995. *Control of Fish Quality*. Fishing News Books.
4. Fennema K, Powrie WD & Marth EH. 1973. *Low Temperature Preservation of Foods and Living Matter*. Marcel Dekker.
5. Gopakumar K. (Ed.). 2002. *Text Book of Fish Processing Technology*. ICAR.
6. Hall GM. (Ed). 1992. *Fish Processing Technology*. Blackie.
7. Hui YH, Merle DP & Richard GJ. (Eds.). 2001. *Food Borne Disease Handbook. Seafood and Environmental Toxins*. Vol. IV. Marcel Dekker.
8. Huss HH, Jakobsen M & Liston J. 1991. *Quality Assurance in the Fish Industry*. Elsevier.
9. John DEV. 1985. *Food Safety and Toxicity*. CRC Press.
10. Krenzer R. 1971. *Fish Inspection and Quality Control*. Fishing News. Sen DP. 2005. *Advances in Fish Processing Technology*. Allied Publ. Vincent K & Omachonu JER. 2004. *Principles of Total Quality*. CRC Press.





Department of Fisheries and Aquaculture St. Albert's College (Autonomous) Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Fisheries Economics and Extension					
Type of Course	DSE 6					
Course Code	24SACIFH6DE101					
Course Level	300					
Course Summary	The Fisheries Extension and Economics course is a comprehensive program designed to provide students with a well-rounded understanding of key concepts in fisheries development. Covering history, teaching methodologies, economic principles and cooperative practices. Emphasizing India's context, the course addresses socio-economic challenges, cooperative structures and the role of organizations in uplifting fishermen.					
Semester	VI	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4			Activities (1.4, 2.3, 4.4, 4.5)	60
Pre-requisites, if any	Basic Knowledge of Fisheries Science					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Define the principles, scope of economics and basic economic concepts.	K, U	1
2	Demonstrate an understanding of demand and supply dynamics.	U	1, 2
3	Explain the concept of elasticity of demand and Law of Equimarginal Returns and demonstrate its significance in fisheries development.	U	
4	Outline the principles and functions of fisheries co-operatives. Explain the role of National Co-operative development	U	1, 9

	Corporation, Matsyafed and NABARD in improving the socio-economic conditions of fishermen.		
5	Demonstrate comprehensive historical awareness of fisheries extension and its pivotal role in Indian fisheries development. Demonstrate skills in actively employing individual, group and mass extension teaching methods.	U	5
6	Apply communication skills, audio-visual aids in the planning, preparation and presentation of extension programs.	A	4
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

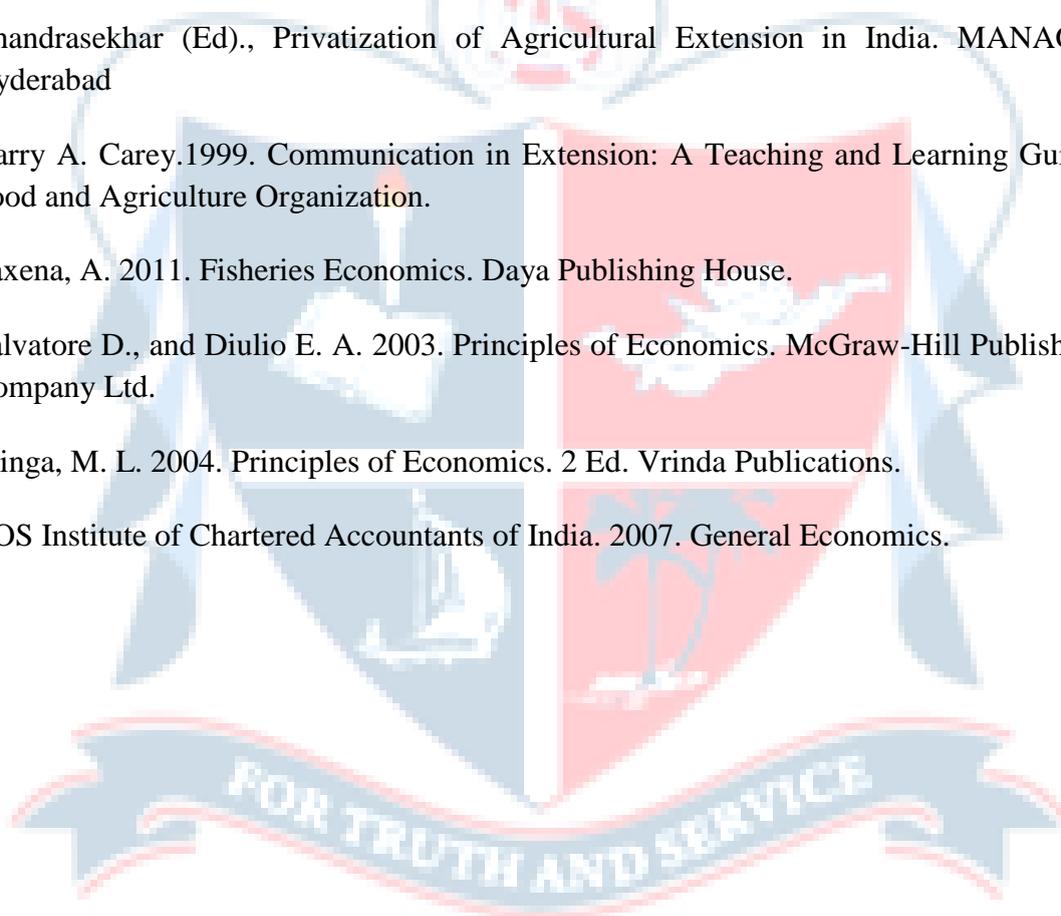
Module	Units	Course description	Hrs	CO No.
1	Fisheries Economics			
	1.1	Principles of Economics: Definition, Subject Matter and Scope of Economics. Basic Concept of economics-goods, services, utility. Wants and Demands; Micro and Macro Economics: Definition	5	1
	1.2	Demand and supply, Law of diminishing returns, Laws of increasing, constant and decreasing utility and returns	4	2
	1.3	Elasticity of demand, Law of equi-marginal returns. Importance of economics in fisheries development	3	3
	1.4	<i>Activity:</i> Prepare Questionnaire: Collection of Socio-economic data from fishing villages	4	6
2	Fisheries Co-operatives			
	2.1	Fishery Co-operatives: Principles, Functions, and its administrative structure, financial assistance, input supplies, marketing of fish.	4	4
	2.2	Role of National Cooperative Development Corporation, Matsyafed and NABARD in uplifting socio economic conditions of fishermen	4	4
	2.3	<i>Activity:</i> Meet the members of a fisheries cooperative society and write a report on the routine and financial activities of that group	2	4
3	Fisheries Extension			
	3.1	History of Fisheries Extension, Concepts and Principles. Role		

		of fisheries extension in fisheries development in India.	5	5
	3.2	Extension Teaching Methods: Individual, Group and Mass methods, farm and home visits, seminars, discussions, exhibition and personal contacts.	7	5
4	Communication Process			
	4.1	Introduction, Characteristics of communication, Dimensions of communication-verbal, non-verbal, oral communication, written communication, formal communication, Informal communication, unintentional communication, intentional communication; Communication Context; Communication Process; Elements of Communication- Source, Message, Channels, Receiver, Feedback, Barriers	5	6
	4.2	Audio-visual Aids- Introduction, Classification of Audio-visual aids, Choice of Audiovisual aids, Organization of Audio-visual programme-Planning, Preparation, Presentation, Follow-up; Qualities of a Good visual, Limitation	5	6
	4.3	Extension Talk: Planning of extension talk, Delivery or presentation of Extension talk. Handling group and Individual situations	3	6
	4.4	<i>Activity:</i> Design Extension materials: Posters/ Flip Charts/ leaflets/ bulletins	4	5
	4.5	<i>Activity:</i> Make a video reel on value addition in fish or activity of a fishing village	5	5
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 30 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Essay (2 out of 3) 2 X 10 = 20 Marks Total – 70 Marks

References

1. Saxena A. 2011. Fisheries Extension. Daya Publishing House.
2. Carey H. A., Haberland H. N. 2007. Communication in Extension- A Teaching and learning Guide. Astral
3. Ray G. L. 2023. Extension Communication and Management. Kalyani Publishing House.
4. Malhotra, S. P. and Sinha V. R. P. 2007. Indian Fisheries and Aquaculture in Globalizing Economy Part II, Narendra Publishing House.
5. Chandrasekhar (Ed)., Privatization of Agricultural Extension in India. MANAGE, Hyderabad
6. Harry A. Carey.1999. Communication in Extension: A Teaching and Learning Guide. Food and Agriculture Organization.
7. Saxena, A. 2011. Fisheries Economics. Daya Publishing House.
8. Salvatore D., and Diulio E. A. 2003. Principles of Economics. McGraw-Hill Publishing Company Ltd.
9. Jhinga, M. L. 2004. Principles of Economics. 2 Ed. Vrinda Publications.
10. BOS Institute of Chartered Accountants of India. 2007. General Economics.





Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam

Programme	B.Sc. Industrial Fisheries					
Course Name	Aquatic animal health management					
Type of Course	DSE 7					
Course Code	24SACIFH6DE102					
Course Level	300					
Course Summary	Aquatic Animal Health Management is a specialized program that focuses on the health and management of aquatic animals, including fish, shellfish, and other aquatic organisms. It equips students with the necessary skills and knowledge to prevent, diagnose, and treat diseases in aquatic animals, while also addressing environmental and public health concerns.					
Semester	VI	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities 3.3	75
Pre -requisites, if any	Students should possess knowledge regarding Aquatic animal health management.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Understanding the various diseases in fishes and diagnostic methods.	U	1
2	Develop a basic knowledge of fish immunology and prevention of fish diseases.	U, A, S	1 2
3	Thorough knowledge in the field of diseases in various species of fishes caused by infectious and noninfectious agents.	A, S	1 2
4	Clear knowledge of the new method of prevention and therapy of fish diseases in culture systems.	A, S	10 6

5	Necessary skill and knowledge in animal health in relation between host, pathogen and the environment.	A, C, S	1 2
6	Sufficient knowledge on diseases management tools and ecological impacts of diseases in aquatic environment.	A, S	1
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
		Module 1. Pathology and Parasitology	7 Hours	
1	1.1	Introduction to fish diseases – Definition and categories of diseases – Disease and environment. pathology and parasitology.	2	1
	1.2	Stress as a factor in the occurrence of diseases. Parasitism – host-parasite relationship. Defence mechanism in fish and shell fish, Application and development of vaccines, Diagnostic tools – immune detection- DNA/RNA techniques.	5	3,5
		Module 2. Bacteria, Viral and Fungal Diseases	20 Hours	
2	2.1	Common bacterial diseases (Enteric red mouth disease, Bacterial cold water disease, furunculosis, vibriosis, dropsy and Gill and fin rot) their diagnosis and treatment.	10	3, 4
	2.2	Major shrimp viral diseases – <i>Baculovirus penaeii</i> , Monodon Baculovirus, Baculo viral midgut necrosis, IHHNV, Hepatopancreatic parvo like virus, Yellow head baculovirus, white spot baculovirus	7	3, 4
	2.3	Fungal diseases (finfish) – Saprolegniosis, brachiomyxosis, ichthyophonus diseases – Lagenidium diseases – Fusarium disease Viral diseases (finfish) – IPN, IHN, Viral Hemorrhagic Septicemia, Spring Viremia of carps – Major CCVD, Carp lymphocytes	3	3,5
		Module 3. Protozoan, Metazoan and Nutritional Diseases	18 Hours	
3	3.1	Protozoan diseases- Ichthyophthiriasis, Costiasis, whirling diseases, trypanosomiasis. General preventive methods and prophylaxis. Good pond management practices- Eco-friendly and sustainable aquaculture.	10	4

	3.2	Metazoan Diseases- diseases caused by annelids, helminthes, crustaceans and molluscs. Quarantine. Methods of pathological examination of fish and infectious diseases. Production of disease-free seeds.	5	3, 5
	3.3	Nutritional pathology – lipid liver degeneration, Vitamin and mineral deficiency diseases. Aflatoxin and dinoflagellates. Antibiotic and chemotherapeutics. Nutritional cataract. Genetically and environmentally induced diseases. Evaluation criteria of healthy seeds. Good Feed management for healthy organisms. Probiotics in health management. Activity : Visit to aquatic animal health institution	3	4
Module 4. PRACTICAL		30 Hours		
	1	Collection of diseased specimen.	6	4
	2	Identification of fungal pathogens.	4	4
	3	Identification of parasites.	4	4
	4	Dosage calculation of therapeutant for prophylatic measures.	4	4
	5	Dosage calculation in feed for bacterial disease	4	4
	6	Dissection of shrimp and bivalve and studying the anatomy.	4	4
	7	Quarantine treatment method	4	4
Module 5. Teachers specific module				

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	<p>Mode of Assessment</p> <p>A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks</p> <p>B. Semester End Examination</p> <p>Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks</p> <p>Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks</p>

Recommended Books for Transaction hours

INGLIS, VALERIE ET AL	Bacterial diseases of fish
BISWAS, K P	Prevention and control of fish and prawn diseases
TRAVERS & JANEWAY	Immunobiology: the immune system in health and disease
CHAKRABARTI, N M	Diseases of cultivable fresh water fishes and their control
GRABDA, JADWIGA	Marine fish Parasitology
EGUSA, SHUZO	Infectious diseases of fish
BISWAS, K P	Prevention and control of fish and prawn diseases
AUSTIN, B & AUSTIN, D A	Bacterial fish pathogens: disease of farmed and wild fish

References

A Gopalakannan, A Uma and S. Felix - Fish Diseases and Management

1. A S Ninawe, J R Dhanze and Rani Dhanze - Aquaculture for Nutritional and livelihood Security
2. Boyd, C. E. and Tucker, C. S. 1992 - Water Quality and Pond Soil Analyses for Aquaculture, Alabama Agricultural Experimental Station- Auburn University
3. CIFE. 1993 - Training Manual on Culture of Live Food Organisms for AQUA Hatcheries - CIFE, Mumbai
4. D R Khanna, Rajani Rana and Gagan Matta - Ecology of Fish Pond
5. De Silva S S & Anderson T A. 1995 - Fish Nutrition in Aquaculture - Chapman & Hall Aquaculture Series
6. F Parthiban, S Balasundari, B Ahilan and S Felix - Aquatic Food Safety and Quality Management
7. Felix S, Riji John K, Prince Jeyaseelan MJ & Sundararaj V. 2001 - Fish Disease Diagnosis and Health Management. Fisheries College and Research Institute - T.N. University Thoothukkudi

8. Halver JE & Tiews KT. 1979 – Fin fish Nutrition and Fish feed Technology - Vols. I, II Heenemann, Berlin
9. Halver J & Hardy RW. 2002 - Fish Nutrition – Academic Press
10. Hertrampf JW & Pascual FP.2000 - Handbook on Ingredients for Aquaculture Feeds – Kluwer
11. Midlen & Redding TA. 1998 – Environmental Management for Aquaculture - Chapman & Hall.
12. N Jayakumar, P Jawahar, R Durairaja and S Felix - Fish Population Dynamics and Stock Assessment
13. Pillay TVR & KuttyMN. 2005 - Aquaculture: Principles and Practices - Ed. Blackwell.
14. R.K. Rath - Freshwater Aquaculture (3rd Edition)
15. Rajagopalsamy CBT & Ramadhas V. 2002. - Nutrient Dynamics in Freshwater Fish Culture System - Daya Publ.
16. Sharma LL, Sharma SK, SainiVP & Sharma BK. (Eds.).2008. - Management of Freshwater Ecosystems - Agrotech Publ. Academy
17. Thomas PC, Rath SC & Mohapatra KD. 2003 - Breeding and Seed Production of Finfish and Shellfish - Daya Publ
18. Wedmeyer G, Meyer FP & Smith L. 1999 - Environmental Stress and Fish Diseases - Narendra Publ.House





**Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam**

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Fish farm Practices					
Type of Course	SEC					
Course Code	24SACIFH6SE101					
Course Level	300					
Course Summary	This course provides students with a comprehensive understanding of the principles and practices involved in managing a fish farm. Topics include site selection, pond preparation, water quality management, fish health, and sustainable aquaculture practices. Practical aspects of fish farming, such as feeding, stocking, and harvesting, are also covered.					
Semester	VI	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2		1	Activities	60
Pre- requisites, if any	Students should possess basic knowledge in fish farm.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Summarize the different systems of aquaculture including recent techniques in aquaculture systems.	U	1
2	Understand the importance of fish farming and criteria for the site selection and selection of species. Analyze water quality, Design and planning and fish farm or hatchery	U, A, S	1 2
3	Demonstrate the pre -stocking pond preparation steps such as drying, plough, liming, and manuring and fertilization and proper procedures for grow out	A, S	1 2

4	Develop sufficient professional knowledge in fish farm to start own enterprise, outline the major diseases associated with farming practices and develop knowledge on disease management tools	A, S	5 6 10
5	Illustrate feed formulation techniques for the manufacture of nutritionally balanced feed	A, C, S	1 2
6	Mastery on hatchery operation and harvesting methods, familiarity with equipment operation	A, S	1
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Site Selection, Pond Design and Water Management in Fish Farming			
	1.1	Definition and scope of fish farm management. Aquaculture and its significance. Historical perspective and development of aquaculture. Criteria for site selection, Types of aquaculture facilities (ponds, raceways, tanks), Facility design considerations and planning.	4	1
	1.2	Factors influencing pond design. Types of fish ponds and construction methods: Dike construction, Eradication of undesirable aquatic weeds, Eradication of weed fishes, Liming of pond, Basal manuring and fertilization, Eradication of aquatic insects, Bio fencing.	4	3, 4
	1.3	Principles of water quality management. Monitoring and maintenance of water parameters. Aeration systems and their applications.	3	2
2	Fish Species Selection, Stocking and Post Harvest			
	2.1	Criteria for selecting fish species for farming. Handling and transportation of fish, Stocking densities and ratios.	4	3
	2.2	Nutritional requirements of fish, Formulation and preparation of fish feeds, Feeding strategies for different species.	5	3, 4
	2.3	Common diseases in aquaculture, Disease prevention and control measures, Health management practices	4	5

	2.4	Harvesting techniques, Processing and storage of aquaculture products, Value addition and marketing.	3	6
	2.5	Developing a business plan, Budgeting and financial management, Marketing strategies for fish products.	3	6
3	Practical			
	3.1	Estimation of water quality parameters (pH, Salinity, Turbidity, Hardness, Dissolved Oxygen, CO ₂ , Ammonia, etc.)	8	2
	3.2	Fish feed preparation	4	5
	3.3	Identification of common diseases in aquaculture	2	4
	3.4	Preparation of value-added products	6	6
	3.5	Training in fish farm	10	3, 4
4	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 15 Marks Practical – 10 Marks
	B. Semester End Examination Theory MCQ (15 out of 15) 15 X 1=15 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Total - 35 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 10 Marks Record = 3 Marks Viva = 2 Marks Total – 15 Marks

References

1. A Gopalakannan, A Uma and S. Felix - Fish Diseases and Management
2. A S Ninawe, J R Dhanze and Rani Dhanze - Aquaculture for Nutritional and livelihood Security

3. Boyd, C. E. and Tucker, C. S. 1992 - Water Quality and Pond Soil Analyses for Aquaculture, Alabama Agricultural Experimental Station- Auburn St. Albert's College (Autonomous)
4. CIFE. 1993 - Training Manual on Culture of Live Food Organisms for AQUA Hatcheries - CIFE, Mumbai
5. D R Khanna, Rajani Rana and Gagan Matta - Ecology of Fish Pond
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7. F Parthiban, S Balasundari, B Ahilan and S Felix - Aquatic Food Safety and Quality Management
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14. Pillay TVR & Kutty MN. 2005 - Aquaculture: Principles and Practices - Ed. Blackwell.
15. R.K. Rath - Freshwater Aquaculture (3rd Edition)
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18. Thomas PC, Rath SC & Mohapatra KD. 2003 - Breeding and Seed Production of Finfish and Shellfish - Daya Publ
19. Wedmeyer G, Meyer FP & Smith L. 1999 - Environmental Stress and Fish Diseases - Narendra Publ. House



**Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam**

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Sustainable Fisheries Management					
Type of Course	VAC					
Course Code	24SACIFH6VA101					
Course Level	300					
Course Summary	This course explores the principles and practices of sustainable fisheries management, focusing on ecological, social, and economic aspects. Topics include fisheries ecology, resource assessment, conservation measures, community involvement, and policy development.					
Semester	VI	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3			Activities	45
Pre- requisites, if any	Students should possess basic knowledge in seafood processing and fisheries.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Define the concept of sustainable fisheries and articulate its importance in maintaining ecosystem health and meeting the needs of present and future generations.	U	1
2	Apply population dynamics concepts to assess and understand the growth, recruitment, and mortality of fish populations.	A	2
3	Assess national and international fisheries legislation and policies governing sustainable fisheries management and identify key legal frameworks and analyze their effectiveness.	U, E	2,6

4	Demonstrate the ability to conduct stock assessments, utilizing both fishery-dependent and fishery-independent data.	U, A	2
5	Analyze the impact of bycatch and discards on fisheries sustainability.	An	2
6	Understand the principles of sustainable aquaculture and its role in meeting global food demand. Understand social ethics and responsibilities in fisheries.	U	2,6
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Fisheries Legislation and Policy			
	1.1	Definition and importance of sustainable fisheries. Historical perspectives on fisheries management, Fisheries Subsidies and their Impacts.	2	1
	1.2	Ecosystem-based fisheries management. Population dynamics and stock assessment. Trophic interactions in marine ecosystems, Concepts of Sustainable Yield and Maximum Sustainable Yield, Understanding Recruitment, Growth, and Mortality in Fish Populations.	3	2
	1.3	Overview of national and international fisheries regulations, Fishery legislation and regulation, Laws of the Sea, Regulation on industrial effluents, Fisheries Regulations and Governance Structures, Role of Stakeholders in Fisheries Management, Fisheries Policy Frameworks: National and International Perspectives.	6	3
	1.4	Code of conduct for responsible fisheries, WTO, Important acts pertaining to fisheries in Kerala - Kerala Marine Fisheries Act.	4	3
2	Fisheries Assessment Methods & Conservation and Bycatch Reduction			
	2.1	Fisheries stock assessment techniques. Data collection and analysis. Uncertainty and precautionary approaches.	4	4
	2.2	Environmental Impacts of Aquaculture Environmental Impacts of Fishing Gear, Bycatch and Discard Issues, Innovations in Selective and Sustainable Fishing Gear, Sustainable fishing practices, Selectivity in fishing gear.	6	5

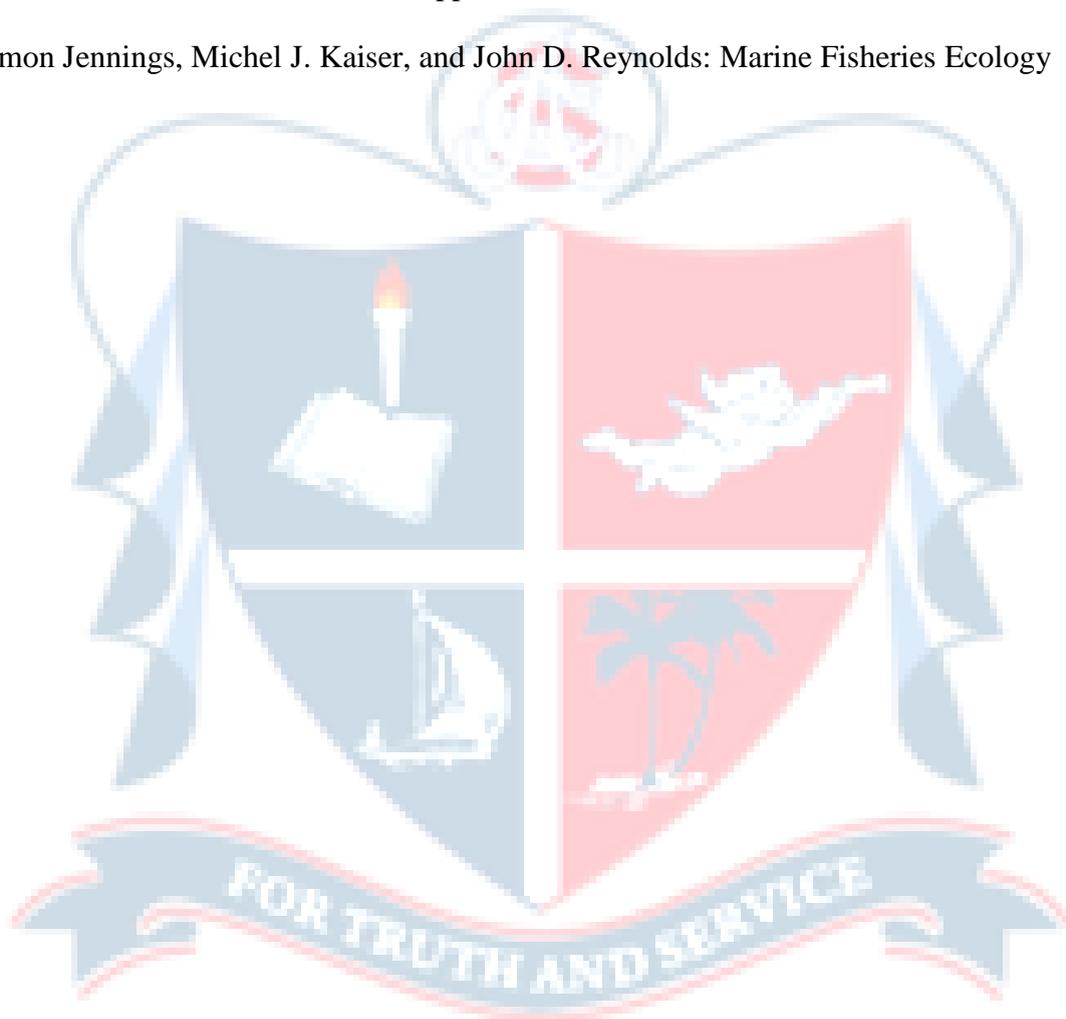
	2.3	Conservation and Regulation of Fishing pressure, closed seasons, EEZ, sea ranching, artificial reefs, mesh size regulations, BRD/TED	5	5
3	Strategies For Sustainability, Ethics and Social Responsibility in Fisheries			
	3.1	Sustainability concept; food security; biosecurity; organic farming; integrated farming; responsible aquaculture; rotational aquaculture; bioremediation; biofloc; periphyton aquaculture; IMTA; RAS; role of biotechnology, traceability. Seed certification, Fisheries Enhancement Programs: Stocking and Habitat Enhancement, Use of antibiotics. Activity: Visit to RAS/Biofloc/IMTA and Model preparation	6	6
	3.2	Role of Marine Protected Areas (MPAs) in Fisheries Management, Design and Implementation of MPAs, Habitat Conservation and Restoration Techniques	4	6
	3.3	Ethical Issues in Fisheries Management, Social Impacts of Fisheries Management Decisions, Indigenous Knowledge and Perspectives in Fisheries Management, Gender Equality and Social Inclusion in Fisheries. Activity: Visit to conventional aquafarm	5	6
4	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1=20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Total – 50 Marks

References

1. David L. MacKinlay and Patricia A. M. Brown: Introduction to Fisheries Management
2. Michael King and David Crear: Fisheries Biology, Assessment and Management

3. Ministry of Agriculture and Farmers Welfare, Government of India: Marine Fisheries Policy of India
4. Norman P. Brown: Fishery Science: The Unique Contributions of Early Life Stages
5. Paul R. Pinet: Introduction to Oceanography
6. Peter Castro and Michael E. Huber: Introduction to Marine Biology
7. R. Quentin Grafton, Ray Hilborn, Dale Squires, Maree Tait, and Meryl Williams: Sustainable Fisheries: Multi-level Approaches to a Global Problem
8. Simon Jennings, Michel J. Kaiser, and John D. Reynolds: Marine Fisheries Ecology



Semester: VII

Course Code	Title of the Course	Type of the Course	Credit	Hour s/ week	Hour Distribution /week			
					L	T	P	O
24SACIFH7CC101	Fisheries Administration and Legislation	DCC	4	4	4	0	0	0
24SACIFH7CC102	Fisheries Marketing and Seafood Trade	DCC	4	4	4	0	0	0
24SACIFH7CC103	Fish Genetics and Biotechnology	DCC	4	5	3	0	2	0
24SACIFH7CE101	Oceanography	DCE	4	4	4	0	0	0
24SACIFH7CE102	Fish farm Engineering and Aquaculture Techniques	DCE	4	4	4	0	0	0
24SACIFH7CE103	Fishery Ecology	DCE	4	4	4	0	0	0



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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Fisheries Administration and Legislation					
Type of Course	DCC					
Course Code	24SACIFH7CC101					
Course Level	400					
Course Summary	This course provides an overview of the principles, practices, and regulations governing fisheries administration and legislation. Equip students with the knowledge and skills required to effectively manage fisheries operations. Participants will explore the principles of fisheries administration, regulatory compliance, and sustainability in the fisheries industry.					
Semester	VII	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4			Activities (3.3)	60
Pre-requisites, if any	Students should possess basic knowledge in fisheries.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Define and explain the principles and functions of fisheries administration at local, regional, and national levels.	U	1
2	Explain the role of different state level and central level fisheries organizations and institutions	U	1
3	Explain planning organizations for fisheries and understand Fisheries development in India during the plan periods.	U	1
4	Understand the national policies and regulations in marine, inland, brackish water and processing sectors.	U	1,2
5	Explain fish marketing and trade policies, institutionalization of stakeholder participation and developing policy framework for fisheries.	U	1

6	Describe the international fisheries governance structures, including regional fisheries management organizations (RFMOs), UNCLOS provisions, and transboundary fisheries cooperation mechanisms.	U	1
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Fisheries Administration			
	1.1	Introduction to public administration, principles of organization and management of public enterprise. Introduction to Fisheries administration in India ,Work allocation	3	1
	1.2	Central and State responsibilities for fisheries development, organizational set up of fisheries administration at the Centre and state levels. Functions and powers of functionaries of the department of fisheries, corporations and cooperatives. Importance of public sector enterprises Producer companies & Trusts	6	1
	1.3	Different central and state level fisheries institutions. Role of Central and State Government in the regulatory activities of Aquaculture and fisheries.	3	2
	1.4	Planning organizations for fisheries. Fisheries development in India during the plan periods. Importance of fisheries in the Indian economy.	5	3
2	Overview of legislation			
	2.1	Critical review of fisheries regulatory and developmental setup in central and states (spheres of responsibility and division of power); Need for fisheries management; Regulatory, Legal and enforcement regimes.	6	4
	2.2	Developmental planning for fisheries; Plan allocation, Programs and performance of fisheries sector; Regional disparities and balanced development; Political economy of fisheries development political ecology.	6	4
3	National policies and regulations			
	3.1	Objectives, Salient features and amendments: Indian Fisheries Act, Biodiversity Act, The Environmental (Protection) Act;		4

		Policy and regulatory environment in marine fisheries and mariculture Sector (National Policy on Marine Fisheries, MFRA, Deep sea fishing policy, Guidelines for deep sea vessels, Policy on Mariculture, seed certification),	8	
	3.2	Inland Fisheries and Aquaculture Sector (National Policy on Inland Fisheries and Aquaculture), Wetlands, Heritage sites, Hot spots; Brackishwater Aquaculture Sector (CAA)	6	4
	3.3	Processing Sector (MPEDA Act; HACCP/ ISO Standards / Food safety/ Quality Safety Management Systems). Fish Marketing and Trade policies, institutionalization of stakeholder participation and Developing policy framework for fisheries. Activity: Visit to appropriate Government organizations/research, institutions/NGOs	8	4, 5
4	International policy and regulatory scenario in fisheries sector			
	4.1	FAO's CCCRF; IUU; MCS; UN's Law of the Sea and other conventions; treaties; SAARC, NACA, CBD, CITES, MARPOL, IWC, EU's Common Fisheries Policy, RAMSARSDG- RFMOs.	7	6
	4.2	Fisheries sustainability, Eco-labeling and Certification.	3	6
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 30 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Essay (2 out of 3) 2 X 10 = 20 Marks Total – 70 Marks

References

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12. Verghese CP. 1989. Fishing Regulation in India's Territorial Waters. World Fishing.



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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Fisheries Marketing and Seafood Trade					
Type of Course	DCC					
Course Code	24SACIFH7CC102					
Course Level	400					
Course Summary	With the expansion in aquaculture and seafood industry, marketing become an inevitable area of study. This course in marketing and trade covers a range of topics related to understanding consumer behavior, creating effective marketing strategies, and navigating the complexities of international trade. This course equip the students with the knowledge and skills needed to navigate the dynamic and interconnected world of business, whether in the context of local marketing efforts or global trade initiatives.					
Semester	VII	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1		75
Pre-requisites, if any	Students should possess basic knowledge on trade, export & import					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Identifies the basic functions and characteristics of marketing.	U, I	1
2	Analyze the development of new product	An	1,2
3	Explain how the pricing and distribution of products is carried out	An, A	2
4	Interpret the behavior of consumer in a market and use of market data to make decisions	S, U, An	1, 8

5	Explain the different agencies and certification related to export & import of fishes	K	1,2
6	Creating knowledge on the current market status, use of newly acquired terms and concepts related to fisheries	A, An	1
<i>*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)</i>			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
M1	Introduction to Marketing		15 Hrs	
1	1.1	Marketing- meaning and definition. Objectives of marketing. Functions of marketing. Difference between Marketing and selling. Importance of marketing in fisheries.	4	1
	1.2	Marketing mix- product, price, promotion, place. Factors effecting marketing mix.	3	1
	1.3	Market segmentation. Methods of market segmentation (Geographic, Demographic, Psychographic, Behavioral). Targeting- Steps - Targeting strategies (Undifferentiated, Differentiated, Concentrated, Micromarketing). Market positioning concepts and strategy.	4	1
	1.4	Consumer buying behavior and factors influencing it. Demand and Market forecasting. Marketing Research. Application of market research and information system	4	1
M2	Product Planning and Development		M3	7
	2.1	Definition of products, goods and services. Classification of products- (a brief of Consumer and Business products).	2	2
	2.2	New product development- Importance strategy, stages in development process.	3	2
	2.3	Brand- branding meaning and role, Brand equity Trademark	2	2
M3	Pricing and Distribution		9hrs	

	3.1	Pricing strategies- cost based pricing, demand-based pricing, competition-based pricing. Price elasticities. Issues in price determination of fish and fishery products.	3	3
	3.2	Supply Chain management and Distribution of products. Distribution Channels- Classification & Selection Physical distribution and Personal Selling.	3	3
	3.3	Emerging issues in marketing, e-marketing	3	3
M4	Export & Import services in Fisheries		14hrs	
4	4.1	A brief on international trade- history of GATT & WTO. Different forms of international trade (Export/import, Subsidiaries, Joint ventures, Franchises). Factors influencing international consumer behaviour.	3	4
	4.2	Planning and preparations for export/ import operations. Selection of products and markets for export and Import. Registration process- A general registration process for importing and exporting products	3	4,5
	4.3	Role of agencies in marketing and trade of fish & fishery products- MPEDA, EIC, DGFT-Directorate General of Foreign Trade, Catch certification, Farm traceability, Green certification etc Free trade agreements and HS code (Harmonized System) for fish products	6hr	5,6
	4.4	Different marketing practices in fisheries E marketing- scope, concerns and importance Future aspects for diversification of aquatic organisms in export market	2hr	6
M4	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks

	<p>Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks</p> <p>Essay (1 out of 2) 1 X 10 = 10 Marks</p> <p>Total – 50 Marks</p> <p>Practicals</p> <p>Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks</p> <p>Record = 3 Marks</p> <p>Viva = 2 Marks</p> <p>Total – 20 Marks</p>
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Reference

1. MJ Etzel, BJ Walker, WJ Stanton & Ajay Pandit, 2006, *Marketing- Concepts & Cases*. Tata McGraw Publishing Company Ltd, New Delhi
2. Rajan Nair & Sanjith Nair, 1993. *Marketing*. Sultan Chand & Sons, New Delhi
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4. Kotler & Armstrong, 2008. *Principles of Marketing 12th edition*. Prentice Hall New Jersey
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10. Paul & Aserkar, 2008. *Export Import- Management, 2nd edition*. Oxford University Press, New Delhi.
11. Balagopal, 2004. *Export management*. Himalaya publishing House, Mumbai
12. Rao & Prakash, 2000. *Export Marketing of Marine Products*. Discovery Publishing House, New Delhi.



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St. Albert's College (Autonomous)
Ernakulam**

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Fish Genetics and Biotechnology					
Type of Course	DCC					
Course Code	24SACIFH7CC103					
Course Level	400					
Course Summary	The course imparts knowledge on the principles and techniques employed in the field of fish genetics and biotechnology. The course is designed to cover aspects on selective breeding, hybridization, sex manipulation, chromosome manipulation and different molecular biological techniques used in aquaculture. Genetic modification and biotechnology embrace tremendous potential to improve the health of fish population.					
Semester	VII	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities (1.3)	75
Pre-requisites, if any	Students should possess knowledge regarding general introductory biology.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Explain the principles of genetics and biotechnology and their applicability towards fisheries management and aquaculture.	U	1, 2
2	Summarize the various genetic techniques used in fish breeding for stock improvement.	U	1, 2,10

3	Explain the basic steps in recombinant DNA technology and its application in optimization of production, health and environment in fisheries and aquaculture	U	1, 2, 10
4	Outline the genetic principles in conservation and management of aquatic resources	U	6
5	Examine the applicability on the molecular biological techniques and nanotechnology in fisheries and aquaculture	An	1, 2
6	Summarize the various potential marine resources for bioactive compounds, pharmaceuticals and the application of biotechnological tools to limit marine pollution.	U	10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
	Overview of fish genetics and breeding		16 Hours	
1	1.1	Origin and advancement in genetics. Mendelian principles and significance. Phenotype and genotype. Gene and chromosome as basis of inheritance. DNA as genetic material. Different types of crosses in genetic breeding programmes (test cross and back cross). Practical applications of genetics in aquaculture.	5	1
	1.2	Introduction to population genetics - Hardy-Weinberg principles: significance, factors affecting Hardy-Weinberg's law, genetic drift.	2	1
	1.3	Activity- Preparation of charts on Mendelian laws, Model preparation of Chromosomes	1	1
	1.4	Selection: basis of selection- Phenotypic and genotypic selection. Genotype environment interactions. Marker assisted selection in fisheries.	4	2
	1.5	Crossbreeding and Hybridisation - selective hybridisation, intra-specific and inter-specific hybridization. Inbreeding and heterotic effects. IPR issues.	3	2
	1.6	Domestication: Strategies and obstacles. Strain evaluation in aquaculture: features and techniques	1	2

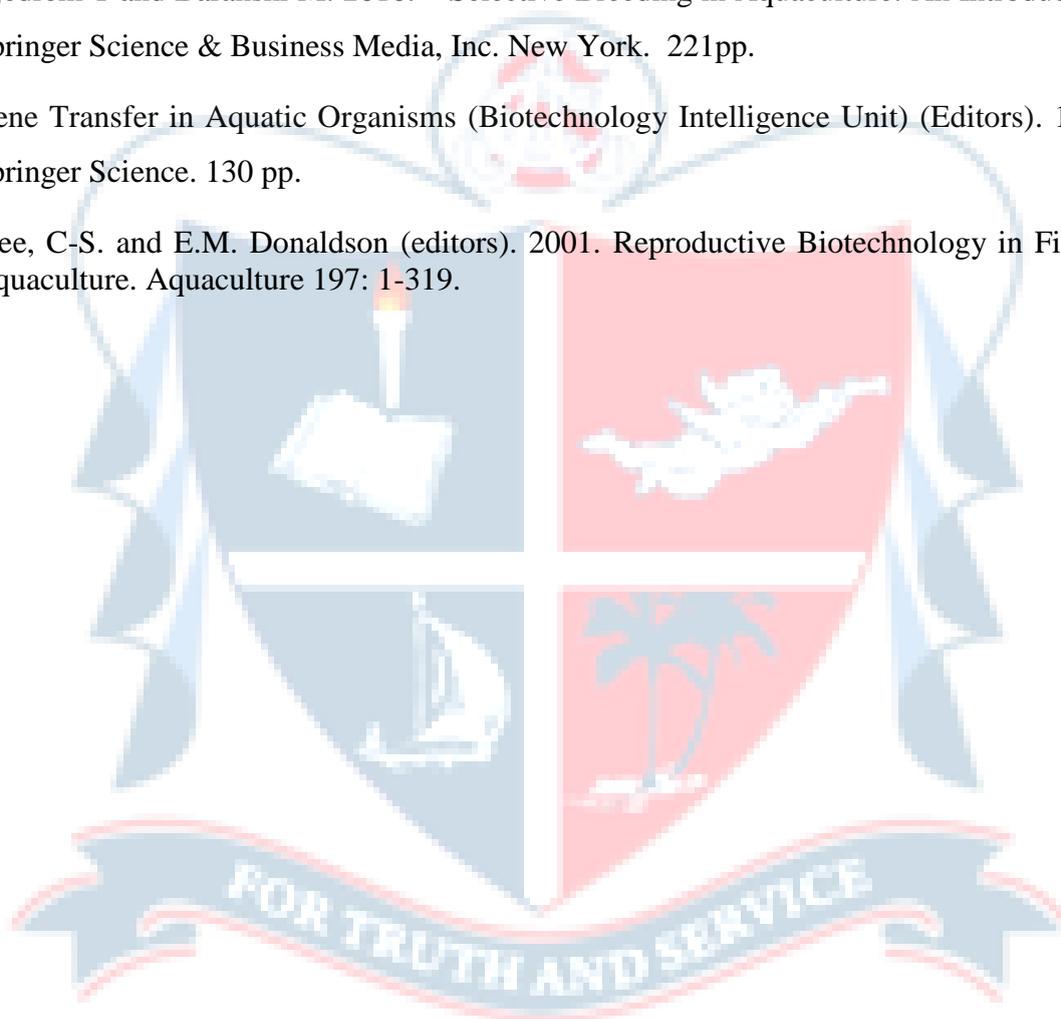
	Genetics of fish sex determination and chromosome manipulation			
	10 Hours			
2	2.1	Sex determination in fish. Gonochorism, Hermaphroditism, Protandry, Protogyni, Sexual dimorphism, Environmental influence of sex Determination.	4	2
	2.2	Sex control and its role in aquaculture, Chromosome manipulation: Androgenesis, Gynogenesis, Ploidy induction methods	3	2
	2.3	Monosex strains and their importance, super male fish production techniques, sex reversal– mechanisms and applications	3	2
	Biotechnological applications in Aquaculture and Marine Sciences			
	19 Hours			
3	3.1	Recombinant DNA technology – Overview, vaccines, Restriction enzymes; Gene isolation; Cloning vectors. Transgenics in aquaculture – gene transfer technology, genes of interest- Anti-Freeze Protein, disease resistance genes, growth hormone gene.	4	3
	3.2	Cryopreservation of fish gametes. <i>In-situ and ex-situ</i> conservation.	6	4
	3.3	Molecular biological techniques in marine sciences: PCR, ELISA	1	5
	3.4	Introduction to nanotechnology: biosensor, bioaccumulation. Vaccines - bio film vaccines, DNA vaccines, recombinant vaccine. Synthetic hormones for induced breeding	2	5
	3.5	Marine bioresources - marine natural products, bioactive compounds from marine organisms. Marine toxins. Biofuel from micro algae	6	6
	Practical			
	30 Hours			
4	4.1	Problems on Mendelian inheritance	4	1
	4.2	Exercises on Hardy Weinberg equation	4	1
	4.3	Demonstration of isolation of DNA	4	3
	4.4	Demonstration of PCR amplification	4	5
	4.5	Demonstration of protocol for monosex fish production	5	2
	4.6	Familiarisation of equipments used in cryopreservation	5	4
	4.7	Identification of different spotters (Thermocycler, ELISA plates, Micro injection methods used in Transgenics)	4	3, 5
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

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2. Lutz C G. 2003. Practical Genetics for Aquaculture. Wiley- Blackwell. 256 pp.
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**Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Oceanography					
Type of Course	DCE					
Course Code	24SACIFH7CE101					
Course Level	400					
Course Summary	Fisheries oceanography is the study of oceanic processes that affect marine ecosystems and the relationship of these ecosystems to the abundance, distribution, and availability of fishery species. A knowledge on fisheries oceanography is needed to improve fisheries resource management.					
Semester	VII	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4				60
Pre- requisites, if any	Students should possess knowledge regarding marine life and organisms.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Clear knowledge on different oceanographic processes and marine ecosystem.	U	1
2	In depth knowledge of the community interactions at specific aquatic ecosystems.	U	1
3	Recognize the oceanographic and ecological processes that affect fishery abundance and distribution.	An	1,2
4	Use and apply various sampling devices for marine biological studies.	A	2

5	Application-level knowledge on fisheries oceanography	A	2
6	Collect, analyze, interpret and communicate marine scientific data.	A, S	2
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill(S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

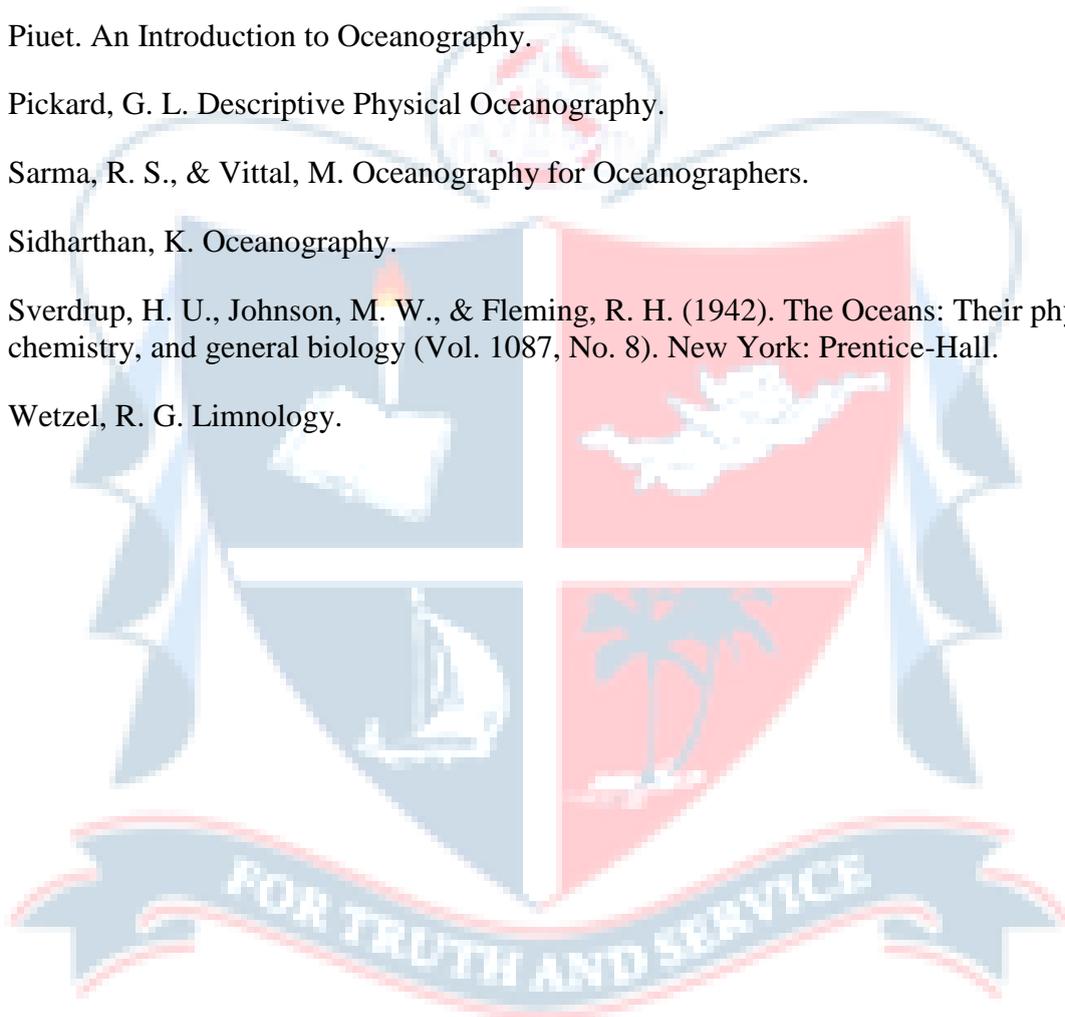
Module	Units	Course description	Hrs	CO No.
Introduction to Marine Environment			10 Hrs	
1	1.1	History of marine biological investigations in India and major expeditions.	3	1
	1.2	Salient features of world oceans. Oceanographic features of Arabian Sea, Bay of Bengal and Andaman Sea.	3	1,2,3
	1.3	Movements of Ocean Water Physico-chemical features of Marine environment- tides, currents, waves, upwelling and monsoon cycles, Mud banks.	4	1,2,3
Composition and Properties of Sea water			13 Hrs	
2	2.1	Elemental composition of water Estimation of Primary Productivity Activity: 1. Analysis of physico-chemical parameters of sea water. 2. Chlorophyll Estimation	5	1
	2.2	Physical parameters of sea- tides, waves, light, colour, temperature, currents, density & pressure. Chemical parameters of sea- salinity, dissolved oxygen, pH and nutrients. Oceanographic Equipments. Activity: Theory and operation of equipments used for sampling water, sediment, plankton and benthos.	8	1,4,5
Marine Ecosystem			19 Hours	
3	3.1	General characteristics of the marine environment. Zonation of sea. Deep Ocean Topographic features – Continental shelf, continental slope, continental rise, oceanic ridges, trenches, sea mounts, guyots, plateaus, submarine canyons.	6	1,2

	3.2	Biological divisions of the sea. Zonation and adaptations – intertidal, rocky, sandy and muddy shore- associated fauna and their adaptations. Deep sea adaptations. Pelagic and Benthic adaptations of the ocean community.	8	1,2
	3.3	Population of the oceans - phytoplankton, zooplankton, benthos and nekton. Marine food chains and food webs. Activity: 1. Methods of collection, analysis and preservation of phytoplankton, zooplankton and Benthos. 2. Identification of major zooplanktons, phytoplankton and benthic organisms. 3. Chlorophyll Estimation	5	1,2,6
	Fisheries Hydrography , Fish Finding Devices and Fisheries Forecasts		18 Hours	
4	4.1	Fishery hydrography - Influence of fishery independent factors - El Nino Southern Oscillation (ENSO).	4	3
	4.2	Upwelling and fisheries - climate change and fisheries. Oceanography in relation to fisheries.	4	5,6
	4.3	Introductory information on echo sounder, Sonar, Netsonde, Global positioning Systems, Remote Sensing, Potential Fishing Zones. Application of Geographic Information System (GIS) in fisheries.	7	5
	4.4	Code of conduct of responsible fishing-Turtle Exclusion Devices (TED)-By-catch Reduction Devices (BRD).	3	5
5	Teacher Specific Content			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 30 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Essay (2 out of 3) 2 X 10 = 20 Marks Total – 70 Marks

References

1. Kinne, O. Marine Ecology.
2. Klaff, J. Limnology: Inland Water Ecosystems.
3. Nair, N. B., & Thampi, D. M. A Textbook of Marine Biology.
4. Piuert. An Introduction to Oceanography.
5. Pickard, G. L. Descriptive Physical Oceanography.
6. Sarma, R. S., & Vittal, M. Oceanography for Oceanographers.
7. Sidharthan, K. Oceanography.
8. Sverdrup, H. U., Johnson, M. W., & Fleming, R. H. (1942). The Oceans: Their physics, chemistry, and general biology (Vol. 1087, No. 8). New York: Prentice-Hall.
9. Wetzel, R. G. Limnology.





Department of Fisheries and Aquaculture St. Albert's College (Autonomous) Ernakulam

Programme	BSc. (Honours) Industrial Fisheries				
Course Name	Fish farm Engineering and Aquaculture Techniques				
Type of Course	DCE				
Course Code	24SACIFH7CE102				
Course Level	400				
Course Summary	Fish farm Engineering and Aquaculture Techniques focuses on the design, construction and management of system for cultivating aquatic organisms. Topics covered include water quality management, system design and sustainable practices to optimize production while minimizing environmental impact. Students learn to apply engineering principles to create efficient and environmentally sound fish farm fostering the responsible growth of the aquaculture industry.				
Semester	VII	Credits		4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	
		4			Activities
Pre- requisites, if any	Students should possess knowledge regarding fish farming.				

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Understand technical components of farm designing, different components of fish farms – peripheral dikes, secondary dikes, feeder canals, sluice gate and monks. Recent trends in aquaculture engineering	U, An	1, 2
2	Apply the planning process, site selection and evaluation, design, components and construction of freshwater and brackish water farms (tanks, ponds, cages and hatcheries) and project formulation and layout.	A	1,2

3	Analyze pipeline, water flow and head loss, pumps-different types; understand and develop equipment used for water treatment, filters, ultraviolet light, ozone, heating and cooling and other processes of disinfection.	U, An	1, 2, 4
4	Develop skills in design and fabrication of aerators, compressors, blowers, paddle wheel aerators, and oxygen injection systems. Design recirculation and water use systems Definition, components and design.	A, C	1, 2, 6, 10
5	Construct different types of feeding equipment, feed control systems, dynamic feeding systems, and instruments for measuring water quality.	C	1, 6, 8
6	Address the environmental impact of aquaculture operations, includes strategies for minimizing negative effects on ecosystems and surrounding environments.	An, E	6, 7, 10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

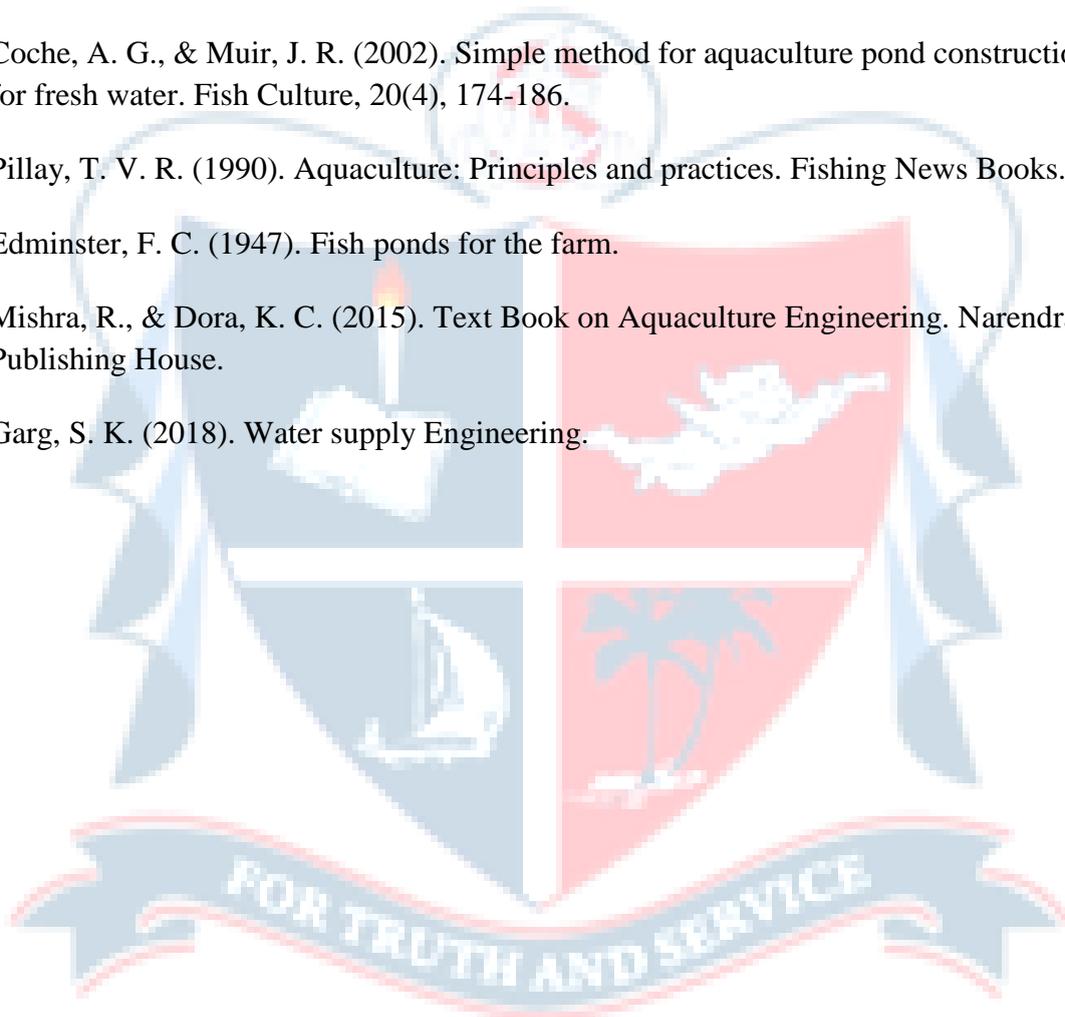
Module	Units	Course description	Hrs	CO No.
		Farm Engineering and Fish farm Facilities	15 Hours	
1	1.1	Criteria for the selection of site for aquaculture - Surveying – chain survey, plane table survey, leveling. Calculation of earthwork for the construction of ponds. Types of soil, soil sampling methods, prevention of erosion. Activity- Survey for fish farm construction	4	1, 2
	1.2	Recent trends in aquaculture engineering	1	1
	1.3	Design of freshwater and brackish water farms. Different components of aquafarms – peripheral dikes, secondary dikes, feeder canals, sluice gate and monks.	4	1, 2
	1.4	Various farm equipment. Pumps in aquaculture, different type of pumps.	3	3
	1.5	Pipe line, water flow and head loss, pumps-different types	3	3
		Hatchery facilities, Aeration and Oxygenation	15 Hours	
2	2.1	Components and design of shrimp hatcheries – various components and infrastructure facilities required	3	1, 2
	2.2	Equipment used for water treatment, filters, ultraviolet light, ozone, heating and cooling and other processes of	3	3

		disinfection Aeration of pond water and different types of Aerators		
	2.3	Recirculation and water use systems, definition, components and design.	4	1, 2, 4
	2.4	Various hatchery equipment including aeration devices and pumps, design and fabrication of aerators, compressors, blowers, paddle wheel aerators, oxygen injection system Activity : Construct and design Recirculatory system	5	3, 4,
		Feeding System and Instrumentation	15 Hours	
3	3.1	Different types of feeding equipment	5	5
	3.2	Feed control systems, dynamic feeding systems	5	5
	3.3	Instruments for measuring water quality Activity -Water quality analysis; Construct feeding equipment	5	5
		Environmental Monitoring and Impact Assessment	15 Hours	
4	4.1	Introduction- Definition, history, aim, principles, concept, and scope.	2	6
	4.2	Baseline data collection, methods and steps.	3	6
	4.3	Impact assessment and impact evaluation -EIA processes, stages, EIA statement environment management plan. National Policy on EIA and regulatory framework Activity- Impact Assessment Study on near canals or estuaries	5	6
	4.4	Effluent monitoring, Sewage disposal and treatment,	5	3, 6
Module 5: Teacher Specific Content				

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 30 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Essay (2 out of 3) 2 X 10 = 20 Marks Total – 70 Marks

References

1. Swift, D. R. (1993). Aquaculture training manual. Fishing News Books.
2. Stickney, R. R. (1994). Principles of aquaculture. John Wiley and Sons, Inc..
3. Insull, D., & Nash, C. E. (1990). Aquaculture project formulation (No. 316).
4. Coche, A. G., & Muir, J. R. (2002). Simple method for aquaculture pond construction for fresh water. *Fish Culture*, 20(4), 174-186.
5. Pillay, T. V. R. (1990). Aquaculture: Principles and practices. Fishing News Books.
6. Edminster, F. C. (1947). Fish ponds for the farm.
7. Mishra, R., & Dora, K. C. (2015). Text Book on Aquaculture Engineering. Narendra Publishing House.
8. Garg, S. K. (2018). Water supply Engineering.





**Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam**

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Fishery Ecology					
Type of Course	DCE					
Course Code	24SACIFH7CE103					
Course Level	400					
Course Summary	Fishery Ecology explores the ecological principles and processes that underlie the management and sustainability of fisheries. This course integrates biological, ecological, and social perspectives to understand the dynamics of fish populations, their habitats, and the interactions between human activities and aquatic ecosystems. Practical exercises, field trips, and hands-on projects can further enhance the learning experience for students in this course					
Semester	VII	Credits		4	Total Hours	
Course Details	Learning Approach	Lecture	Tutorial	Practical		Others
		4				60
Pre- requisites, if any	Students should possess knowledge regarding marine life and organisms.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Understand the fundamental principles of ecology and ecological concepts applicable to fisheries.	U	1,2
2	Understand the various types of fishery resources, including commercial, recreational, and subsistence fisheries and analyze the life history characteristics of major targeted fish species	U, A,	1,10
3	Analyze the factors influencing the growth, mortality, and recruitment of fish populations.	An	2

4	Analyze how environmental factors, such as temperature, light, and water flow, influence fish behavior and Develop critical thinking skills to address conservation challenges related to fish behavior and migration.	C, S, An	1,2,6
5	Develop critical thinking skills to address complex and multifaceted challenges in contemporary fisheries ecology.	E, An, S	1,2,
6	Develop fundamental skills in doing the fish population dynamics	A, S	1,4
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
Introduction to Fishery ecology and Habitat Ecology			10 Hrs	
1	1.1	Key ecological principles – Interdependence, habitat, niche, community interactions, energy flow and nutrient cycling, succession, adaptation and evolution, carrying capacity, conservation and sustainability Historical perspectives on fisheries, Importance of fisheries in global and local contexts, Overview of <ul style="list-style-type: none"> Importance of habitats in fisheries, Types of aquatic habitats 	4	1
	1.2	Pond Ecology – Physico chemical characteristics of pond, zonation/stratification, Abiotic and biotic components, food chain in pond ecosystem.	2	1
	1.3	Riverine Ecology - Physico chemical characteristics of river, zonation/stratification, Abiotic and biotic components, food chain in riverine ecosystem, Adaptations of lotic animals.	3	1
	1.4	Marine, Estuarine and Brackish water Ecology - Physico chemical characteristics, Zonation, zonation/stratification, Abiotic and biotic components, food chain in marine, estuarine and brackish water ecosystem. Characteristics of Coral reef community. Classification of estuaries	3	1

	1.5	Lacustrine and Reservoir Ecology - Classification of lakes, Zonation / Stratification in lakes, Abiotic and biotic components, Biological communities of lakes. Major lakes and reservoirs in Kerala and India.	3	1
2	Fishery Resources		13 Hrs	
	2.1	Types of fisheries (commercial, recreational, subsistence)	3	2
	2.2	Fishery resources and their classification	3	2
	2.3	Overview of major fish species targeted in fisheries – Anchovies, Salmon, Tuna, Cod, Haddock, Pollock, Sardines, Shrimp, Mackerel, Catfish, Flounder, Mussels, clams ,oysters	4	2
3	Fish Behavior and Migration		19 Hours	
	3.1	Behavior of fish in different life stages –egg stage, larval stage, sub-adult stage, Adult stage, senescent stage behaviors. Iteroparity , semelparity	3	4
	3.2	<ul style="list-style-type: none"> Migration patterns and their ecological significance –Types of migration, ecological significance of migration, key migration patterns, environmental cues, examples of migratory fishes. 	3	4
	3.3	<ul style="list-style-type: none"> Impact of human activities on fish behavior – Habitat destruction, pollution & its consequences, overfishing, impact of noise pollution in fishery, Impact of invasive species introduction in fishery, impact of selective fishing practices such as trawling in fishery, anthropogenic disturbances 	4	4
4	Emerging Issues in Fishery Ecology		18 Hours	
	4.1	<ul style="list-style-type: none"> Climate change and its impact on fisheries – impact temperature rise in fish abundance, impact of ocean acidification in fishery, Alteration of ocean current –impact on fishery, Alteration of precipitation impact on fishery. 	4	5
	4.2	<ul style="list-style-type: none"> Invasive species and their effects –ecological effects, biodiversity loss, vector for disease, economic impact 	3	5
	4.3	<ul style="list-style-type: none"> Sustainable and responsible fisheries practices 	3	5
5	Teacher Specific Content			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 30 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (6 out of 9) 6 X 5 = 30 Marks Essay (2 out of 3) 2 X 10 = 20 Marks Total – 70 Marks

References

- Jennings, S., Kaiser, M., & Reynolds, J. D. (2009). *Marine fisheries ecology*. John Wiley & Sons.
- King, M. (2013). *Fisheries biology, assessment and management*. John Wiley & Sons
- Sakhare, V. B. (2007). *Advances in aquatic ecology* (Vol. 1). Daya Books.
- Biswas, K. P. (1995). *Ecological and fisheries development in wetlands: A study of Chilka Lagoon*. Daya Books.
- Verma, P. S., & Agarwal, V. K. (2000). *Environmental Biology: Principles of Ecology*. S. Chand.
- Walters, C. J., & Martell, S. J. (2004). *Fisheries ecology and management*. Princeton University Press..
- Hosetti, B. B. (2002). *A textbook of applied aquatic biology*.
- Magnuson, J. J. (1991). Fish and fisheries ecology. *Ecological Applications*, 1(1), 13-26.

Suggested Readings

- Barnes, R. S. K., & Hughes, R. N. (1999). *An introduction to marine ecology*. John Wiley & Sons.
- Tait, R. V., & Dipper, F. (1998). *Elements of marine ecology*. Butterworth-Heineman

Semester: VIII

Course Code	Title of the Course	Type of the Course	Credit	Hour s/ week	Hour Distribution /week			
					L	T	P	O
24SACIFH8CC101	Biostatistics and Computer Application	DCC	4	5	3	0	2	0
24SACIFH8CC102	Research Methodology in Fisheries	DCC	4	5	3	0	2	0
24SACIFH8CE101	Seafood toxins and pollutants	DCE	4	5	3	0	2	0
24SACIFH8CE102	Fish Stock Assessment and Management	DCE	4	5	3	0	2	0
24SACIFH8CE103	Disaster Management in Fisheries	DCE	4	5	3	0	2	0
	* Project (UG Degree-Honours)		8					
	* Project (UG Degree-Honours with Research)		12					



Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Biostatistics and Computer application					
Type of Course	DCC					
Course Code	24SACIFH8CC101					
Course Level	400					
Course Summary	This course combines the principles of biostatistics with practical applications. Students will develop a strong foundation in statistical methods relevant to biological and fisheries sciences, and gain experience in using computer applications for data analysis and interpretation.					
Semester	VIII	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities	75
Pre-requisites, if any	Students should possess basic knowledge in Statistics and Computer.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Express to present the statistical data in order to comprehend the complicated practical field scenarios.	U	2
2	Develop measures that can be used to summarize a data set: mean, median, mode, percentiles, variance, standard deviation, and range.	A	2
3	Know how to use sample data to estimate a population mean, a population variance, and a population proportion and know how to compute point and interval estimates of the population parameters.	A	2
4	Utilize the application of computer-based data presentation and analytical tools.	U, A	1, 2

5	Apply to perform various numerical data processes on Microsoft office.	A	2
6	Explain computer language and communication.	U	1
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

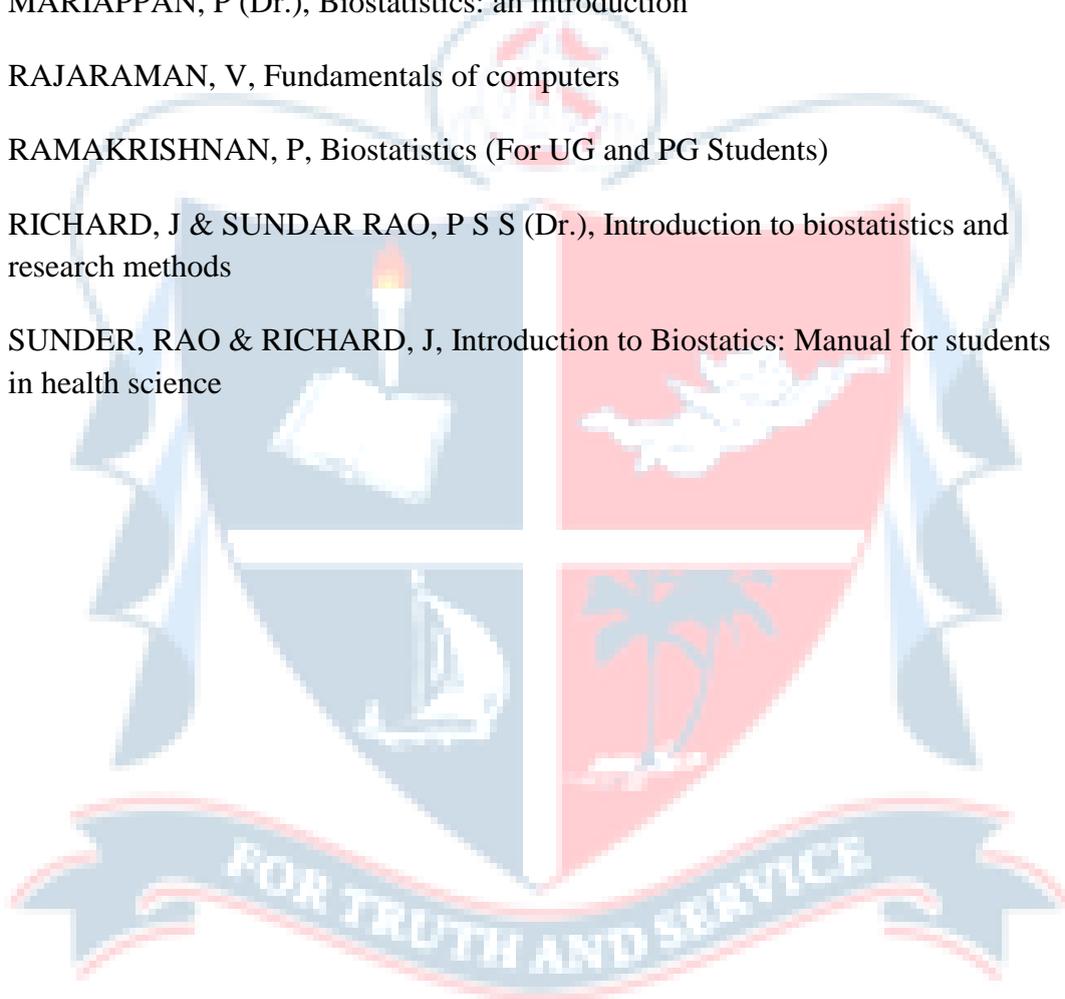
Module	Units	Course description	Hrs	CO No.
1	Introduction to Biostatistics			
	1.1	Preliminary concept, definition and application of Biostatistics.	3	1
	1.2	Data and Data Collection methods Sampling and Methods of Sampling	4	1
	1.3	Tabulation Graphical Representation of data	3	1
2	Statistical Tests			
	2.1	Measures of Central Tendency, Measures of Dispersion, Skewness and Kurtosis	5	2
	2.2	Correlation and Regression Analysis, Testing of Hypothesis	5	2
	2.3	Probability	5	2
	Strategies for sustainable aquaculture and guiding principles for sustainable aquaculture			
3	3.1	History of computing; Computer organisation; Binary system; Hardware and software; Generation of computers; Computer programming; System flowcharts.	5	4
	3.2	Microprocessors, Storage devices, Memory systems and ASCII Code; Input-Output devices; Disk Operating System; Booting; Formatting; Operating Systems.	5	5
	3.3	Office application software, Word Processing, Worksheet, presentation software's, and data analysis. SQL.	5	5
	3.4	Computer language, Classification & Types	3	6

	3.5	Computer Communication, Network Topology, Media of networking, Networking Protocols	4	6
4	Practical			
	4.1	Study of computer components	2	4
	4.2	Formatting a document using excel	2	5
	4.3	Use of the internet to collect fisheries data - FAO, NACA, ICLARM etc.	2	4
	4.4	Descriptive statistical analysis, calculation of mean, median, mode, standard deviation, standard error using computer programmes/packages.	6	2
	4.5	t- test, Chi –square, F- test, one way ANOVA,	4	2
	4.6	Analysis of fisheries/ biological data using computer programmes/packages	4	3
	4.7	Accessing information from FISHBASE	2	4
	4.8	Correlation and regression analysis	4	2
	4.9	Graphical representation and tabulation	4	2
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

References

1. ARUMUMUGAM, N et.al., Biostatistics, computer application, bioinformatics and instrumentation
2. FORTHOFFER, RONALD N et.al., Biostatistics: A Guide To Design, Analysis, and Discovery
3. MARIAPPAN, P (Dr.), Biostatistics: an introduction
4. RAJARAMAN, V, Fundamentals of computers
5. RAMAKRISHNAN, P, Biostatistics (For UG and PG Students)
6. RICHARD, J & SUNDAR RAO, P S S (Dr.), Introduction to biostatistics and research methods
7. SUNDER, RAO & RICHARD, J, Introduction to Biostatics: Manual for students in health science





**Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam**

Programme	BSc. (Honours) Industrial Fisheries				
Course Name	Research Methodology				
Type of Course	DCC				
Course Code	24SACIFH8CC102				
Course Level	400				
Course Summary	<p>Research is a scientific and systematic search for pertinent information. It is a way of systematically solving a research problem. Students will get familiarized with important steps needed for undertaking a research study. It will give an idea about research process starting from identifying a problem to writing a research report and publication. One can enhance and broaden their knowledge in data management, report writing and result representations.</p>				
Semester	VIII	Credits			Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	
		3		1	Activities 1.3
Pre- requisites, if any	Students should have a basic knowledge in research and computer application.				

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Discuss the role and importance of research and to identify the steps needed for conducting a research study.	U	PO1
2	Acquire knowledge on research design and methods of sample collection, data collection and report writing.	U	PO1

3	Design and implement research project.	A,C	PO 1,2
4	Select and define appropriate research problem and parameters	A	PO1, 2
5	Develop on various kinds of research, objectives of doing research, research process and sampling	U,A ,An	PO1, 2
6	Analysis and interpretation of data, report writing and data presentation.	E,S,C	PO 4,2
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
	Introduction to Research Methodology and Steps in Research Process		15 hours	
1	1.1	Research methodology- meaning, objectives, characteristics, significance, criteria for good research	5	1
	1.2	Different types of research - descriptive, analytical, applied, fundamental, quantitative, qualitative, empirical and conceptual.	5	1
	1.3	Research Process- different steps in research process – Flow Chart Activity – Identify and select a research topic in fishery science. Elaborate the importance and scope of study. Literature review.	5	1,2,3
	Selection of a Research Problem and Sample Design		15 hours	
2	2.1	Research Problem- definition. Selection of a research problem. Techniques involved in defining a problem	5	4,5
	2.2	Research Design- meaning. Need for research design. Features, Concepts.	5	4,5
	2.3	Sampling Design, steps in sampling design. Criteria of selecting a sampling procedure. Characteristics of a good sampling design. Different types of sampling designs. Sampling procedure.	5	4,5
	Methods of Data Collection, Data Analysis and Interpretation		15 hours	

3	3.1	Methods of data collection. Types of data- primary and secondary. Primary data collection, meaning, sources, advantages and disadvantages.	5	2
	3.2	Secondary data collection, meaning, sources, advantages and disadvantages. Activity - Collection of data of a research topic through secondary sources like published scientific reports annual reports from fishery institutions.	5	2
	3.3	Data Analysis: Interpretation-meaning, techniques of interpretation. Report writing, Types of reports; (technical and popular), Mechanics in report writing – Documentation style, footnotes, abbreviations, bibliography, preparation of index. Layout of report. Oral presentation, Course work.	5	6
Practicals			30 hours	
1	Preparation of tables and graphs from the given data		10	2,4
2	Collection of data of a research topic in fishery science through primary sources.		10	2
3	Preparation of project report on a research topic in fishery science. Report Writing.		10	6
Teacher Specific Outcome				

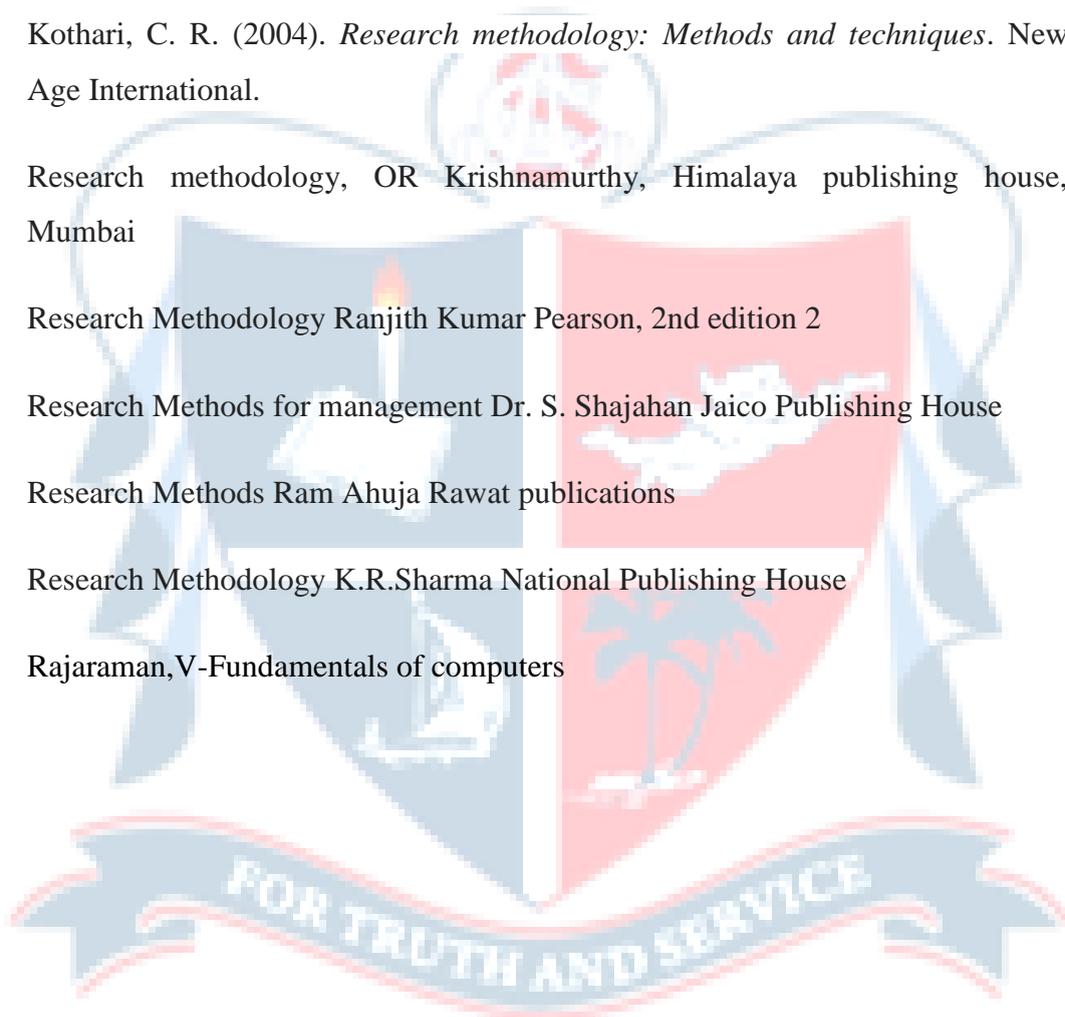
Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

Recommended Books for Transaction hours

1. Vivek Singh, Research Methodology
2. Parul Nagar, A Hand Book on Research Methodology

References

1. Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.
2. Research methodology, OR Krishnamurthy, Himalaya publishing house, Mumbai
3. Research Methodology Ranjith Kumar Pearson, 2nd edition 2
4. Research Methods for management Dr. S. Shajahan Jaico Publishing House
5. Research Methods Ram Ahuja Rawat publications
6. Research Methodology K.R.Sharma National Publishing House
7. Rajaraman,V-Fundamentals of computers





Department of Fisheries and Aquaculture
St. Albert's College (Autonomous)
Ernakulam

Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Seafood toxins and pollutants					
Type of Course	DCE					
Course Code	24SACIFH8CE101					
Course Level	400					
Course Summary	This course is designed to provide students with a thorough understanding of the various toxins and pollutants that can affect seafood and, consequently, human health. The curriculum encompasses both theoretical knowledge and practical skills, allowing students to comprehend the sources, classifications, and regulatory aspects of seafood contaminants.					
Semester	VIII	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities	75
Pre- requisites, if any	Students should possess basic knowledge in pollution, seafood pollution and toxins.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Explain the key concepts and classifications of aquatic pollutants, and management issues of pollutants	U	1
2	Identify and describe the health problems and outbreaks of foodborne contaminants	U	1,2
3	Analyze the characteristics, symptoms, and impacts of biotoxins associated with seafood, including Paralytic Shellfish Poisoning (PSP), Amnesic Shellfish Poisoning (ASP), and Diarrhetic Shellfish Poisoning (DSP).	An	2

4	Analyze the methods for different types of marine toxins and its tolerance limits.	An	2
5	Assess the environmental and health impacts of heavy metals, including mercury, lead, cadmium, and arsenic.	A, An	2, 6
6	Analyze the persistence and effects of Persistent Organic Pollutants (POPs) such as PCBs, dioxins, and furans.	A	2, 6
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Aquatic pollution and its management			
	1.1	Aquatic pollution – sources, types and their impacts, marine debris.	4	1
	1.2	Pollution problems of groundwater resources –sources of contamination, management issues	4	1
2	Food borne contaminants and Seafood toxins			
	2.1	Public health problems due to food borne contaminants. Factors contributing to outbreaks of food poisoning.	7	2
	2.2	Different types of marine bio-toxins such as Ciguatoxin, Paralytic shellfish toxins, diarrhetic shellfish toxins, DSP toxins, Scomberotoxins, Brevetoxins, etc. Symptoms, treatment, pharmacology, detection. Aflatoxins in fishery products. PAH in smoked fish. Biogenic amines and its significance to human health, Activity: Collection and identification of different algal species	10	3
	2.3	Overview of toxicity of marine animals. Analytical methods for different types of marine toxins and its tolerance limits: Stability, bioassays, pharmacology assays, immunoassays, Instrumental methods.	5	4
3	Contaminants of the aquatic environment			
	3.1	Heavy metals (Hg, Cd, Pb, Cr, Ni, As etc.).	3	5
	3.2	Pesticide contaminants: PCB, organochlorine etc., their source, bioaccumulation, magnification and toxicity. Persistent pollutants. Toxicity evaluation. Measurement of LC50 and factors affecting LC50, Animal tissue analysis.	8	6

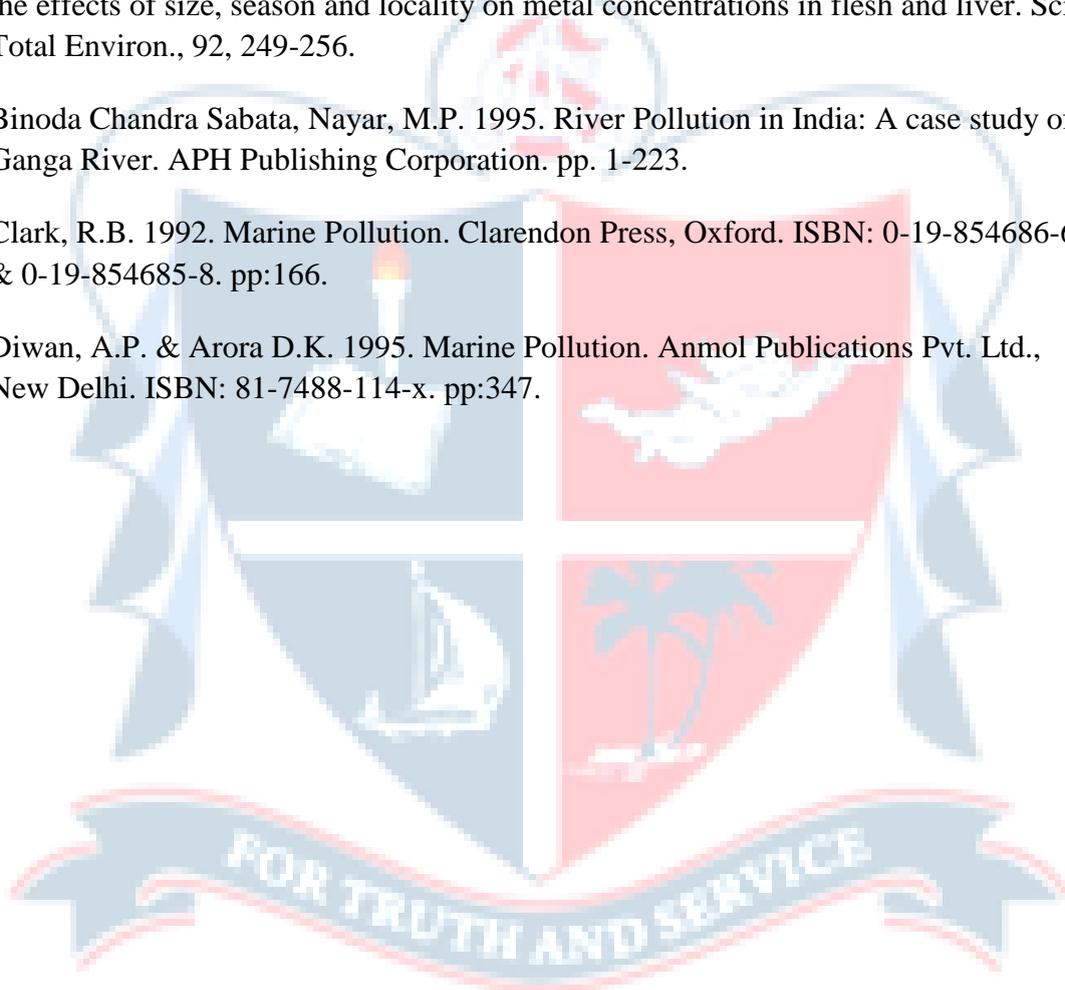
	3.3	Challenges from microplastics	4	6
4	Practical			
	4.1	Collection of algal species	8	4
	4.2	Identification of different harmful algal species.	6	5
	4.3	Case study on toxicity of different heavy metals (Mercury, Cadmium, Chromium)	8	4
	4.4	Demonstration of samples using appropriate methods to detect and quantify biotoxins.	8	2
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

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Programme	BSc. (Honours) Industrial Fisheries					
Course Name	Fish Stock Assessment and Management					
Type of Course	DCE					
Course Code	24SACIFH8CE102					
Course Level	400					
Course Summary	A course on fish stock assessment typically covers various methodologies, tools, and techniques used to evaluate and manage fish populations in aquatic ecosystems.					
Semester	VIII	Credits				Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3		1	Activities (1.3 3.5)	60
Pre- requisites, if any	Students should possess knowledge regarding the basic science and maths.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Mastery in understanding stock assessment and different types of fish stocks	U	1,2
2	Competency in applying sampling methodologies for fishery data collection and abundance estimation.	A	1,2
3	Comprehensive understanding of growth dynamics in fish populations and proficiency in assessing and estimating mortality rates	U, A, C	1,2
4	Mastery in using various prediction models to forecast fish population trends and competency in employing trophic and ecosystem-based models to study complex interactions within marine ecosystems.	An,C	1,2

5	Develops skill for using software like FiSAT and R programming for fish stock assessment	A, S	1,2
6	Understanding the various types and impacts of overfishing and analyzing the role of regulatory measures in sustainable fisheries management	U, C	2,10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
		Introduction to fish stock assessment	13 Hours	
1	1.1	Introduction: Concept and definition, Definition of stock, Objectives of stock assessment. Principles of stock assessment: fish abundance, surplus production Maximum Sustainable Yield (MSY) and Maximum Economic Yield (MEY)	3	1
	1.2	Distribution and types of stock - unit stock-mixed stock-straddling stock	2	1
	1.3	Characterization of stock (life history traits, truss network, environmental signals, otolith shape; genetic analyses, applied marks); <i>Activity- A field trip to nearby fish landing centre for collecting length-frequency data</i>	3	1
	1.4	Overfishing- Growth overfishing, Recruitment overfishing, Ecosystem overfishing, regulatory measures; CPUE- fishing effort, catchability coefficient; Open access fishery, fisheries regulations, current regulatory objectives	5	1
		Growth model	12 Hours	
2	2.1	Length-weight relationships in fishes	2	1
	2.2	VBGF equation, Growth parameters: Length at infinity, Growth coefficient,	2	3
	2.2	Principles of growth; Estimation of growth parameters, Gulland and Holt Plot, Ford – Walford plot & Chapman's method ELEFAN – Electronic Length Frequency Analysis	2	3

	2.3	Mortality parameters; Types of mortality; Estimation of total, natural and fishing mortality rates, Exploitation ratio, Exploitation rate	2	3
	2.4	Principles and estimation of gear selectivity trawl net and gill net selectivity	2	3
	2.5	Recruitment: Timing and size of recruitment Factors influencing recruitment	2	3
Fish stock assessment models			20 Hours	
3	3.1	Analytical models: Cohort dynamics and life history; Virtual population analysis	3	4
	3.2	Prediction models (Thompson and Bell model; Yield per recruit model and Relative Yield per Recruit model)	3	4
	3.3	Surplus production models / Holistic models: Schaefer's model, Fox model, Swept area method	3	4
	3.4	Trophic models: Ecosystem based models– Principles, Applications, Ecopath with Ecosim	3	4
	3.5	Software's: Software for fish stock assessment Computer based software's, FiSAT, Monte Carlo simulations <i>Activity- Estimate growth, mortality and exploitation pattern of a species using FiSAT software</i>	4	5
	3.6	R program: An introduction to R programming, Application of R program in fisheries. Troph Fish R Software	4	5
PRACTICAL			30 Hours	
	1	Collection of length frequency data for various groups of finfish and shellfish. Model Progression analysis	6	5
	2	Estimation of age and growth based on length frequency data. Growth, mortality, population and stock parameters employing computer based software (FiSAT)	6	5
	3	Scale estimation of growth parameters	6	5
	4	Analytical and Holistic models in fish stock assessment	6	5
	5	Application of ParFish, ARTFISH, BEAM1 and 2, BEAM4, CLIMPROD, FishStatJ, Ecopath with Ecosim software's in fishery management	6	5

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks
	B. Semester End Examination Theory MCQ (20 out of 20) 20 X 1 = 20 Marks Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks Essay (1 out of 2) 1 X 10 = 10 Marks Total – 50 Marks Practicals Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks Record = 3 Marks Viva = 2 Marks Total – 20 Marks

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Programme	BSc. (Honours) Industrial Fisheries						
Course Name	Disaster Management in Fisheries						
Type of Course	DCE						
Course Code	24SACIFH8DE103						
Course Level	400						
Course Summary	This course provides an in-depth understanding of disaster management principles and practices as they relate to the fisheries industry. Students will explore strategies to mitigate and respond to disasters, with a focus on safeguarding fishery resources, livelihoods, and communities in the face of natural and man-made disasters.						
Semester	VIII		Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	75	
		3		1	Activities		
Pre- requisites, if any	Students should possess basic knowledge in natural disasters and disaster management.						

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Define and explain the concept of disaster management in the context of fisheries. Understand the unique challenges and vulnerabilities of the fisheries sector to various types of disasters.	U	2
2	Develop comprehensive disaster preparedness plans for fisheries operations.	U	2, 6
3	Formulate strategies for mitigating the impact of disasters on fishing communities and the seafood supply chain.	U, A	6
4	Evaluate the effectiveness of disaster management strategies employed in different contexts.	U, An	2, 6

5	Understand the importance of effective communication during a disaster.	U	1
6	Demonstrate the ability to coordinate response efforts among various stakeholders, including government agencies, NGOs, and local communities.	U, A	1
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Components of Disaster Management			
	1.1	Hazard, Vulnerability, Physical Vulnerability, Socio-economic Vulnerability, Capacity, Physical Capacity, Socio-economic Capacity, Risk.	5	1
	1.2	Multi-hazard and disaster vulnerability of India. Types of natural and manmade hazards in fisheries and aquaculture - cyclones, floods, droughts, tsunamis, El-nino, algal blooms, avalanches, pollution, habitat destruction, overfishing, introduction of exotic species, landslides, epidemics, loss of biodiversity	5	2
2	Disaster Management Strategies			
	2.1	Causes, characteristics and impact of various disasters. Preparedness, Mitigation, Response, Recovery.	3	3
	2.2	Risk assessment and vulnerability analysis, Applied research and technology transfer, Public awareness and training, Institutional mechanisms, Incentives and resources for mitigation, Land use planning and regulations, Hazard-resistant design and construction, Structural and constructional reinforcement of existing buildings.	7	4
	2.3	Overview of toxicity of marine animals. Analytical methods for different types of marine toxins and its tolerance limits: Stability, bioassays, pharmacology assays, immunoassays, Instrumental methods.	5	4
	2.4	Pre Disaster: prevention, preparedness and mitigation; different ways of detecting and predicting disasters; early warning, communication and dissemination, community based disaster preparedness, structural and non-structural mitigation measures.	3	5

	2.5	During disaster: response and recovery systems at national, state and local, coordination between different agencies, international best practices.	2	5
	2.6	Post-disaster: Methods for assessment of initial and long term damages, reconstruction and rehabilitation.	2	5
	2.7	Agencies involved in monitoring and early warnings at district, state, national and global level.	3	6
3	Sea Safety and Health			
	3.1	Introduction Sea safety Coordinating agencies Maritime and/or transport authorities Fisheries authorities Coast Guard/The Navy Port authorities	7	6
	3.2	Search and rescue organizations The Meteorological Department The health authorities Fisherfolk groups and organizations Wives and families of fishermen Disaster management authorities Standard-setting organization/agency	8	6
4	Practical			
	4.1	Methods for assessment of initial and long-term damages.	4	1
	4.2	Preparedness in pre, during and post disasters.	6	2
	4.3	Acquaintance with fire-fighting devices.	4	2
	4.4	Lifesaving appliances and first-aid.	4	2
	4.5	Operation and usage of communication channels and media.	4	5
	4.6	Uses of distress signals and technologies.	4	5
	4.7	Field visits and case studies.	4	6
5	Teacher Specific Module			

Teaching and Learning Approach	Lecturing with ICT activities Transactions
Assessment Types	Mode of Assessment A- Continuous Comprehensive Assessment (CCA) Theory – 25 Marks Practical – 5 Marks

	<p>B. Semester End Examination</p> <p>Theory</p> <p>MCQ (20 out of 20) 20 X 1 = 20 Marks</p> <p>Short Answer Questions (4 out of 6) 4 X 5 = 20 Marks</p> <p>Essay (1 out of 2) 1 X 10 = 10 Marks</p> <p>Total – 50 Marks</p> <p>Practicals</p> <p>Lab Exam (Identification of Spotters/ Principle and Procedure) = 15 Marks</p> <p>Record = 3 Marks</p> <p>Viva = 2 Marks</p> <p>Total – 20 Marks</p>
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