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

**Affiliated to Mahatma Gandhi University, Kottayam, Kerala**

**SYLLABUS FOR UNDERGRADUATE VOCATIONAL PROGRAMMES**

**FACULTY OF AQUACULTURE**

**EXPERT COMMITTEE FOR AGRICULTURE AND SUSTAINABILITY**

# B.VOC (HONOURS) COMMERCIAL AQUACULTURE

**SACA – B.VOC (HONOURS)**

**(WITH EFFECT FROM 2025 ADMISSION)**

# Syllabus of B.Voc (Honours) Commercial Aquaculture

**Prepared by the Board of Studies on 26th June 2025**

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Chairman, Board of Studies

**Approved by the Academic Council on 27th June 2025**

**Dr. Joseph Justin Rebello, Principal**
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**Approved by the Governing Council on 3rd July 2025**

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## PREFACE

The Bachelor of Vocation (B.Voc) programme is designed to address the growing need for skill-based higher education in India. Rooted in the framework of the University Grants Commission (UGC) guidelines, NHEQF and the B.Voc (Honours) Regulations of Mahatma Gandhi University, Kottayam, this curriculum structure integrates academic learning with practical training to ensure graduates are industry-ready, socially responsible, and professionally competent.

This syllabus has been developed in accordance with the **M.G. University B.Voc Honours Regulations 2025 as adopted by St Albert's College, Autonomous**, Ernakulam as SACA B. Voc (Honours), 2025 Regulations, emphasizing a **multi-exit and multi-entry model**, wherein learners can earn a Certificate, Diploma, Degree or Honours degree depending on the level of completion. The programme promotes flexibility, allowing students to progress based on their career goals and life circumstances.

A key feature of this syllabus is its alignment with **Outcome-Based Education (OBE).** This pedagogical approach ensures that the curriculum is learner-centric, with clearly defined Program Outcomes (POs) and Course Outcomes (COs). Each component of the syllabus is meticulously crafted to impart knowledge, skills, values, and attitudes that will enable students to meet professional demands and societal expectations.

The structure of the programme integrates General Education Components with Skill Education Components in a balanced manner. It facilitates hands-on training, internships, and industry collaboration to bridge the gap between theoretical learning and real-world application. The curriculum also ensures continuous assessment and feedback, which is central to the OBE framework.

This syllabus is the result of collaborative efforts by academic experts, industry professionals, and institutional stakeholders, aimed at ensuring quality and relevance. We are confident that this structured and forward-looking curriculum will empower students to thrive in a rapidly evolving job market and contribute meaningfully to the nation's economic and social development. The Board of Studies sincerely records its heartfelt gratitude to the scholars, parents, and teachers who have contributed to the development and refinement of this syllabus. We extend our special thanks to the individual members who worked tirelessly each day, dedicating themselves to the enrichment of the curriculum.

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. The three year degree programme 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). UGC sanctioned the B.Voc. Programme in Commercial Aquaculture in 2019. 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. 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 2 weeks long On Job Training. 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 programme provides a mix of a broad science background and applied hands-on and technical skills. The graduating students who do not opt for higher studies get placed in scientifically run Aquaculture Farms, Hatcheries, 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.

The Board of Studies of Aquaculture, St. Albert's College (Autonomous), is proud to introduce the revised curriculum for the B.Voc (Honours) in Commercial Aquaculture programme, effective from the academic year 2025–26. This curriculum has been developed

in accordance with the M.G. University B.Voc (Honours) structure, leading to an Honours Degree. The syllabus is a harmonious blend of insights from numerous dedicated contributors who have invested their expertise and time into this noble academic endeavor.

We express our deepest gratitude to our Manager and Chairman, **Rev. Dr. Antony Thoppil**, our Principal, **Dr. Joseph Justin Rebello**, the administrative staff of the college, Mahatma Gandhi University, and the Board Members of Aquaculture. Their goal-oriented leadership, consistent encouragement, and collaborative spirit have been instrumental in this process. We are equally thankful to the **Academic Dean** and the **Office of the Dean Academics, St. Albert's College**, for their steadfast support from the inception of this initiative. We wholeheartedly acknowledge the importance of collective wisdom in ensuring the success of this remarkable venture. Our sincere thanks to the dedicated teachers and resource persons, especially whose active participation in the curriculum revision workshop greatly enriched the process with their insightful contributions. We hope it will be both intellectually stimulating and accessible at the undergraduate level. Above all, we extend our heartfelt thanks to Board of Studies in Aquaculture, external subject experts and faculty members for framing a new curriculum of Four Year Degree Honours Programme. May this academic framework inspire students to become responsible, visionary citizens capable of leading the world to greater heights of excellence.

Chairman

Board of Studies in Aquaculture

# THE ST. ALBERT'S COLLEGE (AUTONOMOUS) VOCATIONAL UNDERGRADUATE PROGRAMMES (HONOURS) REGULATIONS, 2025 SACA- B.VOC (HONOURS)

## PREAMBLE

The University Grants Commission (UGC) has issued the Curriculum and Credit Framework for Vocational Undergraduate Programmes 2025 (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 Vocational undergraduate curriculum for the 2025-26 academic year, adopting 4-year Vocational undergraduate programmes to bring Kerala's Vocational 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 Vocational 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 VOCATIONAL PROGRAMMES (HONOURS) REGULATIONS, 2025 {MGU-B.VOC (Honours)} under the New Curriculum and Credit Framework, 2025. Being an Autonomous College affiliated to MG University, St. Albert's College (Autonomous), Ernakulam is adopting all the major components of MGU B.VOC (HONOURS) 2025 in the title SACA-B.VOC (HONOURS) 2025 to our Vocational UG curriculum from the academic year (2025-26) onwards.



## REGULATIONS

### 1. Short Title and Commencement

i) These Regulations will be called as 'THE ST. ALBERT'S COLLEGE (AUTONOMOUS) UNDER GRADUATE VOCATIONAL PROGRAMMES (HONOURS) REGULATIONS, 2025 {SACA-B.VOC. (HONOURS) 2025} under the New Curriculum and Credit Framework for B.Voc. Programmes by Kerala State Higher

Education Council, 2025.

ii) These Regulations will come into effect from the academic year 2025-2026 and will have prospective effect.

## 2. Scope, Application

i) These Regulations shall apply to all Under Graduate Vocational Programmes under various faculties conducted by ST. ALBERT'S COLLEGE (AUTONOMOUS), ERNAKULAM and its affiliating institutions for the admissions commencing in the academic year 2025-2026.

ii) Every programme conducted under the SACA-B.Voc. (Honours) shall be monitored by SACA-B.Voc.(Honours) Academic Committee (Academic Council) comprising members nominated by the College Governing Body and by the University.

## 3. Definitions

i) FYUGP means Four Year Under Graduate 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 senior faculty/expert in the field nominated by the college council to co-ordinate the effective conduct of the SACA - B.Voc.(Honours) 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 minimum 2 hours of lab work/ practical work/practicum/ hands-on skill training/field work per week is given one credit hour. Accordingly, one credit is equivalent to one hour of lecture or two hours of lab work /practical work/hands-on skill training/ field work/ practicum and learner engagement in terms of course related activities (such as seminars 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 lectures or 30 hours of practical/ field work/ practicum/ hands-on skill training and 30 hours learner engagement. A two credit On the Job Training (OJT) in a semester should be designed for 5 hours per week. One credit of Apprenticeship/Research Internship is equivalent to 10 days.

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 fulfill 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 individual's 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 -B.Voc.(Honours). 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 is 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, laboratory work, studio activity, field work, 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 SACA - B.Voc. (Honours) at the college level comprising the Principal as the Chairperson, the Academic Co- ordinator/ Nodal Officer as its convenor.

xviii) 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 SACA-B.Voc.(Honours).

xix) CSDCCP means Centre for Skill Development Courses and Career Planning (CSDCCP):

xx) Department means any teaching department in a college offering a course of study approved by the University as per the Statutes and the Act of the University and it includes a Department, Centre, or School of Teaching and Research conducted directly by the University.

xxi) Senior Faculty Advisor (SFA) is a faculty nominated by a Department Council to co-ordinate all the necessary work related to SACA-B.Voc.(Honours) 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 University or the Higher Education Institution which include the learning outcomes related to the disciplinary areas in the chosen field of learning and generic learning outcomes. University will specify graduate attributes for its programmes.

xxv) Job Role: It refers to specific occupation or position within an industry, defined by a set of competencies, knowledge, and skills required to perform task effectively. Each job role is aligned with a particular NHEQF level.

xxvi) National Occupational Standards (NOS): National Occupational Standards (NOS) specify the standard of performance that a person must meet when performing a job along with the skills and knowledge required to satisfy a standard consistently. These standards can form the benchmarks for various education and training programs to match with the job requirements.

xxvii) NHEQF means National Higher Education Qualification Framework

xxviii) Programme means the entire duration of the educational process including the

evaluation leading to the award of a degree.

xxix) 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, such as sciences, social sciences, humanities, and a wide range of vocational fields including information technology, tourism, logistics, agriculture, fashion technology etc. The pathways could be in terms of major- minor options with different complementary/ allied disciplines.

xxx) Qualification Pack (QP): A Qualification Pack (QP) is a set of NOS aligned to a job role. A QP is available for every job role in each industry sector.

xxxi) Regulatory Body: 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), National Board of Accreditation (NBA), National Council for Vocational Education and Training (NCVET), National Skill Development Corporation (NSDC) etc.

xxxii) Sector Skill Council (SSC): The NOSs and QPs for each job role corresponding to each level of the NSQF are being formulated by the respective Sector Skill Councils (SSCs) set up by NSDC with industry leadership.

xxxiii) Signature Courses: Signature courses are specialized courses classified under Skill Development Component Elective (SDCE) Courses, Skill Enhancement Courses (SEC) or Value Addition Courses (VAC) designed and offered by the regular/ ad hoc/ visiting/ emeritus/ adjunct faculty member of a particular college with the prior recommendation of the BoS and the approval of Academic Council of the University/ institute.

xxxiv) 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.

xxxv) 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-point scale.

xxxvi) 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.

xxxvii) 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 x C

xi) 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.

xii) Grade Card means the printed record of students' performance, awarded to them.

xiii) Words and expressions used and not defined in this regulation, but defined in the Mahatma Gandhi University Act and Statutes shall have the meaning assigned to them in the Act and Statutes.

## 4. Features and Objectives of SACA-B.Voc. (Honours) 2025

The features and objectives of the SACA-B.Voc.(Honours) shall be

i) The features, meaning, and purpose of Four Year B.Voc. Honours Degree programmes shall be as stipulated by the UGC and as adapted by the Curriculum and Credit Framework for Bachelor of Vocation (B. Voc.) programmes proposed by Kerala State Higher Education Council.

ii) B.Voc. programme shall have five Broad Pathways, (a) 1-year UG Certificate, (b) 2-year UG Diploma (c) 3-year B.Voc. Degree and (d) 4-year B.Voc. Honours Degree (e) 4-year B.Voc. Honours with Research Degree.

iii) Students who choose to exit after 1 year shall be awarded UG Certificate -NHEQF Level 4.5 after the successful completion of the required minimum Courses with 48 credits and an additional 4-credits from Skill Enhancement Courses (SEC) in order to attain 60% of total credits in skill components.

iv) Students who choose to exit after 2 years shall be awarded UG Diploma-NHEQF Level 5.0 after the successful completion of the required minimum Courses with 96 credits and an additional 4-credits from Skill Enhancement Courses (SEC) in order to attain 60% of total credits in skill components.

v) Students who choose to exit after 3 years shall be awarded B.Voc. Degree with Minor-NHEQF Level 5.5 in their respective Discipline/Disciplines after the successful completion of the required minimum Courses with 140 credits.

vi) A 4-year B.Voc. (Honours) Degree - NHEQF Level 6.0 in the Discipline/Disciplines shall be awarded to those who complete a specific number of Courses with 180 credits. Students who have chosen the Honours programme shall do a one-year structured apprenticeship including 3 online courses from a minor discipline contributing 40 credits. Students who have chosen the Honours with Research programme shall do a one-year Research Internship including two courses from the Skill Development Components (SDC) and three courses from a minor discipline in online mode contributing 40 credits.

vii) The practice of lateral entry of students to various semesters exists. The students who exit with Certification and Diploma shall be eligible to re-enter the programme at the exit level to complete the programme or to complete the next level.

viii) Students who have chosen the Honours with research stream shall do their entire fourth year under the mentorship of a mentor.

ix) The mentor shall prescribe suitable advanced level/capstone level courses for a minimum of 8 credits to be taken along with the courses on research methodology, research ethics, and research topic-specific courses including online and blended modes.

x) Students who have opted for the Honours with Research should successfully complete an industry-linked research project under the guidance of the mentor and should submit a research report for evaluation from University/ College/ Recognized Research Institute. The research shall be in the Major/Allied discipline.

xi) The research outcomes of their project work may be published in peer-reviewed journals or presented at conferences or seminars or patented.

xii) The proposed B.Voc.(Honours) curriculum comprises Two Broad Parts: Part I) General Education Components (GEC) and Part II) Skill Development Components (SDC).

xiii) The General Education Component of B.Voc.(Honours) shall consist of a set of General Foundation Courses and Minor Pathway Courses (MPC).

xiv) 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).

xv) Ability Enhancement Courses shall be designed specifically to achieve competency in English and other languages as per the student's choice with special emphasis on language and communication skills. Students must complete 3 AECs with two mandatory English Courses and one Elective, which may be in English or other language.

xvi) 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.

xvii) 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 permitted to take the MDC in all three semesters in the same discipline as studied under Part III during their Plus Two education, and MDC selection must also comply with the exclusion list published by the university. This shall be the sole condition for

eligibility for MDC course selection. Third semester MDC can be Kerala Specific Content. Each BoS can prepare basket of courses under MDC in first and second semesters.

xviii) Skill Enhancement Courses (SEC) shall be designed to include modules on Employability Skills, Soft Skills and Life Skills with specific modules to enhance employability. These modules are NHEQF-aligned and approved, offering certification options of 30, 60, 90, or 120 hours through professional skilling agencies. Among 9 credits, students are flexible to take 6 credits of SEC from Skill Development Courses.

xix) Value Addition Courses (VAC) are tailored to the students' skill domains, designed by the respective Boards of Studies (BoS) with CSDCCP's assistance and included in University VAC course baskets. Value Addition Courses (VAC) shall be so designed as to empower the students with personality development, perspective building, and self-awareness.

xx) Minor Pathway Courses (MPC) offer the flexibility to select subjects either related or unrelated to their vocational domain, promoting interdisciplinary learning and broadening academic horizons.

xxi) Skill Development Components (SDC) shall include any domain specific demand led skill training activity, enabling students to equip with practical skills leading to employment or improving employability or enabling them to acquire a duly assessed and certified skill in the chosen discipline. The skill development components shall be designed and delivered in line with National Occupational Standards (NOS) and Qualification Packs (QP), ensuring relevance to specific job roles and industries.

xxii) 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.

xxiii) Major area of specialization shall be focused on Skill Development in the appropriate areas. By selecting a Major, the student shall be provided with an opportunity to pursue an in-depth study of a particular discipline.

xxiv) 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.

xxv) Students shall be given options to choose courses from a basket of courses which the institution is offering. There shall be no rigidity of combination of subjects. Students enrolling in a particular vocational stream may be allowed to take a Multidisciplinary Course (MDC) from another vocational stream/SACA-B.Voc (Honours) in their first two semesters, alongside a minor subject as part of the General Education Component. Students can opt for a change of Major within the vocational stream at

the end of the second semester to MDC courses they have studied. Alternatively, students also can opt for a change of Major to SACA-B.Voc (Honours) while retaining their vocational stream as minor.

xxvi) Students should opt their 5th and 6th semester VAC and SEC from their SDC only.

xxvii) Course cum Credits Certificate: After the successful completion of a semester as proof for re-entry to another institution this certificate is essential. This will help the learner for preserving the credits in the Academic Bank of Credits.

xxviii) 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.

xxix) 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.

xxx) 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.

xxxi) 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. University will publish a separate guidelines for Internship Programmes.

xxxii) 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 to improve their employability.

xxxiii) The University will provide 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 University will provide the students with opportunities for Community engagement and services, exposing them to socio-economic issues to facilitate theoretical learning in real-life contexts.

xxxiv) Additional Credits will be awarded for those who actively participating 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 University.

xxxv) Grace marks shall be awarded to a student for meritorious achievements in cocurricular 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.

xxxvi) 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/university from time to time.

xxxvii) Students shall be entitled to gain credits from courses offered by other recognized institutions directly as well as through distance learning

xxxviii) For the effective operation of the four year vocational programmes, a system of flexible academic transaction timings shall be implemented for the students and teachers.

## 5. Eligibility for Admission and Reservation of Seats

i) The eligibility for admissions and reservation of seats for various SACA-B.Voc. (Honours) Degree Programmes shall be in accordance with the norms/rules made by the Government/University from time to time.

ii) No student shall be eligible for admission to SACA-B.Voc. (Honours) Degree Programmes in any of the disciplines unless he/she/they has successfully completed the examination conducted by a Board/University at the +2 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 by the University 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 student so that this 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 Minor Pathway

Courses (MPC) /Multidisciplinary Courses (MDC). 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) Students who exit with Certificate or Diploma shall be eligible to reenter the programme at the exit level to complete the programme or to complete the next level.

ix) 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.

x) 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.

xi) The HEIs can also enroll 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 programmes 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 or it may be communicated to the University against the unique higher education ID provided by the University 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/expert in the field as Academic Co-ordinator/ Nodal officer for the smooth conduct of SACA-B.Voc. (Honours).

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 University portal only after displaying the same on the department notice board/ other official digital platforms of the college at least for two working days.

a) 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.

b) If the concerns are not resolved at the advisor's level, the same can be referred to the properly constituted college-level grievance redressal committees as per the existing UGC/ University/ Government norms.

c) The Principal/ HOD shall ensure the proper redressal of the concerns raised by the students regarding CCA.

d) If the students raise further concerns about the issue, the principal shall refer the issue to the University-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 University 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 University norms,

regulations, guidelines and procedures on all academic and other University 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 advisor, 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 feels that he/she/they has registered for more Courses than he/she/they can handle, within 30 days from the commencement of the semester.

vi) The college shall publish a list of the students registered for each course including audit courses, 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 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 exit with Certificate or Diploma shall be eligible to reenter the programme at the exit level to complete the programme or to complete the next level.

iii) Students who have successfully completed a particular programme pathway may be permitted to take an additional minor or second major.

iv) 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 Programme, 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 SACA - B.Voc.(Honours) programme shall not exceed 7 years.

ii) Students will get a NHEQF Level 4.5 Undergraduate Certificate after completing first two semesters with a credit of 48 (28 credits from SDC and 20 credits from GEC) and an additional 4-credits from Skill Enhancement Courses (SEC) in order to attain 60% of total credits in skill components.

iii) Students will get a NHEQF Level 5.0 Undergraduate Diploma after completing first four semesters with a credit of 96 (56 credits from SDC and 40 credits from GEC) and an additional 4-credits from Skill Enhancement Courses (SEC) in order to attain 60% of total credits in skill components.

iv) Students will get a NHEQF Level 5.5 B.Voc. degree after completing six semesters with a credit of 140 (86 credits from SDC and 54 credits from GEC).

v) Students will get a NHEQF Level 6.0 Honours degree after completing eight semesters with a credit of 180 (110 credits from SDC and 70 credits from GEC).

vi) 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 SACA -B.Voc.(Honours).

vii) 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.

viii) For students who crossed 6 semesters at a slower pace, the requirement of 16 credits per semester from the institutions where they enrolled may be relaxed.

1. Credit Structure and Levels of Awards

| NHEQF Level | Skill Development Component Credits | General Education Component Credits | Total Credits for Award | Normal Duration | Exit Points |
|---|---|---|---|---|---|
| 4.5 | 28 | 20 | 48 | Two Semesters | UG Certificate (48 credits) + SEC (4 credits) |
| 5.0 | 56 | 40 | 96 | Four Semesters | UG Diploma (96 credits) + SEC (4 credits) |
| 5.5 | 86 | 54 | 140 | Six Semesters | B.Voc Degree with Minor |
| 6.0 | 114 | 66 | 180 | Eight Semesters | B.Voc Honours/ Honours with Research |

## 10. Credit Structure

The proposed number of credits per course and the credit distribution of them for the SACA - B.Voc. (Honours) Programmes are given below:

**A.** An academic year shall consist of 200 working days; one semester consists of 90 working days; and an academic year consists of two semesters.

**B.** 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.

**C.** The maximum number of available weeks for curriculum transactions should be fixed at 15 in each semester. A minimum of 5 teaching hours could be made available for a day in a 5-day week.

**D.** A course that includes one hour of lecture or two hours of lab work/ practical work/ field work/ practicum/hands-on skill training per week is given one credit hour.

**E.** One credit in a semester should be designed for 15 hours of lectures 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, submitting assignments, etc.

**F.** 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).

**G.** A course can have a combination of lecture credits, practical credits, hands-on skill training credits, OJT credits and practicum credits.

**H.** Minimum credit for one Course should be 2 (Two), and the maximum credit should be 4

(Four).

**I.** All Skill Development Components/ Minor Pathway Courses shall be of 4 (Four) credits. A 4-credit course can include five modules, out of which one will be Teacher Specific content.

**J.** Each semester requires a minimum of 18 skill credits (including theory, practicals and on the job-training) over six semesters.

**K.** For all Skill Development Components/ Minor Pathway Courses, there may be practical/ practicum of two or four hours per week.

**L.** All Courses under the Multi-Disciplinary, Ability Enhancement, Value Addition and Skill Enhancement categories are of 3 credits. A 3-credit course can include four modules, out of which one will be Teacher Specific content.

**M.** 20% syllabus of each course will be prepared by the teacher as 'Teacher Specific Content' and will be evaluated under CCA.

**N.** A two credit OJT in a semester should be designed for 5 hours per week.

**O.** One credit of Apprenticeship/Research Internship is equivalent to 10 days.

**P.** Summer Internship, Apprenticeship, Community outreach activities, etc. may require sixty hours (or as appropriate) of engagement for acquiring one credit.

**Q.** 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.

**R.** 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 6-semester UG programmes and 240 credits for a 4-year (8-semester) programmes.

**S.** 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.

**T.** For a four-credit theory course, 60 hours of lecture class shall be assured as a mandatory requirement for the completion of that course.

## 11. Course Structure of the SACA-B.Voc. (Honours) Programmes

The SACA -B.Voc.(Honours) 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 Credits Required | |
|---|---|---|---|
| | | 3-year B.Voc | 4-year B.Voc |
| 1 | Skill Development Components (SDC) | 72 | 72 |
| 2 | Minor Pathway Courses (MPC) | 24 | 36 |
| 3 | Multi-Disciplinary Courses (MDC) | 9 | 9 |
| 4 | Skill Enhancement Courses (SEC) | 9 | 9 |
| 5 | Ability Enhancement Courses (AEC) | 9 | 9 |
| 6 | Value Addition Courses (VAC) | 9 | 9 |
| 7 | Summer Internship | 2 | 2 |
| 8 | On the Job Training (OJT) | 6 | 6 |
| 9 | Apprenticeship/Research Internship | | 28 |
| | **Total Credits** | **140** | **180** |

**i.** 6 out of 9 credits of the SEC are part of the SDC.

**ii.** The Summer Internship/OJT must be undertaken in an area aligned with the SDC. The credits earned through this activity shall contribute to the SDC.

**iii.** Students enrolled in the Honours degree programme must earn a minimum of 12 credits from MPC at level 300 or above.

**iv.** Students pursuing the Honours with Research degree must complete an industry- linked research project of 20 credits and earn the remaining 8 credits of the SDC through research-oriented courses.

## 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 per semester, which may be offered as SDCE /SEC/ VAC.

ii. Each institution may publish a list of their signature courses in SDCE/ SEC/ VAC offered by their faculty members with a prior recommendation of BoS and the approval of academic council.

iii. An institution 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. 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 SDCE/ 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

i. the University BOS after the approval of department and college level academic committees formed as part of this regulations.

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 recommended 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 B.Voc. Degree and Honours programme.

- **Degree with Single Major**: A student pursuing the B.Voc. programme in a specific discipline shall be awarded a Major degree if he/she/they secures at least 60% of the total credits in the specific discipline required for the award of the Degree in that Discipline.

  Example: Logistics Management Major/ Information Technology Major/ Fashion Technology Major/ Renewable Energy Management Major etc.

- **Degree Major with Minor**: If a student pursuing the B.Voc. Programme is awarded a Major Degree in a particular discipline, he/she/they is eligible to be awarded a Minor in another discipline of his/her/their choice, if he/she/they earns a minimum of 24 credits from 6 pathway courses in that discipline.

  Example: Travel and Tourism Major with Information Technology Minor/ Fashion Technology Major with Commerce Minor/ Finance and Taxation Major with Retail Management Minor/ Animation and Graphic Design Major with Literature Minor/ Agriculture Technology Major with Culinary Arts and Hospitality Management Minor

etc.

- **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 B.Voc. Degree Programme is awarded a major Degree in a particular discipline, he/she/they is eligible to get mentioned his/her/their core competencies in other disciplines of his/her/their choice if he/she/they has earned 18 credits from the pathway courses of that discipline.

  Example: Information Technology Major with Minors in Travel and Tourism and

  History, Agro Food Processing Major with Minors in Banking and Financial Services and Biotechnology, Data Analytics and Machine Learning Major with Minors in Logistics Management and Commerce etc.

- **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 interdisciplinary programme.

  Example: Fashion Innovation and Retail Management Major, Agri-Business and Food Technology Major, Financial Technology and Banking Analytics Major, Econometrics Major, Global Studies Major, Biostatistics Major etc.

- **Multi-Disciplinary Major**: For multidisciplinary major pathways, the credits for the major and minor pathways will be distributed among the broad disciplines such as Management Studies, Design and Creative Arts, Communication and Media Studies, Environmental and Sustainability Studies, Applied Technologies, Life Sciences, Physical Sciences, Mathematical and Computer Sciences, Data Analysis, Social Sciences, Humanities etc.

  Example: Biomedical Informatics, Computational Social Science, Life Science, Data Science, Nano Science etc.

- **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/she/they could secure 40% of credits from that discipline for the 3-year/ 4-year UG degree to be awarded a double major degree.

  Example: Information Technology and Logistics Management Major, Fashion Technology and Travel and Tourism Major, Renewable Energy and History Major, Finance and Taxation and Journalism and Mass Communication Major etc.

## Pathway Option - Major with Minor

| Course and Components | Semester 1 | Semester 2 | Semester 3 | Semester 4 | Summer Internship of 2 Credits | Semester 5 | Semester 6 | Total | Semester 7 & 8 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **SDC** (4 Credit /Course) | 3 (2P) | 3 (2P) | 3 (2P) | 3 (2P) | | 3* (2P) | 2* (2P) | 17 | 2** (2 online) | 17/ 19** |
| **MPC** (4 Credit /Course) | 1 (P) | 1 | 1 (P) | 1 (P) | | 1 | 1 | 6 | 3 (3 online) | 9 |
| **(MDC)** (3 Credit /Course) | 1 | 1 (P) | 1# | | | | | 3 | | 3 |
| **(AEC)** (3 Credit /Course) | 1 (English) | 1 (English/ OL) | 1 (English) | | | | | 3 | | 3 |
| **(SEC)** (3 Credit /Course) | | | | 1 | | 1## (P) | 1## | 3 | | 3 |
| **(VAC)** (3 Credit /Course) | | | | 1 | | 1## | 1## | 3 | | 3 |
| **Total Courses** | **6** | **6** | **6** | **6** | | **6** | **5** | **35** | | **38/40** |
| **OJT** (2 Credits) | 1 | 1 | 1 | | | | | 3 | | 3 |
| **Project** (4 Credits) | | | | | | | 1 | 1 | | 1 |
| **Apprenticeship** (28 credits)/ **Research Internship** (20 credits) | | | | | | | | | 1 | 1 |
| **Total Credits** | **24** | **24** | **24** | **22** | **2** | **22** | **22** | **140** | **40** | **180** |
| **Total Hours per week** | **30** | **30** | **30** | **25** | | **25** | **28** | | | |



*One of the courses in 5th and 6th semesters will be Skill Development Component Elective (SDCE)

** Honours with Research

# The MDC offered in the third semester shall focus on Kerala-based content.

## The SECs and VACs offered in 5th and 6th semester shall be chosen from domains that align with the SDC.

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

- A student shall register to a minimum of 16 credit per semester from the college/ department where he/she/they officially admitted for a particular programme. However, students enrolled for a particular programme in one institution can simultaneously enroll for additional credits from other HEIs within the University or outside University subject to a maximum of 30 credits per semester including the 16 institutional credits.
- Each institution 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.
- 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.
- 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 course for major/ minor for their disciplines at different levels.
- At the end of each semester college will include the credit acquired by the student through online courses in their semester grade card subject to a maximum of 30 credits.

16. **Attendance**

(a) A student shall be permitted to register for the end-semester evaluation of a specific course to acquire the credits only if he has completed 75% of the prescribed classroom activities in physical, online, or blended modes, including any makeup activities as specified by the course faculty of that particular course.

(b) 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 leaves such as maternity leave, and menstrual leave shall also be treated as authorized absences.

(c) The condonation facility can be availed as per the university 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. Programme wise workload calculation will be as per the FYUGP workload ordinance.

v. The teachers given the administrative responsibilities in the department and college level may give a relaxation in their work load as specified in the UGC regulations 2018.

18. **Credit Transfer and Credit Accumulation**

- University will establish a digital storage (DIGILOCKER) of academic credits for the credit accumulation and transfer in line with ABC.
- The validity of credits earned shall be for a maximum period of seven (7) years or as specified in the university/ UGC regulations.
- The students shall be required to earn at least 50% of the credits from the university.
- 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**

(a) The curriculum will be designed based on Outcome Based Education (OBE) practices. The Graduate Attributes (GA) and Programme Outcomes (PO) are provided as Appendix-1. The OBE based syllabus template is provided as Appendix-2.

(b) The Institution will establish an appropriate Board of Studies (BoS) to approve the curriculum and course content developed by the institution in consultation with the CSDCCP and industry partners.

(c) The CSDCCP will support the institution in developing a regionally relevant skill curriculum based on appropriate Qualification Packs (QPs) and National Occupational Standards (NOSs).

20. **Assessment and Evaluation**

The assessment for SACA B.Voc.(Honours) programmes includes evaluations of both the General Education Components and the Skill Development Components.

2. The College will conduct examinations for the General Education components and Skill Components of the B.Voc. programme in accordance with the existing norms of the University.

3. The assessment shall be a combination of Continuous Comprehensive Assessment (CCA) and an End Semester Evaluation (ESE).

4. 30% weightage shall be given for CCA. The remaining 70% weight shall be for the ESE.

5. Teacher Specific Content will be evaluated under CCA.

6. CCA will have two sub-components- Formative Assessment (FA) and Summative

Assessment (SA). Each of these components will have equal weightage and to be conducted by the course faculty/ course coordinator offering the course.

7. 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 for both students. FA will help students become more aware of their learning needs, strengths, and interests so they can take greater responsibility over their own educational growth. FA will be prerogative of the course faculty/ course coordinator based on specific requirement of the student.
8. Suggestive methods of FA are as follows: (anyone or in combinations as decided by the course faculty/ course coordinator)
    - Practical assignment
    - Observation of practical skills
    - Viva voce
    - Quiz
    - Interview
    - Oral presentations
    - Computerized adaptive testing
    - In-class discussions
    - Group tutorial work
    - Reflection writing assignments
    - Home assignments
    - Self and peer Assessments
    - Any other method as may be required for specific course/ student by the course faculty/ course coordinator.
9. 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 a 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 evidences 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.
10. The method of SA will be as follows: (any one as decided by the course faculty/ course coordinator)
    - Written test
    - Open book test

- Laboratory report
- Problem based assignments
- Individual project report
- Case study report
- Team project report
- Literature survey
- Standardized test
- Any other pedagogic approach specifically designed for a particular course by the course faculty/ course coordinator.

11. A student may repeat SA only if for any compulsive reason due to which the student could not attend the assessment.
12. The prerogative of arranging a CCA lies with the course faculty/ course coordinator with the approval of SACA -B.Voc. Academic Committee based on justified reasons.
13. The course faculty/ course coordinator shall be responsible for evaluating all the components of CCA. However, the college may involve any other person (External or Internal) for evaluation of any or all the components as decided by the Chairman/ Principal from time to time in case any grievances are raised.
14. 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.
15. The course faculty may provide options for students to improve their performance through continuous assessment mechanism.
16. There shall be theory and practical examinations at the end of each semester.
17. Regarding evaluation, one credit may be evaluated for 25 marks in a semester; thus, a 4-credit course will be evaluated for 100 marks; 2-credit courses for 50 marks.
18. Odd semester examinations will be conducted by the university and will be evaluated at the institution level. However, even semester examinations will be conducted and evaluated by the university itself.
19. 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.
20. Students possessing a valid examination hall ticket may enter the examination hall up to 15 minutes after the scheduled start of the examination, with the permission of the Principal or the Chief Superintendent of Examinations.
21. 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 End Semester Examinations. The BoS may recommend T & M from the following list, considering a half-hour evaluation for the 1-credit course, except when the evaluation mode consists entirely of multiple-choice questions.

| Mode | Time (in Hours) | |
|---|---|---|
| | Minimum | Maximum |
| Written Examination | 1 | 2 |
| Multiple Choice | 0.75 | 1.5 |
| Open Book | 1 | 2 |
| Any Other Mode | 1 | 2 |

## 21. Practical Examination

(a) The end semester practical examination will be conducted and evaluated by the institution.

(b) There shall be a CCA of practical courses conducted by the course faculty/ course coordinator.

(c) 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% |

(d) Those who have completed the CCA alone will be permitted to appear for the ESE.

(e) For grievance redressal purpose, the college shall have the right to call for all the records of CCA.

(f) The BOS can suggest appropriate Time and Mode (T & M) for practical examinations.

## 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 |
|---|---|---|---|
| Industry-Linked Research project of Honours with Research (20 credits) | 200 | 60 | 140 |
| Apprenticeship of Honours (28 credits) | 300 | 90 | 210 |
| Project (4 credits) | 100 | 30 | 70 |

## 23. Evaluation of Internship/OJT

The evaluation of internship/OJT 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 / OJT | Weightage | Marks for Internship / OJT 2 Credits / 50 Marks |
|---|---|---|
| **CCA** | 30% | 15 |
| **ESE** | 70% | 35 |

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

## 24. Letter Grades and Grade Points

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

1. 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.
2. Based on the SGPA/ CGPA obtained, the grade point will be mentioned in the student's grade cards

| Letter Grade | SGPA/ CGPA range ($x$) | Class |
|---|---|---|
| O (Outstanding) | $9.5 \leq x$ | First Class with Distinction |
| A+ (Excellent) | $8.5 \leq x < 9.5$ | |
| A (Very good) | $7.5 \leq x < 8.5$ | |
| B+ (Good) | $6.5 \leq x < 7.5$ | First Class |
| B (Above average) | $5.5 \leq x < 6.5$ | |
| C (Average) | $4.5 \leq x < 5.5$ | Second Class |
| P (Pass) | $3.5 \leq x < 4.5$ | Third Class |
| F (Fail) | $x < 3.5$ | Fail |
| Ab (Absent) | | Fail |

3. **Conversion of CGPA to percentage**

$$\text{Equivalent Percentage} = \frac{CGPA \text{ obtained}}{Maximum\ CGPA\ (= 10)} \times 100$$

4. Based on the marks obtained, the grade point will be mentioned in the student's grade cards.

| Letter Grade | Grade Point | Percentage of Marks (Both CCA & ESE Marks put together) ($y$) | Class |
|---|---|---|---|
| O (Outstanding) | 10 | $95\% \leq y$ | First Class with Distinction |
| A+ (Excellent) | 9 | $85\% \leq y < 95\%$ | |
| A (Very good) | 8 | $75\% \leq y < 85\%$ | |
| B+ (Good) | 7 | $65\% \leq y < 75\%$ | First Class |
| B (Above average) | 6 | $55\% \leq y < 65\%$ | |
| C (Average) | 5 | $45\% \leq y < 55\%$ | Second Class |
| P (Pass) | 4 | $35\% \leq y < 45\%$<br>Aggregate with a minimum of 30% in ESE | Third Class |
| F (Fail) | 0 | $y < 35\%$<br>Below an aggregate (CCA and ESE put together) of 35% or below 30% in ESE | Fail |
| Ab (Absent) | 0 | | Fail |

5. When students take audit courses, they may be given pass (P) or fail (F) grade without any credits.
6. If a course evaluation consists of both theory and practical components, the minimum passing criteria for each component must be met separately
7. The marks for CCA components and ESE shall be rounded to two decimal places.
8. The aggregate marks for CCA and ESE should be rounded up to the next highest integer.

## 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):

- 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 undergone by a student in the semester, i.e.

**SGPA** (Si) = Σ(Ci x Gi) / ΣCi

Where Si is the SGPA in the $i^{th}$ semester, Ci is the number of credits of the $i^{th}$ course and Gi is the grade point scored by the student in the $i^{th}$ course.

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

Illustration – Computation of SGPA

| Semester | Course | Credit | Letter Grade | Grade point | Credit Point (Credit x Grade) |
|---|---|---|---|---|---|
| I | SDC 1 | 4 | A | 8 | 4 x 8 = 32 |
| I | SDC 2 | 4 | B+ | 7 | 4 x 7 = 28 |
| I | SDC 3 | 4 | B | 6 | 4 x 6 = 24 |
| I | MPC | 4 | B | 6 | 4 x 6 = 24 |
| I | AEC | 3 | O | 10 | 3 x 10 = 30 |
| I | MDC | 3 | O | 5 | 3 x 5 = 15 |
| I | OJT | 2 | A | 8 | 2 x 8 = 16 |
| | Total | 24 | | | 169 |
| | | | SGPA | | 169/24 = 7.04 |

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

**CGPA** = Σ(Ci x Si) / ΣCi

Where Si is the SGPA in the $i^{th}$ semester, Ci is the total number of credits in the $i^{th}$ semester.

$$\text{CGPA} = \frac{\text{Sum of the credit points of all the courses in six/ eight semesters}}{\text{Total Credits in Six (140)/ Eight (180) semesters}}$$

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

## 26. Skill Assessment and Certification

(a) Awarding Bodies

NCVET recognize Awarding Bodies who are entitled to award NCVET certificate to trainees/ learners after successful completion of training and assessment of NHEQF aligned and approved qualifications which are either developed or adopted by the Awarding Body. The college level Center for Skill Development Courses and Career Planning may try to get status of deemed Awarding Bodies of NCVET and can issue a dual certification for their skill courses.

(b) Assessment Agencies (AA):

An NCVET recognized Assessment Agency is authorized to assess trainees after completion of the trainees' training under an NSQC aligned and approved qualification. The recognized Assessment Agency is eligible to carry out assessments for NSQF aligned and approved qualifications in the sector allocated to the AA for which adequate capacity (Question Banks, SMEs, Industry connects, Governance processes etc.) Current there are around 56 approved AAs by NCVET. The list of the all the NCVET recognised Assessment Agencies can be accessed https://ncvet.gov.in/assessment-agencies/ The universities or the CSDCCP centers may get the assistance of these Assessment agencies for doing an effective assessment of the Skill Domains of the learner.

(c) Training Provider (TP)/ Training Centre (TC):

A TP/TC means a person or an organization, which is affiliated by an awarding body or an Higher Education Institution recognized by the NCVET/ Higher Education Council for providing Vocational Education, Training & Skilling and related activities with respect to a qualification/ course. The CSDCCP centers may be recognised as authorized training centers / training providers for the NHEQF aligned Skill Development courses/qualification.

(d) The Skill component of the course can be assessed and certified by the respective Sector Skill Councils.

(e) In case, there is no Sector Skill Council for a specific trade, the assessment may be done by an allied Sector Council or the Industry partner.

(f) CSDCCP/Training Provider/Industry shall do the assessment for skill competency through certified skill assessors.

(g) Wherever the university/college may deem fit, it may issue a joint certificate for the courses with the respective Sector Skill Councils.

(h) The credits regarding skill component will be awarded in terms of NHEQF level certification which will have a minimum of 60% weightage of total credits of the course.

27. **Committees to be constituted for the Implementation and Monitoring of SACA-B.Voc. (Honours)**

1. There shall be an SACA-B.Voc.(Honours) implementation cum monitoring committee at the College level under the chairmanship of the Principal to ensure the smooth implementation of the SACA-B.Voc.(Honours)
2. Apart from this, there shall be a college level SACA-B.Voc.(Honours) Academic Co-ordinator/ Nodal Officer, academic committee and an SACA-B.Voc. (Honours) department committee in each department of the affiliating colleges.
3. The affiliating colleges should provide an undertaking regarding the constitution of these two committees within one month from the date of effect of this regulation.
4. The tenure of the college level committees will be 4 years.

i. SACA-B.Voc. (Honours) Academic Committee

i. The Principal (Chairman)
ii. Academic Co-ordinator/ Nodal Officer (Convenor)
iii. CSDCCP Co-ordinator
iv. Academic Co-ordinator/ Nodal Officer of SACA- B.Voc (Honours).
v. All the Heads of Departments associated with B.Voc programmes
vi. Four teachers of the college representing different discipline nominated by the college council by rotation
vii. Not less than two experts/ academicians from outside the college representing areas such as Industry, Management, Commerce, Technology, Sciences etc., to be nominated by the college council preferably from the alumni of the college
viii. One nominee of the affiliating University (not less than the designation of associate professor in a college/ university department)

ii. Functions of SACA - B.Voc. (Honours)Academic Committee

i. Scrutinize, approve, recommend to the University all the proposals submitted by the department committee with regard to the SACA-B.Voc. (Honours) such as, academic pathway, allowed syllabi enrichment/ updation, 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 course faculty concerned, 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 Department committee concerned 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 council for starting innovative

programmes using the flexibility and holistic nature of the SACA-B.Voc. (Honours) curriculum frame work.

iii. SACA-B.Voc. Department Committee

i. Head of the Department concerned (Chairman)
ii. The entire faculty of the Department
iii. Two subject experts from outside the college to be nominated by the SACA - B.Voc. (Honours) 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-B.Voc.(Honours), may with the approval of the principal of the college, co-opt:
- Experts from outside the college whenever special courses of studies are to be formulated.
- Other faculty members of the same Faculty within the college

iv. Functions of SACA-B.Voc. (Honours) Department Committee

i. Prepare teacher specific content of syllabi for various courses keeping in view the objectives of the SACA-B.Voc.(Honours) 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.

v. CSDCCP

Constitution of CSDCCP: CSDCCP Advisory Body consists of seven members
i. Head of the institution: Chairperson
ii. Director/Co-ordinator of CSDCCP (One senior faculty nominated by the Head of the institution): Convenor
iii. Academic Co-ordinator /Nodal Officer- SACA-B.Voc.(Honours)
iv. Four members : Internal and External Experts

vi. Functions of CSDCCP

i. Propose skill components for SACA B.Voc. (Honours) courses, ensuring they meet the standards of the National Skills Qualification Framework (NSQF).
ii. Propose sector-specific skill curricula in line with National Occupational Standards (NOS) and Qualification Packs (QPs), ensuring relevance to

specific job roles and industries.

iii. Conduct competency-based assessments in collaboration with Sector Skill Councils (SSCs) and provide certifications at appropriate NHEQF levels to enhance employability.

## 28. Proposed Options for Higher Studies for the Students of SACA-B.Voc. (Honours)

The following higher education and research opportunities at the postgraduate level:

a) Postgraduate Diploma:

After completing the 3-year B.Voc. programme, students may opt for a 1-year Postgraduate Diploma in industry-linked, work-integrated, or apprenticeship- embedded programmes.

b) Honours Degree:

Students may pursue a 1-year structured apprenticeship or work integrated programme in collaboration with relevant industries, leading to an Honours Degree in their skill domain and enhancing their professional credentials.

c) Honours with Research:

For research-oriented students, an Honours with Research option may be offered through a work-integrated programme involving industry-linked research projects in their skill domain, preparing them for research careers.

d) Lateral Entry to M.Voc.:

Students who complete a Postgraduate Diploma are eligible for lateral entry into M.Voc. programme, allowing for advanced specialization in their skill areas.

e) PG or Research Programs

Students with Honours or Honours with Research degrees are eligible to pursue 1-year PG or research programme in accordance with UGC norms. Students with a standard B.Voc. Degree are eligible for 2-year M.Voc. programme or other regular PG programme, subject to the eligibility conditions prescribed by the relevant regulatory bodies.

## 29. 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 appropriate university authorities.

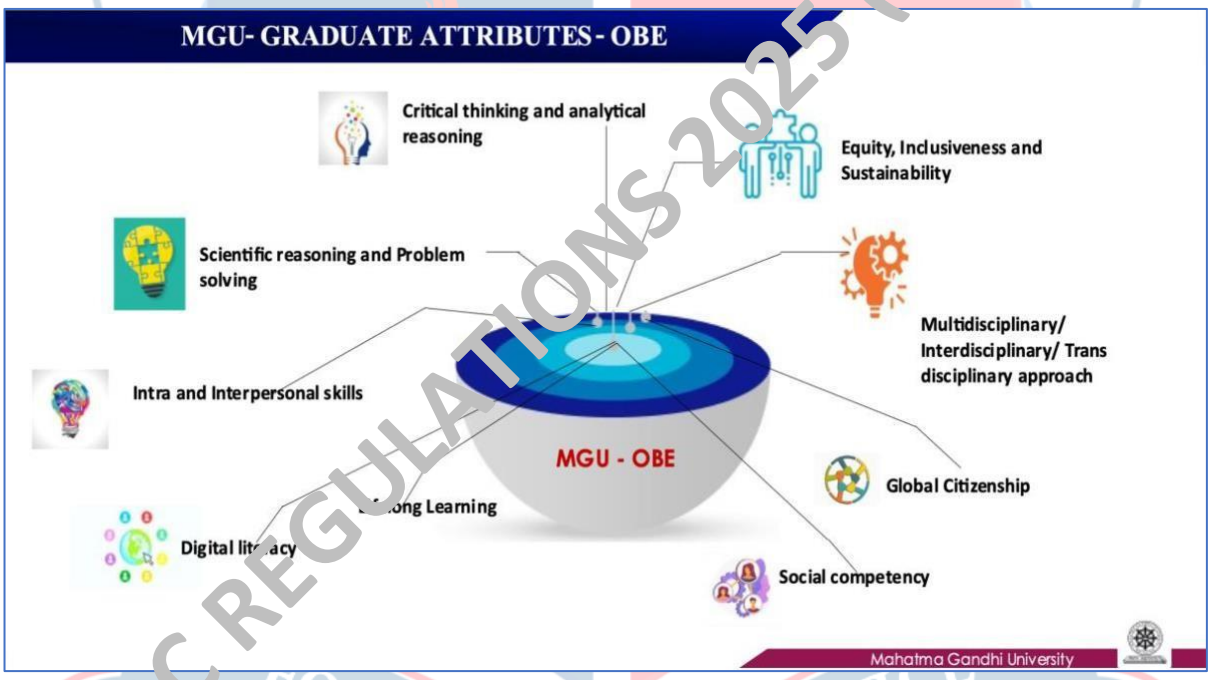
## 30. Modifications to the Regulations

Not withstanding 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.

**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




**GA 1: 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.

**GA 2: 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.

**GA 3: Multidisciplinary/interdisciplinary/transdisciplinary 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 for formulate constructive arguments and rational analysis for achieving common goals and objectives.

**GA 4: 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.

**GA 5: 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.

**GA 6: 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.

**GA 7: Social Competency**
Ability to contemplate of 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.

**GA 8: 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.

**GA 9: 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 adaptive to changing trades and demands of work place through knowledge/skill development/reskilling.



## Programme Outcomes (PO)

**PO 1: 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.

**PO 2: 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.

**PO 3: Multidisciplinary/interdisciplinary/trans-disciplinary Approach**
Acquire interdisciplinary /multidisciplinary/trans-disciplinary knowledge base as a consequence of the learning they engage with their programme of study; develop a collaborative-multidisciplinary/interdisciplinary/trans-disciplinary approach for formulate constructive arguments and rational analysis for achieving common goals and objectives.

**PO 4: Communication Skills**
Ability to express thoughts and ideas effectively in writing and orally; 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.

**PO 5: Leadership Skills**
Ability to work effectively and lead respectfully with diverse teams; setting direction, formulating an inspiring vision, building a team who 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.

**PO 6: Social Consciousness and Responsibility**

Ability to contemplate of 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.

**PO 7: 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.

**PO 8: 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 behavior.

**PO 9: Networking and Collaboration**
Acquire skills to be able to collaborate and network with educational institutions, research organizations and industrial units in India and abroad.

**PO 10: 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 work place through knowledge/skill develop pment/re-skilling.

# Syllabus Index

**Name of the Major Subject: Commercial Aquaculture**

**Semester: 1**

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ 1ST101 | Introduction to Aquatic Ecosystem | SDC | 4 | 4 | 4 | 0 | 0 |
| 25SACVCQ 1SP101 | Principles of Aquaculture | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 1SP102 | Taxonomy of fin fishes and shell fishes | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 1MD101 | Introduction to Ornamental Fisheries | MDC | 3 | 3 | 3 | 0 | 0 |
| 25SACVCQ 1OJ101 | On Job Training | OJT | 2 | 5 | 0 | 0 | 5 |

L — Lecture, P — Practical/Practicum , O — On the Job Training

**Semester: 2**

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ2 ST101 | Inland and Marine Fisheries | SDC | 4 | 4 | 4 | 0 | 0 |
| 25SACVCQ2 SP101 | Biology of Fishes | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ2 SP102 | Introduction to Marine biology and oceanography | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ2 MD101 | Fishery by-products and utilisation of fishery waste | MDC | 3 | 4 | 2 | 2 | 0 |
| 25SACVCQ2 OJ101 | On Job Training | OJT | 2 | 5 | 0 | 0 | 5 |

L — Lecture, P — Practical/Practicum, O — On the Job Training

**Semester: 3**

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ 3ST201 | Freshwater and Brackishwater Aquaculture | SDC | 4 | 4 | 4 | 0 | 0 |
| 25SACVCQ 3SP201 | Ornamental Fish Culture and Breeding | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 3SP202 | Fishing Methods | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 3MD201 | Traditional Capture and Culture Fishery in Kerala | MDC | 3 | 3 | 3 | 0 | 0 |
| 25SACVCQ 3OJ201 | On Job Training | OJT | 2 | 5 | 3 | 0 | 0 |

L — Lecture, P — Practical/Practicum , O — On the Job Training

**Semester: 4**

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ 4ST201 | Aquaculture Development, Planning and Management | SDC | 4 | 4 | 4 | 0 | 0 |
| 25SACVCQ 4SP201 | Seed Production and Hatchery Technology | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 4SP202 | Aquaculture Nutrition | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 4SE201 | Research Methodology | SEC | 3 | 3 | 3 | 0 | 0` |
| 25SACVCQ 4VA201 | Corporate Readiness | VAC | 3 | 3 | 3 | 0 | 0 |
| 25SACVCQ 4IN201 | Internship | INT | 2 | 20 days on Sem Break | | | |

L — Lecture, P — Practical/Practicum, O — On the Job Training

**Semester: 5**

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ 5ST301 | Sustainable Aquaculture | SDC | 4 | 4 | 4 | 0 | 0 |
| 25SACVCQ 5EP301 | Pathology in Aquaculture (E) | SDCE | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 5SP301 | Fish Preservation and Processing | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 5SP302 | Microbiology and Health Management of Fishes | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 5SE301 | Live Feed and Artificial Feed Preparation | SEC | 3 | 4 | 2 | 1 | 0 |
| 25SACVCQ 5VA301 | Aquaculture Marketing and Entrepreneurship | VAC | 3 | 3 | 3 | 0 | 0 |

L — Lecture, P — Practical/Practicum , O — On the Job Training

**Semester: 6**

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ 6EP301 | Aquaculture Engineering (E) | SDCE | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 6SP301 | Mariculture | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 6SP302 | Cage Designing and Cage Farming Technology | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 6SE301 | Aquaculture Biotechnology | SEC | 3 | 3 | 3 | 0 | 0 |
| 25SACVCQ 6VA301 | Aquafarm Management | VAC | 3 | 3 | 3 | 0 | 0 |
| 25SACVCQ 6PR301 | Project | PRJ | 4 | 8 | | | |

L — Lecture, P — Practical/Practicum , O — On the Job Training

**Semester: 7 and 8**

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ7SN401 | Apprenticeship | APPRENTICESHIP | 28 | 280 days | 0 | 28 | 0 |

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ7SR401 | RESEARCH INTERNSHIP | RESEARCH INTERNSHIP | 20 | 200 days | 0 | 20 | 0 |
| | | | | | | | |

L — Lecture, P — Practical/Practicum , O — On the Job Training

# Job Roles and Qualification Packs for Certificate, Diploma, Bachelor's, and Honours Degrees

| JOB ROLES | NHEQF LEVEL | QPs ALIGNED | SECTOR SKILL | YEAR |
|---|---|---|---|---|
| Fisheries Extension Associate | 4.5 | AGR/N5114 (v3.0)<br>AGR/N5113 (v4.0)<br>DGT/VSQ/N0102 (v1.0) | Agriculture | First Year |
| Freshwater Aquaculture Farmer | | AGR/N4922 (V3.0)<br>AGR/N4923 (V4.0)<br>AGR/N9922 (V2.0)<br>AGR/N4955 (V2.0)<br>DGT/VSQ/N0102 (V1.0) | Agriculture | |
| Ornamental fish Farmer | 5.0 | AGR/N4937 (v3.0)<br>AGR/N4938 (v4.0)<br>AGR/N9908 (v3.0)<br>AGR/N4955 (v2.0)<br>DGT/VSQ/N0102 (v1.0) | Agriculture | Second year |
| Fisheries Post Harvest Supervisor | 5.5 | CUTM/AGI/N1701, V.1.0 | Agriculture | Third Year |
| Fish Seed Grower | 6.0 | AGR/N9923 (v2.0) | Agriculture | Fourth Year |

# SEMESTER – I

| Course Code | Title of the Course | Type of the Course | Credit | Hours / week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ 1ST101 | Introduction to Aquatic Ecosystem | SDC | 4 | 4 | 4 | 0 | 0 |
| 25SACVCQ 1SP101 | Principles of Aquaculture | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 1SP102 | Taxonomy of fin fishes and shell fishes | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 1MD101 | Introduction to Ornamental Fisheries | MDC | 3 | 3 | 3 | 0 | 0 |
| 25SACVCQ 1OJ101 | On Job Training | OJT | 2 | 5 | 0 | 0 | 5 |

L — Lecture, P — Practical/Practicum , O — On the Job Training

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous), Ernakulam



| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Introduction to Aquatic Ecosystem** | | | | |
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ1ST101** | | | | |
| **Course Level** | **100-199** | | | | |
| **Course Summary** | This course provides a foundational understanding of aquatic ecosystems with a focus on their relevance to aquaculture. It introduces students to various freshwater, brackish and marine environments, covering key ecological concepts such as energy flow, food chains, and ecological pyramids. The course also explores the structure and dynamics of ponds, lakes, rivers, estuaries, and marine systems, with emphasis on Indian aquatic resources. Students will gain basic knowledge of aquatic biodiversity, ecological zones, and conservation needs, laying the groundwork for further studies in aquaculture and aquatic resource management. | | | | |
| **Semester** | 1 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 4 | 0 | 0 | 60 |
| **Pre-requisites, if any** | Basic knowledge of high school-level biology and environmental science. | | | | |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Describe the types and characteristics of freshwater, brackish, and marine ecosystems, including energy flow and primary/secondary productivity relevant to aquaculture. | U | PO1, PO2PO2, PO3, PO7 |
| 2 | Identify the types, ecological zones, and seasonal dynamics of ponds and lakes used in aquaculture. | K | PO1 PO2, PO3 |
| 3 | Recognize the ecological features of rivers and estuaries and their role in aquatic biodiversity and aquaculture. | U | PO1, PO2, PO3, PO7 |
| 4 | Describe the zones and biodiversity of marine ecosystems, and identify common marine organisms. | K | PO1, PO2, PO3 |
| 5 | Discuss major threats to marine ecosystems and outline key conservation and management strategies. | Ap | PO2, PO6, PO7, PO8, PO10 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| **CO 2** | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO 3** | 3 | 3 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| **CO 4** | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO 5** | 0 | 2 | 0 | 0 | 0 | 2 | 3 | 2 | 0 | 2 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

# COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Aquatic Ecosystems and Energy Flow** | | **15 hours** | |
| | 1.1 | Introduction to aquatic ecosystems – Freshwater (ponds, rivers), brackish, and marine systems. | 5 | 1 |
| | 1.2 | Ecological components – Abiotic and biotic factors; energy flow, food chains, food webs and ecological pyramids. | 5 | 1 |
| | 1.3 | Primary and secondary productivity – basic definitions and relevance in aquaculture. | 5 | 1 |
| 2 | **Pond and Lake Ecology (15 hours)** | | | |
| | 2.1 | Introduction to ponds and lakes- Types of ponds (nursery, rearing, stocking); types of lakes (oligotrophic, eutrophic, mesotrophic). | 5 | 2 |
| | 2.2 | Pond and lake zones – Littoral (shallow, near shore), limnetic (open surface water), and profundal (deep bottom water) zones. | 5 | 2 |
| | 2.3 | Seasonal turnover and basic ecological features of major Indian lakes and reservoirs. | 5 | 2 |
| 3 | **River and Estuarine Systems** | | **15 hours** | |
| | 3.1 | River types – Mountain vs. plain rivers: basic characteristics and differences, River zonation: upper, middle, lower courses. | 5 | 3 |
| | 3.2 | Major river systems of India – Ganga, Brahmaputra, Indus, East coast and West coast river systems and their aquatic biodiversity. | 5 | 3 |
| | 3.3 | Estuaries – definition, features, species diversity and their role in aquaculture. | 5 | 3 |
| 4 | **Marine and Coastal Systems** | | **15 hours** | |
| | 4.1 | Marine ecosystems – Basic zones: intertidal, pelagic, and benthic; coral reefs; sandy and rocky shores. | 5 | 4 |
| | 4.2 | Marine organisms – common examples of fish, shellfish and seaweeds | 5 | 4 |

| | | | | |
|---|---|---|---|---|
| | 4.3 | Marine conservation – Major threats: pollution, overfishing; basic conservation and management practices. | 5 | 4,5 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>Lectures, Presentations, Group Discussions |
| **Assessment Types** | **MODE OF ASSESSMENT** |

**A. Continuous Comprehensive Assessment (CCA) Theory**

| | |
|---|---|
| **Total Mark: 30** | |
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 10 |
| Test | 10 |

**B. End Semester Evaluation (ESE) Theory**

| | | |
|---|---|---|
| **Total mark: 70** | | |
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 2 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 25 out of 27 |
| Part B | 5 mark | Answer any 5 out of 7 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

## REFERENCES


- Sakhare, V. B., & Vasanthakumar, B. (2013). *Advances in aquatic ecology* (Vol. 7). Astral International.
- Verma, P. S., & Agarwal, V. K. (2000). *Environmental biology: Principles of ecology* (10th ed.). S. Chand & Company Ltd.
- Closs, G. P., Downes, B. J., & Boulton, A. J. (2004). *Freshwater ecology: A scientific introduction*. Blackwell Publishing.
- Nybakken, J. W., & Bertness, M. D. (2005). *Marine biology: An ecological approach* (6th ed.). Pearson/Benjamin Cummings.
- Hosetti, B. B., & Kumar, A. (2002). *A textbook of applied aquatic biology*. Daya Publishing House.


## SUGGESTED READINGS


- Dodds, W.K. et al. (2019). *Properties of Water & Aquatic*
- Clarice B. Catedrilla. (2023). *Aquatic Ecology*
- MDPI (2022). *Food Chains and Food Webs in Aquatic Ecosystems* (Open Access Book).
- Nybakken, J.W. (Archived Edition). *Marine Biology:*
- Begon, M., Townsend, C.R., & Harper, J.L. (2006). *Ecology: From Individuals*
- https://www.mdpi.com — Open-access journals on aquatic and environmental sciences
- https://www.researchgate.net — Scientific papers and chapter previews on aquatic ecology
- https://www.archive.org — Free access to out-of-print ecology and marine biology textbooks

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous), Ernakulam

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Principles of Aquaculture** | | | | |
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ1SP101** | | | | |
| **Course Level** | **100-199** | | | | |
| **Course Summary** | Aquaculture is the production of aquatic organisms in a controlled condition which ensure food security. This course provides a foundational understanding of aquaculture as a scientific and sustainable practice for the production of aquatic organisms. Aquaculture unlocks the vast potential of our oceans, seas, and inland freshwater bodies to produce larger quantities of healthy and nutritious food. This is essential to ensure food security for the ever growing human population. | | | | |
| **Semester** | 1 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Student should know basic biology | | | | |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Identify the potential and challenges of aquaculture for food security and livelihoods. | K | PO1, PO2, PO6 |

| | | | |
|---|---|---|---|
| 2 | Explain the steps involved in pond preparation, including site selection, pond design, drying, liming, fertilization, and water management. | U | PO1, PO3, PO7, PO10 |
| 3 | List out cultivable species (finfish, shellfish, prawns, molluscs) and their biological and ecological requirements. | U | PO1, PO2 |
| 4 | Identify the essential components and infrastructure requirements of a commercial-scale aquaculture farm, including layout, equipment, and utility connections. | K | PO1, PO2, PO10 |
| 5 | Develop practical skills in aquaculture practices especially in routine pond management for healthy stock maintenance. | S | PO1, PO2, PO10 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 1 | 2 | **0** | **0** | **0** | 3 | **0** | **0** | **0** | **0** |
| **CO 2** | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| **CO 3** | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO 4** | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| **CO 5** | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | | | | | | | | | | |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Introduction to aquaculture** | | **16 Hours** | |
| | 1.1 | Introduction-History, definition, scope and significance of aquaculture, Aquaculture - Global and Indian Scenario. comparison of aquaculture with agriculture and commercial fisheries. | 2 | 1, 5 |

| | | | | |
|---|---|---|---|---|
| | 1.2 | General concepts of ecology, Ecology of culture ponds- biotic and abiotic component. Food chain, Productivity- GPP, NPP. | 2 | 1, 5 |
| | 1.3 | phytoplankton, zooplankton and benthos in culture ponds. Significance of planktons in culture ponds. Ecological imbalances in a culture pond- algal blooms. | 2 | 1, 5 |
| | 1.4 | Stocking density and carrying capacity. Laws of limiting factor. Nutrient cycles – Nitrogen, Phosphorous and Carbon. | 2 | 1, 5 |
| | 1.5 | Different aquaculture systems- Based of stocking intensity- extensive, semi-intensive, intensive, based on salinity- freshwater, brackishwater, marine, closed systems, open systems, Based on types-monoculture, polyculture, composite fish culture. | 3 | 1 |
| | 1.6 | Practical- Estimation of productivity, | 5 | 5 |
| 2 | **Management of culture ponds** | | **19 Hours** | |
| | 2.1 | Pond preparation- site selection, pond layout, dewatering, drying, ploughing/desilting, predators, weeds and their control measures. | 3 | 2, 5 |
| | 2.2 | Fertilization- significance, classification of fertilizers. liming. Role of nutrients, NPK contents of various fertilizers and manures. | 3 | 2, 5 |
| | 2.3 | Water quality and soil quality parameters optimum for culture, Management of water and soil quality parameters. Equipments used to check water quality parameters. Correction methods of pH, methods for increasing the concentration of oxygen and reducing the concentration of ammonia and | 5 | 2, 5 |

| | | | | |
|---|---|---|---|---|
| | | hydrogen sulphide. Economics of aquaculture. | | |
| | 2.4 | Practical- measurement of water quality (salinity, pH, turbidity), identification of soil types, identification of plankton | 8 | 2, 5 |
| 3 | **Cultivable aquatic organisms** | | **16 Hours** | |
| | 3.1 | Cultivable Freshwater, Brackishwater and Marine Fishes: classification and salient features of Cultivable freshwater fishes and shellfishes- carps (Indian and exotic), airbreathing fishes (*Channa striatus,clarias batrachus*), tilapia, trout (rainbow trout), freshwater prawn. Major freshwater resources of India. | 4 | 3, 5 |
| | 3.2 | Brackishwater resources and salient features of Cultivable brackishwater fishes – Milk fish, mullet, pearl spot, seabass, shrimps, crabs; Major brackishwater culture systems in India. | 4 | 3, 5 |
| | 3.3 | Different organisms in mariculture – fishes (cobia), shrimps, mussels, oysters (pearl oyster, edible oyster) and sea weeds (red algae, brown algae, green algae). | 4 | 3, 5 |
| | 3.4 | Practical- Identification of finfishes, shellfishes, seaweeds | 12 | 3 |
| 4 | **Introduction to commercial aquaculture 15 Hours** | | | |
| | 4.1 | Components of a commercial scale aquaculture farm: Farm layout and design: water intake, drainage, aeration; pumps; power infrastructure development cost- Unit cost for developing setting up of an aquaculture unit. Materials required for construction of farms. | 4 | 4 |

| | | | | |
|---|---|---|---|---|
| | 4.2 | Electricity and water connection subsidies. Leasing of land. Agreement for leasing. Aquaculture licensing and registration for commercial farms. Renewal of licence. | 3 | 4 |
| | 4.3 | Requirements of human labour in farms, Labour cost, Miscellaneous expenses. | 4 | 4 |
| | 4.4 | Practical - Calculate the unit cost of developing a small-to-medium scale fish or shrimp farm.<br>Create a bill of materials for a standard farm model (e.g., 1-hectare carp farm or RAS unit) | 5 | 5 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

<table>
<tr><td>Teaching and Learning Approach</td><td>Classroom Procedure (Mode of transaction)<br>Lectures, Demonstration, Animations, Presentations, Discussions.</td></tr>
<tr><td>Assessment Types</td><td>MODE OF ASSESSMENT<br><br>A. Continuous Comprehensive Assessment (CCA)<br><br>Theory
<table>
<tr><td colspan="2">Total Mark: 25</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Assignment</td><td>10</td></tr>
<tr><td>Seminar/ Quiz/ Group Discussion</td><td>5</td></tr>
<tr><td>Test</td><td>10</td></tr>
</table>
Practical
<table>
<tr><td colspan="2">Total Mark: 15</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Involvement</td><td>5</td></tr>
<tr><td>Punctuality</td><td>5</td></tr>
<tr><td>Record/PPT</td><td>5</td></tr>
</table>
B. End Semester Evaluation (ESE)</td></tr>
</table>

**Theory**

| | | |
|---|---|---|
| **Total mark: 50** | | |
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 1.5 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 15 out of |
| Part B | 5 mark | Answer any 3 out of |
| Part C | 10 mark | Answer any 2 out of |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |

## REFERENCES


- Arvind Kumar. (2016). *A textbook of applied aquatic biology*. Daya Publishing House.
- Biswas, K. P. (1995). *Ecological and fisheries development in wetlands: A study of Chilka Lagoon* (1st ed.). Daya Publishing House.
- Closs, G., Lake, P. S., & Quinn, G. P. (2004). *Freshwater ecology: A scientific introduction*. Wiley-Blackwell.
- FAO. (2007). *Manual for operating a small scale recirculation freshwater prawn hatchery*. FAO.
- ICAR. (2006). *Handbook of fisheries and aquaculture*. ICAR.
- Nybakken, J. W. (2004). *Marine biology: Ecological approach*. Benjamin–Cummings Publishing Co.
- Pillay, T. V. R. (2004). *Aquaculture and the environment*. John Wiley & Sons.
- Pillay, T. V. R., & Kutty, M. N. (2005). *Aquaculture: Principles and practices* (2nd ed.). Blackwell Publishing.
- Vasanthakumar, B., & Sakhare, V. B. (2014). *Advances in aquatic ecology*. Daya Publishing House.
- Verma, P. S., & Agarwal, V. K. (1983). *Environmental biology (Principles of ecology)*. S. Chand Publishing.


## SUGGESTED READINGS


- CABI. (n.d.). *Aquaculture eBook*. https://www.cabi.org/wp-content/uploads/Aquaculture-eBook.pdf

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous), Ernakulam

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Taxonomy of Finfishes and Shellfishes** | | | | |
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ1SP102** | | | | |
| **Course Level** | **100-199** | | | | |
| **Course Summary** | This course focuses on the classification, identification, and naming of finfishes and shellfishes, which is essential for fisheries management, conservation, and sustainable utilization of aquatic resources. Students will learn about the principles of taxonomy, morphological characteristics, and molecular techniques used in identifying and categorizing various species of fish and shellfish. By exploring the diversity of finfishes and shellfishes, this course will equip students with the knowledge to contribute to research, conservation, and management efforts in aquaculture, fisheries, and marine biology. | | | | |
| **Semester** | 2 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Basic knowledge in science. | | | | |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Identify and classify finfish and shellfish: Recognize and categorize various species of finfish and shellfish using taxonomic principles. | K | PO1, PO2 |
| 2 | Understand morphological characteristics used to distinguish between different species of finfish and shellfish. | U | PO1, PO2 |
| 3 | Describe the diversity of finfish and shellfish species, use of taxonomic keys and other identification tools to identify finfish and shellfish species. | A | PO1, PO2, PO10 |
| 4 | Discuss the importance of molecular taxonomic tools to identify aquatic organisms. | U | PO1, PO2 |
| 5 | Use molecular techniques: Apply molecular techniques, such as DNA barcoding, to identify and classify finfish and shellfish species | A | PO1, PO2, PO10 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| CO 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| CO 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| CO 4 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 5 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **PRINCIPLES OF TAXONOMY** | | **18Hrs** | |
| | 1.1 | Principles of taxonomy, Tools of taxonomy, levels of taxonomy, Nomenclature. | 3 | 1 |
| | 1.2 | The position of fishes in phylum chordate. | 4 | 1, 2 |
| | 1.3 | Various trends in classification of fishes. | 4 | 1 |
| | 1.4 | Analysis of morphometric and meristic features of fishes. | 7 | 1, 2 |
| 2 | **TAXONOMY OF FINFISHES** | | **18Hrs** | |
| | 2.1 | Classification of super class Agnatha and Gnathostomata | 4 | 1, 2, 3 |
| | 2.2 | General characteristics of the orders/ families of freshwater fishes. | 4 | 1, 2, 3 |
| | 2.3 | General characteristics of the orders/ families of marine fishes | 4 | 1, 2, 3 |
| | 2.4 | Collection and identification of commercially important inland and marine fishes. | 6 | 2, 5 |
| | **TAXONOMY OF SHELLFISHES** | | **20Hrs** | |
| 3 | 3.1 | Major taxa of inland and marine shell fishes up to family level. | 3 | 1, 2, 3 |
| | 3.2 | Study of external morphology and meristic characteristics of crustacea and mollusca. | 4 | 2, 3 |
| | 3.3 | Classification of crustacea and mollusca up to the level of species. | 3 | 3 |
| | 3.4 | Collection and identification of commercially important crustaceans and mollusks. | 10 | 3, 4 |

| | | | | |
|---|---|---|---|---|
| 4 | **INTRODUCTION TO TAXONOMIC TOOLS** | | **18Hrs** | |
| | 4.1 | Dichotomous keys: advantages and disadvantages. | 3 | 1, 4 |
| | 4.2 | Molecular methods of species identification | 4 | 1, 4, 5 |
| | 4.3 | DNA polymorphism | 3 | 4, 5 |
| | 4.4 | Visit to fish landing centers to study commercially important fishes and catch composition. | 7 | 1, 4, 5 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions**<br>**Lecture**<br>**E-Learning**<br>**Interactive instructions**<br>**Group assignments**<br>**Group discussion**<br>**Practicals** |
| **Assessment Types** | **MODE OF ASSESSMENT**<br>**Continuous Comprehensive Assessment (CCA)**<br>**Theory** |

| **Total Mark: 25** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |

| | |
|---|---|
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**Practical**

| | |
|---|---|
| **Total Mark: 15** | |
| **Assessment methods** | |
| Involvement | 5 |
| Punctuality | 5 |
| Record/PPT | 5 |

**B. End Semester Evaluation (ESE)**
**Theory**

| | | |
|---|---|---|
| **Total mark: 35** | | |
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 1.5 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 15 out of 17 |
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| |
|---|
| **Total mark: 35** |

| | |
|---|---|
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |

## REFERENCES


- Nair, R. J. (2025). Finfish diversity and taxonomy.
- Kavitha, M., & Venkatesan, V. (2022). Importance of taxonomy and identification in shellfish trade.
- Wada, K. T., & Tëmkin, I. (2008). Taxonomy and phylogeny. *The pearl oyster*, *2008*, 37-75.
- Fischer, J. (2014). Fish identification tools for biodiversity and fisheries assessments: review and guidance for decision-makers. *FAO Fisheries and Aquaculture Technical Paper*, (587), 1.
- SUKUMARAN, S. (2018). Importance of Molecular Taxonomy in Fishery Biology Investigations.
- Livingstone, M. (2016). Taxonomy and systematics: an essential underpinning of modern fisheries management. *New Zealand Science Review*, *73*(3-4), 87-91.


## SUGGESTED READINGS

- "Fishes of the World" by Joseph S. Nelson
- "The Mollusks: A Guide to Their Study, Collection, and Preservation" by Charles F. Sturm, Timothy A. Pearce, and Ángel Valdés - A comprehensive guide to mollusk taxonomy and identification.

- "Crustacea: An Introduction" by Gary C. B. Poore - An introduction to crustacean taxonomy and biology.
- "Marine Fish Identification Guide" by various authors - A practical guide to identifying marine fish species.
- Systematics and Taxonomy of Fishes" by T. Iwatsuki and T. Nakabo - A detailed overview of fish systematics and taxonomy.

| | |
|---|---|
| | **Department of Fisheries and Aquaculture**<br>**St. Albert's College (Autonomous)**<br>**Ernakulam** |

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Introduction to Ornamental Fisheries** | | | | |
| **Type of Course** | **MDC** | | | | |
| **Course Code** | **25SACVC01MD101** | | | | |
| **Course Level** | **100-199** | | | | |
| **Course Summary** | The course on Introduction to Ornamental Fisheries an opportunity deals with the culture and breeding of freshwater ornamental fishes. A wide range of aspects, such as construction of aquarium tanks, maintenance of aquarium, important Ornamental fishes and their breeding preparation of feed and feeding management, water quality management and disease management. | | | | |
| **Semester** | 1 | **Credits** | | 3 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 0 | 0 | 45 |

| | |
|---|---|
| **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 | Make use of fundamental information on ornamental fish industry. | U | PO1,PO2 ,PO3,PO 10 |
| 2 | Show familiarity on diversity of ornamental fish, plants and other ornamental organisms, packing and transportation. | U | PO1,PO2 ,PO3,PO 10 |
| 3 | Make use of setting up and maintenance of fresh and marine aquariums as hobby and commercial level. | Ap | PO2,PO3 ,PO6,PO 7, PO9,PO1 0 |
| 4 | Build entrepreneurship on aquarium construction and setting up. | Ap | PO2,PO3 ,PO6,PO 7, PO9,PO1 0 |
| 5 | Demonstrate skills on ornamental fish breeding, rearing, larval feeds, ornamental fish nutrition, disease management and marketing to make | U, Ap | PO2,PO3 ,PO6,PO 7, PO9,PO1 0 |

| | | | |
|---|---|---|---|
| | them self-sustainable. Commercial production | | |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| CO 2 | 2 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| CO 3 | 0 | 3 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| CO 4 | 0 | 3 | 1 | 0 | 0 | 1 | 2 | 0 | 0 | 1 |
| CO 5 | 0 | 2 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | | INTRODUCTION 15hrs | | |
| | 1.1 | Diversity of ornamental fish. Major hotspots of ornamental fish- global and Indian perspective. Ornamental fish trade- various funding agencies promoting ornamental fish culture. Preferred species in trade. | 5 | 1,2 |
| | 1.2 | Ornamental plants. Ornamental invertebrates. Introduction to aquarium | 5 | 2 |

| | | | | |
|---|---|---|---|---|
| | | and aquarium accessories. Design and construction of public fresh water and marine aquaria. | | |
| | 1.3 | Setting up of aquarium – under gravel filter, pebbles, plants, drift wood, ornamental objects and selection of fishes. Activity- Aquarium setting. Aquarium maintenance and water quality. Control of snail and algal growth. | 5 | 3 |
| 2 | **Commercial Production of ornamental fishes 15 Hours** | | | |
| | 2.1 | Requirements and design for the commercial production units of ornamental fishes. Commercial production of goldfish and live bearers. | 5 | 3 |
| | 2.2 | Commercial production of gouramies, barbs, tetras, discus and angel fish. Mass production of aquarium plants. | 5 | 5 |
| | 2.3 | Commercial production of marine ornamental fishes (damsel and clown fishes) | 5 | 5 |

| | | | | |
|---|---|---|---|---|
| 3 | **Feeding and health management of ornamental fishes. - 15 Hours** | | | |
| | 3.1 | Nutritional requirements of aquarium fish, Use of pigments for colour enhancement | 5 | 5 |
| | 3.2 | Formulated feeds. Preparation of aquarium fish food. Live feed culture. Artemia culture, infusoria, brachionus culture, | 5 | 5 |
| | 3.3 | Common infectious and non- infectious diseases of ornamental fishes, symptoms and treatment | 5 | 5 |
| 4 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>Leverage a blended learning approach with a mix of lectures, interactive discussions. |
| **Assessment Type** | **MODE OF ASSESSMENT**<br>**A. Continuous Comprehensive Assessment (CCA)**<br>**Theory** |

| | |
|---|---|
| **Total Mark: 25** | |
| **Assessment methods** | |
| Assignment | 10 |

| | |
|---|---|
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**B. End Semester Evaluation (ESE)**

**Theory**

| | | |
|---|---|---|
| **Total mark: 50** | | |
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 1.5 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 30 out of 32 |
| Part B | 5 mark | Answer any 4 out of 6 |

Part A can be objective type, fill in the blanks, multiple choice etc.



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- The Simple Guide to Freshwater Aquariums" by David E. Boruchowitz.

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam

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|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **On-the-Job Training** | | | | |
| **Type of Course** | **OJT** | | | | |
| **Course Code** | **25SACVCQ1OJ101** | | | | |
| **Course Level** | **100-199** | | | | |
| **Course Summary** | On-the-Job Training (OJT) is designed to equip students with practical skills, workplace discipline, and industry exposure by actively engaging them in real-world professional environments. Conducted in collaboration with firms, industries, research institutions, or higher education establishments, OJT enables students to understand industry standards, apply academic knowledge, and perform job-specific tasks using contemporary tools and practices. The training must be undertaken in the student's own skill domain, aligned with the major area of study in their undergraduate program, to ensure relevance and coherence with their academic and career goals. The program also fosters essential workplace competencies such as communication, responsibility, adaptability, and teamwork. Furthermore, it offers students a platform for career exploration and networking, helping them evaluate potential career paths and align their aspirations with industry demands. | | | | |
| **Semester** | **1** | **Duration** | **5 hours/week** | **Credits** | **2** |



## COURSE OUTCOMES (CO)

| CO No: | Expected Course Outcome | Learning Domains | PO No: |
|---|---|---|---|
| | Upon the successful completion of the course, the student will be able to | | |
| 1 | Demonstrate understanding of industry operations, standards, and professional expectations through direct exposure to workplace environments. | Ap | PO1,PO3,PO6,PO10 |
| 2 | Apply job-specific skills effectively in real-world tasks and responsibilities within the assigned industry setting. | S | PO2,PO4,PO5,PO10 |
| 3 | Integrate academic knowledge with practical applications to solve work-related challenges and contribute to organizational goals. | An | PO1,PO2,PO3,PO6 |
| 4 | Exhibit essential workplace competencies such as punctuality, accountability, communication, teamwork, and adaptability. | S | PO4,PO5,PO8,PO9 |
| 5 | Identify and evaluate potential career opportunities by reflecting on their internship experiences and professional interactions. | E | PO1,PO9,PO10 |

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

| | | | |
|---|---|---|---|
| **Assessment Types** | **MODE OF ASSESSMENT** | | |
| | **A** | **Internal Evaluation** | |
| | | **Components** | **Marks** |
| | | Feedback from the hosting organization | 5 |
| | | Internal Supervisor feedback | 10 |
| | | **Total** | **15** |
| | **B** | **External Evaluation** | |
| | | **Components** | **Marks** |
| | | Presentation | 10 |
| | | Report | 10 |
| | | Viva Voce | 15 |
| | | **Total** | **35** |

# SEMESTER – II

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ 2ST101 | Inland and Marine Fisheries | SDC | 4 | 4 | 4 | 0 | 0 |
| 25SACVCQ 2SP101 | Biology of Fishes | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 2SP102 | Introduction to Marine Biology and Oceanography | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 2MD101 | Fishery by-products and utilisation of fishery waste | MDC | 3 | 4 | 2 | 2 | 0 |
| 25SACVCQ 2OJ101 | On Job Training | OJT | 2 | 5 | 0 | 0 | 5 |

L — Lecture, P — Practical/Practicum , O — On the Job Training

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

| | |
|---|---|
| **Faculty/ Discipline** | **Aquaculture** |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** |
| **Course Name** | **Inland and Marine Fisheries** |
| **Type of Course** | **SDC** |
| **Course Code** | **25SACVCQ2ST101** |
| **Course Level** | **100-199** |
| **Course Summary** | This course provides an introductory understanding of inland and marine fisheries in India. It covers the characteristics of riverine, reservoir, estuarine, and coastal fishing zones, along with key fishery resources such as pelagic, demersal, deep-sea, crustaceans, and molluscs. The course also introduces basic fish catch estimation methods and highlights the importance of conservation and fishery regulations. It is designed to help students recognize the role of these ecosystems and resources in sustainable fish production. |

| **Semester** | 2 | **Credits** | | 4 | **Total Hours** |
|---|---|---|---|---|---|
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 4 | 0 | 0 | 60 |
| **Pre-requisites, if any** | Basic understanding of water bodies and interest in fishery resources. | | | | |



## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Describe the classification, ecological importance, and fishery potential of Indian rivers, reservoirs, and inland fisheries development. | U | PO1,PO2 ,PO3,PO 7 |
| 2 | Identify key estuarine and pelagic fish species, and explain their habitats, fishing zones, and fishery practices. | K | PO1,PO2 ,PO3 |
| 3 | Recognize important demersal, deep-sea, crustacean, and molluscan fish resources and their significance in marine fisheries. | U | PO1,PO2 ,PO3 |
| 4 | Explain basic fishery data collection techniques, conservation strategies, and regulatory frameworks in India. | A | PO2,PO6 ,PO7,PO 8 |
| 5 | Appreciate the importance of sustainable fisheries and responsible harvesting in the context of Indian aquatic biodiversity | Ap (Appreciation) | PO6,PO7 ,PO8,PO 10 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 3 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| CO 2 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 3 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 4 | 0 | 3 | 0 | 0 | 0 | 2 | 2 | 2 | 0 | 0 |
| CO 5 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 2 | 0 | 2 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

### Content for Classroom transaction (Units)

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Module 1: Inland Fisheries (15 Hours)** | | | |
| | 1.1 | Rivers of India – Classification of Indian rivers (major, medium, minor); basic characteristics and importance in fisheries | 5 | 1 |
| | 1.2 | Reservoir fisheries – Role of reservoirs in fish production; major reservoirs and commonly used fishing methods | 5 | 1 |
| | 1.3 | Inland fish production – General trends and challenges in inland fisheries development in India | 5 | 1 |
| 2 | **Estuarine and Pelagic Fisheries (15 Hours)** | | | |
| | 2.1 | Estuarine ecosystems – Definition and types of estuaries; estuarine fishery | 5 | 2 |

| | | | | |
|---|---|---|---|---|
| | | potential and important species | | |
| | 2.2 | Pelagic fish resources – Common pelagic fishes: sardine, mackerel, anchovy, seer fish, and tuna; fishing practices | 5 | 2 |
| | 2.3 | Coastal fishing zones – Productive maritime fishing grounds including Wadge Bank and mud bank fisheries – a brief overview | 5 | 2 |
| 3 | **Demersal, Deep-Sea, Crustacean and Molluscan Fisheries (15 Hours)** | | | |
| | 3.1 | Demersal fish resources – Key species: elasmobranchs, silverbellies, lizard fish, and perches; fishing techniques | 5 | 3 |
| | 3.2 | Deep-sea fisheries – Main groups: sharks, catfish, eels, and snappers; deep-sea crustaceans like prawns, lobsters, and crabs | 5 | 3 |
| | 3.3 | Molluscan resources – Edible molluscs: clams, mussels, oysters, and cephalopods; role in Indian fisheries | 5 | 3 |
| 4 | | | | |

| | | | | |
|---|---|---|---|---|
| | **Fishery Assessment and Regulations (15 Hours)** | | | |
| | 4.1 | Fish catch estimation and stratified random sampling – Basic idea of fish landing data collection and sampling method | 5 | 4 |
| | 4.2 | **Conservation practices –** Brief on closed seasons, mesh size regulations, and protected areas | 5 | 4 |
| | 4.3 | Regulatory framework – Importance of fishery laws and brief mention of key policies like EMFRA | 5 | 4,5 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>Lectures, Presentations, Group Discussions |
| **Assessment Types** | **MODE OF ASSESSMENT** |

**Continuous Comprehensive Assessment (CCA)**

**Theory**

| **Total Mark: 30** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 10 |
| Test | 10 |

**End Semester Evaluation (ESE)**

**Theory**

| **Total mark: 70** | | |
|---|---|---|
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 2 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 25 out of 27 |
| Part B | 5 mark | Answer any 5 out of 7 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.



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- Spence, A. (1989). *Crab and lobster fishing*. Fishing News Books.


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- Qasim, S.Z. (2020). *Marine Fisheries of India* – comprehensive free PDF on estuarine, pelagic, and deep-sea
- Ganga, B.V. et al. (2021). "Mud Bank Fisheries of Kerala: A unique coastal fishery" – *Journal of Coastal Zone Management*.
- Rao, K.H. (2018). *Fishery Statistics for India* – includes methods for catch estimation
- Kurian, C.V. (2021). "Regulation of Indian Marine Fisheries: KMFRA and beyond" – *Indian Journal of Fisheries*.
- https://nfdb.gov.in – National Fisheries Development Board (India)
- https://mpeda.gov.in – Marine Products Export Development Authority
- https://cifri.res.in – Central Inland Fisheries Research Institute
- https://fisheries.icar.gov.in – Indian Council of Agricultural Research – Fisheries Division

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

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Biology of Fishes** | | | | |
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ2SP102** | | | | |
| **Course Level** | **100-199** | | | | |
| **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** | II | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Student should know basic biology | | | | |

**COURSE OUTCOMES (CO)**

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Outline the general characteristics of finfish and shellfish. | U | PO1, PO2, PO10 |

| | | | |
|---|---|---|---|
| 2 | Understand the mechanism of sense and endocrine organs in fishes, crustaceans and molluscs | U | PO1, PO 2, PO 3, PO 7, PO 10 |
| 3 | Explain the concepts of reproductive, execratory, respiratory and cardiovascular processes in fish. | U | PO 1, PO 2, PO 3, PO 7, PO 10 |
| 4 | Analyze the gut contents and the food and feeding habits of fish. | An | PO 1, PO 2, PO 3, PO 7, PO 10 |
| 5 | Identify the length-weight relationship and age and growth to indicate the taxonomic differences and events in the life history of fish | Ap | PO 1, PO 2, PO 3, PO 7, PO 10 |

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

**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 2 | 3 | 0 | | 0 | 0 | 0 | 0 | 0 | 2 |
| CO 2 | 2 | 3 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| CO 3 | 2 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 2 |
| CO 4 | 2 | 3 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| CO 5 | 2 | 3 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 2 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **General characteristics** | | **20 hours** | |
| | 1.1 | Different types of fins and scales in fish. Buoyancy in fishes. Colouration | 3 | 1 |

| | | | | |
|---|---|---|---|---|
| | 1.2 | Bioluminescence. Sense organs in fishes (Organs of smell, Taste buds, Lateral line system, Ampulla of Lorenzini), crustaceans (ommatidium, statocysts) and molluscs (statocysts). | 4 | 2 |
| | 1.3 | Specialized organs in fishes - electric organs, poison glands. | 3 | 1 |
| | 1.4 | Endocrine organs in fishes and shell fishes | 4 | 2 |
| | 1.5 | Practical - Types of scales in fishes- placoid, cycloid and ctenoid | 6 | 1 |
| 2 | **Food and growth** | **25 hours** | | |
| | 2.1 | Food and feeding habits of fishes, Digestive system and digestion in fishes and shell fishes (mullet, shark, *Penaeus monodon,* freshwater mussel) | 4 | 4 |
| | 2.2 | Methods of gut content analysis – Qualitative and Quantitative. Food analysis indices - simple (Index of fullness, Forage ratio) and compound (Index of preponderance, Index of Relative Importance). Gastro somatic index, relative gut length. | 3 | 4 |
| | 2.3 | Age and growth in fish – Methods employed for the study of growth - scales and otoliths. Length Frequency Analysis. Growth Parameters - Von Bertalanffy growth equation. | 3 | 5 |
| | 2.4 | Tagging and Marking. Length - weight relationships. Condition factor/ Ponderal index, Relative Condition Factor. | 3 | 5 |
| | 2.5 | Practical- Dissection and display of alimentary canal of fishes and crustaceans. Methods of gut content analysis – Numerical/ Volumetric/ Gravimetric. Gastro somatic index and relative gut length estimation | 12 | 4 |

| | | | | |
|---|---|---|---|---|
| 3 | **Respiration, Circulation and Excretion** 14 hours | | | |
| | 3.1 | Respiratory system and mechanism of respiration in fishes, Adaptations for air breathing in fishes. | 2 | 3 |
| | 3.2 | Cardiovascular system and mechanism of circulation in fishes. | 3 | 3 |
| | 3.3 | Excretion and osmoregulation – Structure of teleost kidney, osmoregulation in freshwater teleost, marine teleost and elasmobranch. | 4 | 3 |
| | 3.4 | **Practical**- Dissection of excretory organs in fishes, crustaceans and molluscs | 5 | 3 |
| 4 | **Reproduction and migration 16 hours** | | | |
| | 4.1 | Sexuality in fishes, Sexual dimorphism in fishes and crustaceans (type: shrimp, prawn and crab). | 4 | 3 |
| | 4.2 | Structure of ovary and testis in fishes. Maturity stages in fishes. Fecundity and Gonado- somatic index | 3 | 3 |
| | 4.3 | Parental care - Oviparous, Viviparous and Ovo-viviparous. Migration in fishes and its significance | 4 | 3 |
| | 4.4 | **Practical**- Identifying the secondary sexual characteristics (sexual dimorphism) in fishes, shrimps, prawns and crabs. Fecundity and GSI estimation in fishes. | 5 | 3 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions**<br>**Lecture**<br>**E-Learning**<br>**Interactive instructions**<br>**Group assignments**<br>**Group discussion**<br>**Practical's** |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>Lectures, demonstrations, animations, presentations, and discussions. |
| **Assessment Types** | **MODE OF ASSESSMENT** |

**A. Continuous Comprehensive Assessment (CCA)**

**Theory**

| **Total Mark: 25** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**Practical**

| **Total Mark: 15** | |
|---|---|
| **Assessment methods** | |
| Involvement | 5 |
| Punctuality | 5 |
| Record/PPT | 5 |

**B. End Semester Evaluation (ESE)**

**Theory**

| **Total mark: 50** |
|---|
| **Assessment methods: Written Exam** |

| | | |
|---|---|---|
| **Duration of Examination: 1.5 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 15 out of 17 |
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2.5 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |



**REFERENCES**


- Jhingran, V. G. 1997. Fish and fisheries of India. Hindustan Publishing Corporation (India), New Delhi, 727 pp.
- Nikolsky, G.V., 1996. Ecology of fishes. Allied Scientific Publishers, Bikaner, India. 351 pp.
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- H S Bhamrah and Kavita Juneja. 2003. Introduction to fishes. Anmol Publications Pvt. Limited, New Delhi. 288 pp.
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- Matty, A.J., 1985. Fish endocrinology. Beckenham, Croom Helm, 267 pp.

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- 2. Mattingly, H. T. (1996). Fishes: An introduction to ichthyology.
- 3. Quicke, D. L. (Ed.). (2013). Principles and techniques of contemporary taxonomy. Springer Science & Business Media.
- Roberts, R. J. (2001). The anatomy and physiology of teleosts. In Fish pathology (3rd ed., pp. 12-54).
- Venkataraman, K., & Sivaperuman, C. (2014). Marine faunal diversity in India: Taxonomy, ecology and conservation. Academic Press.

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

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Introduction to Marine Biology and Oceanography** | | | | |
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ2SP102** | | | | |
| **Course Level** | **100-199** | | | | |
| **Course Summary** | This course will provide students with basic knowledge on marine ecosystem and its importance. It demonstrates foundational knowledge in identifying and analyzing marine organisms and their ecological roles across various habitats. | | | | |
| **Semester** | 2 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Basic knowledge in biology. | | | | |



## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | To trace the historical development of marine biological investigations. To describe the salient features and biological processes of marine ecosystems. | K | PO1,PO2 ,PO3 |

| | | | |
|---|---|---|---|
| 2 | Clear knowledge on the types and divisions of various marine habitats and their topographical features. | U | PO1,PO2 ,PO3 |
| 3 | Knowledge on marine living and non-living resources, marine food chain and web. | U | PO1,PO2 ,PO3 |
| 4 | Understanding the dynamics and ecological role of plankton in aquatic food webs and their critical importance in supporting fish populations and overall fisheries productivity. | U | PO1,PO2 ,PO3,PO 6,PO7 |
| 5 | Analyze the structure and function of key marine habitats—such as coral reefs, estuaries, mangroves, pelagic zones, and benthic environments—and their significance in supporting biodiversity and fisheries. | An | PO1,PO2 ,PO3,PO 6,PO7,P O10 |

**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 3 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 4 | 2 | 2 | 2 | 0 | 0 | 3 | 3 | 0 | 0 | 0 |
| CO 5 | 2 | 2 | 2 | 0 | 0 | 3 | 3 | 0 | 0 | 3 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Introduction to Marine environment** | | **15** | |
| | 1.1 | History of marine biological investigations. Major expeditions, Early scientific investigations. | 5 | 1 |
| | 1.2 | Salient features of world oceans. Oceanographic features of Arabian Sea and Bay of Bengal. | 5 | 1 |

| | | | | |
|---|---|---|---|---|
| | 1.3 | Practical - Field visits to oceanographic institutions. | 5 | 1 |
| 2 | **Marine Habitats** | | **20** | |
| | 2.1 | General characteristics of the marine environment. Deep Ocean Topographic features – Continental shelf, continental slope, continental rise, oceanic ridges, trenches, sea mounts, guyots, plateaus, submarine canyons. | 5 | 2 |
| | 2.2 | Zonation of the sea - Biological divisions of the sea. Intertidal environment- zonation and adaptations of intertidal organisms. Intertidal rocky, sandy and muddy shore- associated fauna and their adaptations. Deep sea adaptations. | 5 | 2 |
| | 2.3 | Basic concepts about coastal wetlands, estuaries, mangroves, seagrass and coral reefs. Extreme environments- Polar regions and hydrothermal vents, Oxygen minimum zones, Mud Banks. | 5 | 2 |
| | 2.4 | Practical - Quantitative and qualitative study of the fauna of rocky, sandy and muddy shores. Collection and identification of locally available seaweeds, seagrasses, mangroves and preparation of herbarium. Field visit to intertidal environments, estuaries and Mangroves. | 5 | 2,3 |
| | **Population of the oceans** | | **20** | |
| 3 | 3.1 | Marine living and non-living resources. Planktonic deposits and oozes in marine environment. | 5 | 3 |

| | | | | |
|---|---|---|---|---|
| | 3.2 | Classification of marine organisms by habit and habitat. Populations of the ocean - Phytoplankton, zooplankton, benthos and nekton. Marine food chains and food webs. Indicator organisms, Fouling and boring organisms. | 5 | 3,4 |
| | 3.3 | Practical – methods of collection, preservation, enumeration, identification of common phytoplankton and zooplankton. Collection and identification of marine biofouling organisms. | 10 | 3,4 |
| 4 | **Plankton in relation to fisheries** | | **20** | |
| | 4.1 | Plankton in relation to fisheries. Plankton blooms, Harmful algal blooms. Toxic algae and its impact on fisheries | 5 | 4,5 |
| | 4.2 | Oceanography in relation to fisheries | 5 | 4,5 |
| | 4.3 | Practical – Collection of phytoplankton, enumeration. | 10 | 4 |
| 5 | **TEACHERS SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions**<br>**Lecture**<br>**E Learning**<br>**Interactive instructions**<br>**Group assignments**<br>**Group discussion** |

<table>
<tr><td></td><td>Demonstrations</td></tr>
<tr><td rowspan="2">Assessment Types</td><td>MODE OF ASSESSMENT</td></tr>
<tr><td>
A. Continuous Comprehensive Assessment (CCA)<br>
Theory
<table>
<tr><td colspan="2">Total Mark: 25</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Assignment</td><td>10</td></tr>
<tr><td>Seminar/ Quiz/ Group Discussion</td><td>5</td></tr>
<tr><td>Test</td><td>10</td></tr>
</table>
Practical
<table>
<tr><td colspan="2">Total Mark: 15</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Involvement</td><td>5</td></tr>
<tr><td>Punctuality</td><td>5</td></tr>
<tr><td>Record/PPT</td><td>5</td></tr>
</table>
B. End Semester Evaluation (ESE)<br>
Theory
<table>
<tr><td>Total mark: 50</td></tr>
<tr><td>Assessment methods: Written Exam</td></tr>
<tr><td>Duration of Examination: 1.5 hrs</td></tr>
<tr><td>Pattern of Examination: Non-MCQ</td></tr>
</table>
</td></tr>
</table>

| | | |
|---|---|---|
| Part A | 1 mark | Answer any 15 out of 17 |
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |



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- Hawkins, S. J., Bohn, K., Firth, L. B., & Williams, G. A. (2019). *Interactions in the marine benthos*. Cambridge University Press.
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- Reymont, J. E. G. (1963). *Plankton and productivity in the oceans* (Vols. 1–2). Macmillan.

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- Sverdrup, H. U., Johnson, M. W., & Fleming, R. H. (1968). *The oceans: Their physics, chemistry, and general biology*. Prentice-Hall.


**SUGGESTED READINGS**

- https://marinespecies.org/
- https://coml.org/
- https://obis.org/
- https://www.sealifebase.ca/

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B. Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Fishery By-products and Utilisation of Fishery Waste** | | | | |
| **Type of Course** | **MDC** | | | | |
| **Course Code** | **25SACVCQ2MD101** | | | | |
| **Course Level** | **100-199** | | | | |
| **Course Summary** | This course will provide the students to gain knowledge about different fishery by-products such as fish meal, fish oil, fish silage and fish protein concentrates. It helps to understand nutritional characteristics of different fishery by-products. Students also attain knowledge on conversion of fishery waste into commercially valuable products, including chitin, chitosan and glucosamine hydrochloride. | | | | |
| **Semester** | 2 | **Credits** | | 3 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 2 | 1 | 0 | 60 |
| **Pre-requisites, if any** | Basic knowledge about fisheries by-products. | | | | |



**COURSE OUTCOMES (CO)**

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Gain knowledge about various fishery by products like fish meal, fish oil, fish silage, fish protein concentrates and utilisation of fishery byproducts for for better health and also to prevent nutritional deficiency. | K | PO1,PO2 ,PO3,PO 10 |

| | | | |
|---|---|---|---|
| 2 | Summarize on various nutritional characteristics of the by-products and to understand the role of fishery by-products in addressing nutritional deficiencies and promoting human and animal health, particularly in protein-deficient populations. | U | PO1,PO2 ,PO3 |
| 3 | Illustrate sound knowledge in the utilization of fishery wastes for commercial purpose. | U | PO1,PO2 ,PO3,PO 10 |
| 4 | To develop skill in producing various fishery by-products at entrepreneurship level. | S | PO1,PO5 ,PO10 |

**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| CO 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 3 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| CO 4 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 3 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Fishery By-Products** | | **20** | |
| | 1.1 | Introduction to various fishery by-products like fish meal, fish body and liver oils, fish silage, fish protein concentrate, fish hydrosylates. | 8 | 1,4 |
| | 1.2 | Seaweed products- agar, alginic acid and carrageenan. | 2 | 1,4 |
| | 1.3 | Practical – Identification of different fishery by products. Preparation of agar, fish silage, fish meal. | 10 | 1,4 |

| | | | | |
|---|---|---|---|---|
| 2 | **Nutritional importance and uses of fishery by-products 20** | | | |
| | 2.1 | Nutritional importance of fish body and liver oil, fish meal, fish silage, poly unsaturated fatty acids (PUFA). | 5 | 2 |
| | 2.2 | Applications and uses of fish body and liver oil, fish meal, fish silage, poly unsaturated fatty acids (PUFA). | 5 | 2 |
| | 2.3 | Practical – Identification of different by-products | 10 | 2,4 |
| | **Utilisation of fishery waste** | | **20** | |
| 3 | 3.1 | Utilisation of shrimp waste and crab shell. Preparation of chitin, chitosan, glucosamine hydrochloride. Application and uses of chitin and chitosan, collagen from fish processing wastes. | 5 | 3 |
| | 3.2 | Miscellaneous by products - Fish maws and isinglass, pearl essence, bechedemer, shark fin rays, gelatine, ambergris, squalene. | 5 | 1,3 |
| | 3.3 | Practical – Preparation of chitin and chitosan, fish maws, isinglass. | 10 | 3,4 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions**<br>**Lecture** |

<table>
<tr><td></td><td>F-Learning<br>Interactive instructions<br>Group assignments<br>Group discussion<br>Practicals</td></tr>
<tr><td rowspan="3">Assessment Types</td><td>MODE OF ASSESSMENT</td></tr>
<tr><td>A. Continuous Comprehensive Assessment (CCA)<br>Theory
<table>
<tr><td colspan="2">Total Mark: 15</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Assignment</td><td>5</td></tr>
<tr><td>Seminar/ Quiz/ Group Discussion</td><td>5</td></tr>
<tr><td>Test</td><td>5</td></tr>
</table>
Practical
<table>
<tr><td colspan="2">Total Mark: 15</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Involvement</td><td>5</td></tr>
<tr><td>Punctuality</td><td>5</td></tr>
<tr><td>Record/ Report</td><td>5</td></tr>
</table></td></tr>
<tr><td>B. End Semester Evaluation (ESE)<br>Theory
<table>
<tr><td colspan="3">Total mark: 35</td></tr>
<tr><td colspan="3">Assessment methods: Written Exam</td></tr>
<tr><td colspan="3">Duration of Examination: 1 hrs</td></tr>
<tr><td colspan="3">Pattern of Examination: Non-MCQ</td></tr>
<tr><td>Part A</td><td>1 mark</td><td>Answer any 20 out of 22</td></tr>
<tr><td>Part B</td><td>5 mark</td><td>Answer any 3 out of 5</td></tr>
</table></td></tr>
</table>

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Understanding and application of concept | 10 |
| Data collection and analysis | 10 |
| Presentation | 10 |
| Viva | 5 |

**REFERENCES**


- Balachandran KK. 2001. Post-Harvest Technology of Fish and Fish Products. Daya Publ.
- Gopakumar K. (Ed.). 2002. Text Book of Fish Processing Technology. ICAR.
- Hall GM. (Ed.). 1992. Fish Processing Technology. Blackie.
- Nambudiri DD. 2006. Technology of Fishery Products. Fishing Chimes.
- Sen DP. 2005. Advances in Fish Processing Technology. Allied Publ.
- Wheaton FW & Lawson TB. 1985. Processing Aquatic Food Products John Wiley & Sons.
- Windsor M & Barlow. 1981. Introduction to Fishery Byproducts. Fishing News.


**SUGGESTED READINGS**


- **Clucas, I. J. (1981).** *Fish Handling, Preservation and Processing in the Tropics*. FAO. Includes practical methods for by-product utilization in tropical fisheries.
- **Naghdi, S. et al. (2024).** *Insights into Fishery By-product Application in Aquatic Feed and Food: A Review*. *Aquaculture International*, 32, 5851–5910. Read on Springer A comprehensive review of bioactive compounds like chitin, chitosan, and protein hydrolysates.

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **On-the-Job Training** | | | | |
| **Type of Course** | **OJT** | | | | |
| **Course Code** | **25SACVCQ2OJ101** | | | | |
| **Course Level** | **100-199** | | | | |
| **Course Summary** | On-the-Job Training (OJT) is designed to equip students with practical skills, workplace discipline, and industry exposure by actively engaging them in real-world professional environments. Conducted in collaboration with firms, industries, research institutions, or higher education establishments, OJT enables students to understand industry standards, apply academic knowledge, and perform job-specific tasks using contemporary tools and practices. The training must be undertaken in the student's own skill domain, aligned with the major area of study in their undergraduate program, to ensure relevance and coherence with their academic and career goals. The program also fosters essential workplace competencies such as communication, responsibility, adaptability, and teamwork. Furthermore, it offers students a platform for career exploration and networking, helping them evaluate potential career paths and align their aspirations with industry demands. | | | | |
| **Semester** | **2** | **Duration** | **5 hours/week** | **Credits** | **2** |

## COURSE OUTCOMES (CO)

| CO No: | Expected Course Outcome | Learning Domains | PO No: |
|---|---|---|---|
| | Upon the successful completion of the course, the student will be able to | | |
| 1 | Demonstrate understanding of industry operations, standards, and professional expectations through direct exposure to workplace environments. | Ap | PO1,PO3,PO6,PO10 |
| 2 | Apply job-specific skills effectively in real-world tasks and responsibilities within the assigned industry setting. | S | PO2,PO4,PO5,PO10 |
| 3 | Integrate academic knowledge with practical applications to solve work-related challenges and contribute to organizational goals. | An | PO1,PO2,PO3,PO6 |
| 4 | Exhibit essential workplace competencies such as punctuality, accountability, communication, teamwork, and adaptability. | S | PO4,PO5,PO8,PO9 |
| 5 | Identify and evaluate potential career opportunities by reflecting on their internship experiences and professional interactions. | E | PO1,PO9,PO10 |

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

| | | | |
|---|---|---|---|
| **Assessment Type** | **MODE OF ASSESSMENT** | | |
| | **A** | **Internal Evaluation** | |
| | | **Components** | **Marks** |
| | | Feedback from the hosting organization | 5 |
| | | Internal Supervisor feedback | 10 |
| | | **Total** | **15** |
| | **B** | **External Evaluation** | |
| | | **Components** | **Marks** |
| | | Presentation | 10 |
| | | Report | 10 |
| | | Viva Voce | 15 |
| | | **Total** | **35** |

# SEMESTER – III

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ 3ST201 | Freshwater and Brackishwater Aquaculture | SDC | 4 | 4 | 4 | 0 | 0 |
| 25SACVCQ 3SP201 | Ornamental Fish Culture and Breeding | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 3SP202 | Fishing Methods | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 3MD201 | Traditional Capture and Culture Fishery in Kerala | MDC | 3 | 3 | 3 | 0 | 0 |
| 25SACVCQ 3OJ201 | On Job Training | OJT | 2 | 5 | 3 | 0 | 0 |

L — Lecture, P — Practical/Practicum , O — On the Job Training

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

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Freshwater and Brackish water Aquaculture** | | | | |
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ3ST201** | | | | |
| **Course Level** | **200-299** | | | | |
| **Course Summary** | This course provides a comprehensive overview of aquaculture practices in freshwater and brackishwater environments. It covers the principles, scope, and significance of aquaculture as a food-producing sector. The course focuses on site selection, design, and management of culture systems such as ponds, tanks, cages, pens, and integrated farming systems. | | | | |
| **Semester** | 3 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 4 | 0 | 0 | 60 |
| **Pre-requisites, if any** | Students can have an ideaa about aquaculture, aquatic organisms suitable for culture. | | | | |



## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Explain how the biology and feeding habits of cultivable carps influence the design and management of farming systems. | U | PO1, PO2 |
| 2 | Describe appropriate culture practices for freshwater prawns, including hatchery techniques, grow-out systems, stocking densities, feeding, and water management. | U | PO1, PO2, PO10 |
| 3 | Analyze the suitability of specific culture technologies for sustainable aquaculture in freshwater and brackishwater environments. | C | PO1, PO2,PO10 |
| 4 | Develop practical understanding of different aquaculture systems, including modern approaches like aquaponics and recirculatory aquaculture systems (RAS). | An | PO2, PO6 |
| 5 | Understand and apply aquaculture policies and planning strategies that promote socio-economic development through sustainable aquaculture practices. | A | PO1,PO2,PO6,PO7, PO10 |



**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 2** | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| **CO 3** | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| **CO 4** | 0 | 2 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 |
| **CO 5** | 1 | 2 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 1 |
| | | | | | | | | | | |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Culture of freshwater finfishes** | | **15 hours** | |
| | 1.1 | Culture of carps-Nursery rearing and stocking ponds – composite fish culture | 4 | 1 |
| | 1.2 | preparation of ponds– different methods for the eradication of weed fishes, predators, aquatic insects and aquatic weeds, stocking and post stocking management, harvesting. | 4 | 1, 5 |
| | 1.3 | Culture of air breathing fishes- Channa, catfishes, Anabas (grow out culture, stocking density, feeding, water management). | 4 | 1 |
| | 1.4 | Culture of cold water fishes (trout culture) in India. | 3 | 1 |

| | | | | |
|---|---|---|---|---|
| 2 | **Culture of freshwater crustaceans and molluscs 15 hrs** | | | |
| | 2.1 | Prawns: Cultivable species of freshwater prawns. biology and lifecycle of *Macrobrachium rosenbergii*- morphology, reproduction, spawning, male morphotypes, Ecdysis. | 3 | 2 |
| | 2.2 | culture of *Macrobrachium rosenbergii.* Culture of *Macrobrachium malcomsonii.* | 3 | 2 |
| | 2.3 | Molluscs : Important freshwater molluscs of Kerala. Definition scope and origin of pearls, Pearl producing molluscs. | 3 | 2 |
| | 2.4 | Freshwater pearl culture – Mantle cavity implantation, Mantle tissue implantation, gonadal implantation, post operative care. | 3 | 2 |
| | 2.5 | Present status of freshwater pearl culture and production in India. Freshwater pearl culture in the World and in India. | 3 | 2, 5 |
| 3 | **Brackishwater finfish and shellfish culture 15 hours** | | | |
| | 3.1 | History, development and present status of brackish | 3 | 3, 5 |

| | | | | |
|---|---|---|---|---|
| | | water farming in India. Selection of site, general planning and design of brackish water farms | | |
| | 3.2 | Culture practices of *Chanos chanos, Lates calcarifer, Etroplus suratensis, Oreochromis mossambicus* (grow out culture, stocking density, feeding, water management). | 3 | 3, 5 |
| | 3.3 | Species of shrimps cultured in brackish water –*Penaeus monodon, Penaeus indicus, Litopenaeus vannamei*. Site selection and design of brackish water shrimp farms. Extensive, semi-intensive and intensive shrimp farming practices. | 3 | 3, 5 |
| | 3.4 | Species of crabs cultured and culture techniques, prospects in India. Species of lobsters, culture, problems and prospects in India. | 3 | 3 |
| | 3.5 | Important culturable species of oysters, mussels and clams. Site selection criteria. Methods of culture(raft, rack, pole and line, bottom culture). | 3 | 3 |

| | | | | |
|---|---|---|---|---|
| | **Systems of aquaculture** | | **15 hours** | |
| 4 | 4.1 | Culture systems- ponds, raceways, floating cages, Pens, Rack, raft culture, long line culture, On Bottom Culture. monoculture, polyculture, composite fish culture. | 5 | 4, 5 |
| | 4.2 | Recent trends- sewage- fed fish culture. Recirculatory Aquaculture Systems, Biofloc technology. IMTA (Integrated multitrophic Aquaculture). Aquaponics and Hydroponics | 5 | 4, 5 |
| | 4.3 | Integrated aquaculture systems. Paddy-cum-fish culture, Integrated fish farming with duck, pig, poultry, livestock. | 5 | 4, 5 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>Lectures, Presentations, Group Discussions |
| **Assessment Types** | **MODE OF ASSESSMENT** |

**C. Continuous Comprehensive Assessment (CCA)**

**Theory**

| **Total Mark: 30** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 10 |
| Test | 10 |

**D. End Semester Evaluation (ESE)**

**Theory**

| **Total mark: 70** | | |
|---|---|---|
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 2 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 25 out of 27 |
| Part B | 5 mark | Answer any 5 out of 7 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

## REFERENCES


- Andrew, P. (1999). *Economics of brackish water shrimp culture*. Daya Publishing House.
- Chakrabarti, N. M. (1998). *Biology, culture and production of Indian major carps: A review*. Narendra Publishing House.
- Closs, G., Lake, P. S., & Quinn, G. P. (2003). *Freshwater ecology: A scientific introduction*. Wiley-Blackwell.
- CMFRI. (1979). *Larval development of Indian penaeid prawns*. CMFRI.
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- Thomas, P. C., Rath, S. C., & Mohapatra, K. D. (2003). *Breeding and seed production of finfish and shellfish*. Daya Publishing House.


## SUGGESTED READINGS


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- CMFRI. (n.d.). *Larval development of Indian penaeid prawns*. https://eprints.cmfri.org.in/10336/

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Ornamental Fish Culture and Breeding** | | | | |
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ3SP201** | | | | |
| **Course Level** | **200-299** | | | | |
| **Course Summary** | The course on Ornamental Fish Culture and Breeding an opportunity deals with the culture and breeding of freshwater ornamental fishes. A wide range of aspects, such as construction of aquarium tanks, maintenance of aquarium, important Ornamental fishes and their breeding, preparation of feed and feeding management, water quality management and disease management. | | | | |
| **Semester** | 3 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Student should know basic in fish culture | | | | |



## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | Make use of fundamental information on ornamental fish industry. | U | PO1, PO 2, PO 3, PO 5 |
| 2 | Show familiarity on diversity of ornamental fish, plants and other ornamental organisms, packing and transportation. | U | PO 2, PO 3, PO 6, PO 7, PO 9, PO 10 |
| 3 | Make use of setting up and maintenance of fresh and marine aquariums as hobby and commercial level. | AP | PO 2, PO 3, PO 6, PO 7, PO 9, PO 10 |
| 4 | Build entrepreneurship on aquarium construction and setting up. | AP | PO 2, PO 3, PO 6, PO 7, PO 9, PO 10 |
| 5 | Demonstrate skills on ornamental fish breeding, rearing, larval feeds, ornamental fish nutrition, disease management and marketing to make them self-sustainable. | U, AP | 2,3,6,7,9,10 |

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

**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 2 | 3 | 2 | 0 | 0 | 1 | 1 | 0 | 1 | 2 |
| CO 3 | 2 | 3 | 2 | 0 | 0 | 1 | 1 | 0 | 1 | 2 |
| CO 4 | 2 | 3 | 2 | 0 | 0 | 1 | 2 | 0 | 1 | 2 |
| CO 5 | 2 | 3 | 2 | 0 | 0 | 1 | 2 | 0 | 2 | 2 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Introduction** 17 hours | | | |
| | 1.1 | Introduction to aquarium, ornamental fishes and aquarium accessories. World aquarium trade and present status. | 3 | 1, 2 |
| | 1.2 | Design and construction of public fresh water and marine aquaria and oceanarium. | 3 | 3 |
| | 1.3 | Aerators, filters and lighting. Water quality requirements | 3 | 3 |
| | 1.4 | Temperature control. Biofilters in aquarium. | 2 | 3 |
| | 1.5 | Practical -Water quality management in aquarium | 6 | 3 |
| 2 | **Aquarium Management** 13 hours | | | |
| | 2.1 | Setting up of aquarium – under gravel filter, pebbles, plants, drift wood, ornamental objects and selection of fishes | 3 | 4 |
| | 2.2 | Quarantine measures. Aquarium maintenance and water quality | 2 | 3 |
| | 2.3 | Control of snail and algal growth. Handling, care and transportation of fish. | 2 | 3 |
| | 2.4 | Temperature acclimation, oxygen packing. | 2 | 3 |
| | 2.5 | Practical - Construction and maintenance of aquarium, setting up of aquarium tanks | 4 | 3 |

| | | | | |
|---|---|---|---|---|
| 3 | **Fresh water Ornamental Fishes and their production** 27 hours | | | |
| | 3.1 | Species of ornamental fishes; Commercial production of guppy, platy, mollies, gold fishes, gouramies, barbs and tetras | 5 | 5 |
| | 3.2 | Cichlids - angel fish, oscars | 3 | 5 |
| | 3.3 | Breeding habits – Live bearers, egg layers- egg scatters, egg depositors, egg buriers, nest builders. Spawning, parental care, fertilization and development of eggs. | 3 | 5 |
| | 3.4 | Indigenous ornamental fishes of Kerala. Freshwater aquarium plants. Mass production, | 2 | 2 |
| | 3.5 | Live fish transport and ornamental fish business. Recent trends | 2 | 2 |
| | 3.4 | Practical - Identification of economically important aquarium fishes (Exotic, Indigenous and marine ornamental fishes), important molluscs and crustaceans used in aquariums and aquarium plants and invertebrates. Breeding and rearing of commercially important ornamental fishes in hatchery | 12 | 3, 5, 3 |
| 4 | **Marine Ornamental Fishes and their production** 18 hours | | | |
| | 4.1 | Marine ornamental fishes – varieties and their habitat. Major marine ornamental fish resources of India. Method of collection of live fish | 2 | 2 |
| | 4.2 | Breeding of marine ornamental fishes (clown fishes and Damsel fishes). | 2 | 5 |
| | 4.3 | Reef aquarium. Nutritional requirements of aquarium fishes | 2 | 3 |

| | | | | |
|---|---|---|---|---|
| | 4.4 | Different kinds of feeds. Preparation of dry feeds - feeding methods. Larval feeds and feeding. | 2 | 5 |
| | 4.5 | Common disease in ornamental fishes - infectious and non-infectious and their control measures | 2 | 5 |
| | 4.6 | Practical -Preparation of feeds and practicing feeding schedules, Identification of common diseases and parasites of aquarium fishes | 8 | 5 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions**<br>**Lecture**<br>**Interactive instructions**<br>**Group assignments**<br>**Group discussion**<br>**Practicals** |

<table>
<tr><td>Assessment Types</td><td>MODE OF ASSESSMENT</td></tr>
<tr><td></td><td>

**A. Continuous Comprehensive Assessment (CCA)**

**Theory**

| **Total Mark: 25** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**Practical**

| **Total Mark: 15** | |
|---|---|
| **Assessment methods** | |
| Involvement | 5 |
| Punctuality | 5 |
| Record/PPT | 5 |

**B. End Semester Evaluation (ESE)**

**Theory**

| **Total mark: 50** |
|---|
| **Assessment methods: Written Exam** |
| **Duration of Examination: 1.5 hrs** |

</td></tr>
</table>

| Pattern of Examination: Non-MCQ | | |
|---|---|---|
| Part A | 1 mark | Answer any 15 out of 17 |
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| **Total mark: 35** | |
|---|---|
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |



## REFERENCES


- Hem , J., & Hervy, G. F. (n.d.). *Gold fish*.
- Srivastava, C. B. L. (n.d.). *Aquarium fish keeping*.
- Saxena, A. (n.d.). *Aquarium management*.

Shinekumar, D. (n.d.). *Varna mātsyangalum valarthu mātsyangalum: Vinodhathinum varumanathinum*


## SUGGESTED READINGS


- Jindal, M., et al. (n.d.). *Freshwater ornamental fishes*.
- Inasu, N. D. (n.d.). *Sexual dimorphism of some indigenous ornamental fishes* (Vol. 1)

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



| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Fishing Methods** | | | | |
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ3SP202** | | | | |
| **Course Level** | **200-299** | | | | |
| **Course Summary** | The course "Fishing Methods" examines the various equipment and methods used in fishing, including both conventional and contemporary methods. It explores the design and use of various fishing equipment, such as nets, traps, and lines, and looks at how different fishing crafts—from basic dugouts to motorized boats—are built and operated. The need of comprehending the fundamentals of various fishing techniques and how they relate to various aquatic conditions and target species is also emphasized throughout the course. | | | | |
| **Semester** | 3 | **Credits** | | 4 | **Total Hours** |
| **Course Design and Learning Approach** | | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Basic knowledge in science. | | | | |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Understand and have in depth knowledge on fishing crafts of India. | U | PO1 |
| 2 | Ability to understand operation of fishing gears, itd Dos and Don'ts | U | PO1, PO2 |
| 3 | Analyse and understand various methods to fabricate a fishing gear | A | PO1, PO2, PO6 |
| 4 | Thorough knowledge on fish aggregating devices and legislations of responsible fisheries. | K | PO1, PO2 |
| 5 | Understand the art of fabrication of fishing gears and operation of fishing crafts and gear | U | PO1, PO2, PO6 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 3 | 1 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| CO 4 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 5 | 1 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

# COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **FISHING CRAFTS** | | **18 Hrs** | |
| | 1.1 | Different types of fishing crafts in India- traditional fishing crafts of Inland and marine waters. coracle, catamaran, plank built boat, rampani boat, lodhia boat, mechanisation of fishing vessels | 4 | 1 |
| | 1.2 | Motorized and mechanized crafts- trawlers, gill netters, purse seiners, long liners, trollers, deep sea vessels. | 4 | 1 |
| | 1.3 | Boat building materials – types, its advantages and disadvantages.– types- wood, steel, ferrocement, aluminium and fibreglass (preparation, seasoning, preservation) | 4 | 1, 5 |
| | 1.4 | Identification of different traditional and modern fishing crafts of India. Conduct a visit to nearby fishing harbours | 6 | 1, 4, 5 |
| 2 | **FISHING GEARS** | | **19 Hrs** | |

| | | | | |
|---|---|---|---|---|
| | 2.1 | Traditional fishing gears : Active and passive gears.Drag nets, Bag nets, Seines, Trawls, Purse nets, cast nets, Scoop nets, Traps, Hooks and line. Passive fishing gears: Gill and drift nets, Trammel nets, Screens, Fixed bag nets, Trap nets. | 4 | 2 |
| | 2.2 | Unconventional and illegal methods of fishing.ghost fishing, traps, dynamite fishing, and electrifying methods of fish capture | 4 | 2 |
| | 2.3 | **Modern Fishing** gears and its operation, trawling, purse seining, lampara net fishing, gill netting, line fishing. Squid jigging. Fishing accessories- hooks, floats, sinkers, and ropes. | 4 | 1, 2, 5 |
| | 2.4 | Identify and study the operation of traditional and mechanised fishing gears. | 7 | 2, 3, 5 |
| | **FABRICATION OF FISHING GEAR** | | **20Hrs** | |
| 3 | 3.1 | Netting materials: natural and synthetic fibres. Fabrication. natural and synthetic fibres. | 3 | 3 |
| | 3.2 | Fabrication of a fishing gear, net webbing and mending: | 4 | 3, 4 |

| | | | | |
|---|---|---|---|---|
| | | tailoring of webbing, assembly netting to ropes, rigging, joining of webbing, knots, bends and hitches | | |
| | 3.3 | Accessories used in nets, its types and functions.its types and functions: floats, sinkers, buoys, anchors, thimble, shackle, hooks. classification of floats: high density floats (glass, aluminium, steel), low density floats (wood, cork, thermocole, sponge) hooks: artificial baits and jig | 3 | 3, 4 |
| | 3.4 | Demonstration of net mending and Identification of fishing accessories | 10 | 2, 3, 4 |
| | **FISH FINDERS AND RESPONSIBLE FISHING** | | **18 Hrs** | |
| | 4.1 | FAD's and Fish Finding Devices.Fish aggregating devices and artificial reefs; Impact of artificial reefs on fish stock improvement; Turtle Exclusion Devices (TED) - By-catch Reduction Devices (BRD). Fish finders, GPS navigator, sonar, net sonde, Echo sounder, gear | 3 | 4 |

| | | | | |
|---|---|---|---|---|
| | | monitoring equipments; remote sensing. | | |
| | 4.2 | Concept of responsible Fisheries.Monsoon trawl ban, closed season, mesh size regulations, juvenile fishing, Exclusive Economic Zone (EEZ), MSY, MEY, Overfishing: Recruitment over fishing, aquaranching. | 4 | 2, 4 |
| | 4.3 | Acts for responsible fishing. Indian fisheries Act. 1976. Coast Guard Act 1978. Maritime zones of India- Maritime zones of India Act.1981. | 4 | 2, 4 |
| | 4.4 | Visit to fishing harbour prior to and post trawl ban period. | 7 | 4 |
| 5 | Teacher specific content | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions**<br>**Lecture**<br>**Interactive instructions**<br>**Group assignments**<br>**Group discussion**<br>**Practicals** |

**Assessment Types**

**MODE OF ASSESSMENT**

**Continuous Comprehensive Assessment (CCA)**
**Theory**

| **Total Mark: 25** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**Practical**

| **Total Mark: 15** | |
|---|---|
| **Assessment methods** | |
| Involvement | 5 |
| Punctuality | 5 |
| Record/PPT | 5 |

**B. End Semester Evaluation (ESE)**
**Theory**

| **Total mark: 50** | | |
|---|---|---|
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 1.5 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 15 out of 17 |

| | | |
|---|---|---|
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |



**REFERENCES**


- Bhatta, D., Manna, R. K., Meetei, W. A., Solanki, J. K., & Sah, R. K. (2016). Traditional fishing crafts and gears of Ukai reservoir, Gujarat, India. *International Journal of Fisheries and Aquatic Studies*, *4*(4), 142-145.
- Eyo, J. E., & Akpati, C. I. (1995). Fishing gears and fishing methods. *Proceeding of the UNDP assisted Agriculture and rural development programme (Ministry of Agriculture Awka, Anambra State). Training course on Artisanal Fisheries development, held at University of Nigeria Nsukka*, *143*, 167.
- Maunder, M. N. (2002). The relationship between fishing methods, fisheries management and the estimation of maximum sustainable yield. *Fish and Fisheries*, *3*(4), 251-260.

- McManus, J. W., Reyes Jr, R. B., & Nanola Jr, C. L. (1997). Effects of some destructive fishing methods on coral cover and potential rates of recovery. *Environmental management*, *21*(1), 69-78.
- Montgomerie, M. (2022). Basic fishing methods: a comprehensive guide to commercial fishing methods.


**SUGGESTED READINGS**


- BISWAS,KP - Harvesting aquatic resources.
- VONBRANDI,ANDRES - Fish catching methods of the world .
- BOOPENDRANATH,M R& SHAHUL HAMEED.,M - Modern fishing gear technology.
- ANIL JAMWAL et.al - Principles of remote sensing
- SREEKRISHNA,Y& LATHA SHENOY - Fishing gear and craft technology.
- GEORGE, V C ED.-Proceedings of the national workshop on low energy fishing.
- BALACHANDRAN ,KK - Advances and priorities in fisheries technology
- BISWAS ,K P - Advances in fishing technology.




| | |
|---|---|
| | **Department of Fisheries and Aquaculture**<br>**St. Albert's College (Autonomous) Ernakulam** |

| | |
|---|---|
| **Faculty/ Discipline** | **Aquaculture** |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** |
| **Course Name** | **Traditional Capture and Culture Fishery in Kerala** |

| | | | | | |
|---|---|---|---|---|---|
| **Type of Course** | **MDC** | | | | |
| **Course Code** | **25SACVCQ3MD201** | | | | |
| **Course Level** | **200-299** | | | | |
| **Course Summary** | Kerala, known for its rich aquatic resources and long coastline, has a significant fishing industry that contributes to the state's economy and food security. This course explores the traditional capture and culture fishery practices in Kerala, highlighting the state's unique fishing methods, fish species, and the role of fisheries in the local communities. By studying traditional capture and culture fishery practices in Kerala, students can gain a deeper understanding of the state's aquatic resources, the importance of sustainable fishing practices, and the potential for growth and development in the fisheries sector. | | | | |
| **Semester** | 5 | **Credits** | | 3 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 0 | 0 | 45 |
| **Pre-requisites, if any** | Basic knowledge in science | | | | |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Understand the traditional capture fisheries of Kerala, including major fishing crafts and indigenous gears, and their role in sustaining livelihoods and conserving fishery resources | U | PO3, PO6, PO9, PO10 |
| 2 | Understand the traditional aquaculture practices of Kerala, including integrated and species-specific | U | PO1, PO3, |

| | | | |
|---|---|---|---|
| | systems such as pokkali farming, prawn filtration fields, pen and cage culture, indigenous mollusc farming, and traditional crab fattening and evaluate their ecological, economic and cultural significance. | | PO6, PO9 |
| 3 | Analyze the major legislation and government schemes related to traditional aquaculture and capture fisheries in Kerala, and evaluate their role in conserving resources, improving livelihoods and promoting sustainable fishery practices | An | PO1, PO3, PO6, PO7, PO 9 |
| 4 | Analyze the traditional culture and capture practices of Kerala, and evaluate the relevant legislation, policies and government schemes aimed at conserving fishery resources, improving traditional systems and enhancing the socio-economic status of fishing communities. | An | PO1, PO3, PO6, PO7, PO9 |
| 5 | **TEACHER SPECIFIC CONTENT** | | |

**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | **0** | **0** | **2** | **0** | **0** | **3** | **0** | **0** | **3** | **2** |
| **CO 2** | **2** | **0** | **1** | **0** | **0** | **2** | **0** | **0** | **3** | **0** |
| **CO 3** | **2** | **0** | **2** | **0** | **0** | **2** | **1** | **0** | **3** | **0** |
| **CO 4** | **2** | **0** | **2** | **0** | **0** | **2** | **3** | **0** | **3** | **0** |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **HISTORICAL BACKGROUND OF FISHING AND AQUACULTURE PRACTICES IN KERALA** | | **11Hrs** | |
| | 1.1 | Significance of traditional culture and capture practices in rural livelihoods and culture.Significance of traditional practices in rural livelihoods and culture. Major water bodies: rivers, backwaters, estuaries, and coastal waters | 3 | 1, 2, 4 |
| | 1.2 | Traditional fishing crafts of Kerala. catamarans, vallams, canoes. traitional fishing gears: -Chinese dip nets (cheenavala); Stake nets (katcha vala);Gill nets (olivalai);Cast nets (veesu vala); Hook and line;Traps and barriers | 3 | 1 |
| | 1.3 | Traditional festivals related to fishing in Kerala. Village-level fish harvest feasts (Pond culture / Paddy-cum-fish culture); Vallam Kali (Boat races) – Symbolic of fish harvest culture; Ashtamudi Clam / Fish Harvest Celebrations (Kollam | 3 | 1 |

| | | | | |
|---|---|---|---|---|
| | | region); Mussel Harvest Festivals (Malabar coast). | | |
| | 1.4 | Illegal fishing methods in Kerala: trap fishing, dynamite fishing, ghost fishing, use of explosives, and electrifying methods of fish capture. | 2 | 1 |
| 2 | **TRADITIONAL CULTURE PRACTICES IN KERALA** | | **12Hrs** | |
| | 2.1 | Traditional Seed Collection for fish culture. Wild seed collection methods (finfish, shrimp, mussels, clams); Seasonal and regional variations in seed availability; Collection of natural seed from estuaries like Ashtamudi, Vembanad, and Periyar. | 3 | 2 |
| | 2.2 | Pokkali culture: integrated rice–fish farming in brackish waters. | 3 | 1, 2 |
| | 2.3 | Prawn filtration fields in Kerala. | 3 | 1,2 |
| | 2.4 | Traditional crab fattening in Kerala | 3 | 2 |
| 3 | **FUTURE PROSPECTS** | | **12Hrs** | |
| | 3.1 | Various schemes of fisheries and aquaculture. | 3 | 3, 4 |

| | | | | |
|---|---|---|---|---|
| | 3.2 | Various programs to uplift the socio economic status of fisher community | 3 | 3, 4 |
| | 3.3 | Introduction to training programs in fisheries and aquaculture. | 3 | 3, 4 |
| | 3.4 | Traditional fish and fishery products in Kerala | 3 | 3, 4 |
| 4 | **VISIT TO FISH FARMS AND LANDING CENTRES** | | **10Hrs** | |
| | 4.1 | Visit to traditional prawn filtration farms | 2 | 3, 4 |
| | 4.2 | Visit to aquaculture farm facility of college | 2 | 3, 4 |
| | 4.3 | Identification of traditional fishing craft and gears. | 3 | 3, 4 |
| | 4.4 | Interaction with traditional fish farmers and fishermen. | 2 | 3, 4 |
| 5 | Teacher specific content | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions.**<br>**Lecture**<br>**E-learning**<br>**Interactive instructions**<br>**Group assignments.** |

| | |
|---|---|
| | **MODE OF ASSESSMENT** |
| **Assessment Types** | **Continuous Comprehensive Assessment (CCA)**<br><br>**Theory : 25 marks**<br>Internal tests<br>Assignments<br>Quiz<br>In class discussion and involvement. |
| | **E. End Semester Evaluation (ESE)**<br><br>**Theory : 50 marks**<br>**Duration of Examination : 1:30 hrs**<br>**Pattern of examination for Theory :MCQ/Non-MCQ}** |

## REFERENCES


- Antony, P., & Shyam, S. S. (2019). Indigenous Technical Knowledge (ITK) in Capture Fisheries: A Case Study in Vypeen Island of Ernakulam District.
- Ashok, A., Sreejith, S., Benjamin, D., Bindu, J., & Gopal, N. (2021). Ethnic Foods and Food based Traditional Knowledge of Fishing community in Kerala, India.
- Prabhu, K. K., Remesan, M. P., & Edwin, L. (2016). Traditional wisdom of fishing techniques and rituals of Kuruman tribe of Wayanad, Western Ghats. *Asian Agri-History*, *20*(2), 119-126.
- Shyam, S. S., & Antony, P. (2013). Indigenous Technical Knowledge (ITK) in capture fisheries: A case study in Vypeen island of Ernakulam district. *Discovery Nature*, *4*(11), 7-10.


## SUGGESTED READINGS

- Manual on the Production and Use of Live Food for Aquaculture:
- Textbook On Fish Food Organisms

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam

| | | | | | |
|---|---|---|---|---|---|
| **culty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **On-the-Job Training** | | | | |
| **Type of Course** | **OJT** | | | | |
| **Course Code** | **25SACVCQ3OJ201** | | | | |
| **Course Level** | **200-299** | | | | |
| **Course Summary** | On-the-Job Training (OJT) is designed to equip students with practical skills, workplace discipline, and industry exposure by actively engaging them in real-world professional environments. Conducted in collaboration with firms, industries, research institutions, or higher education establishments, OJT enables students to understand industry standards, apply academic knowledge, and perform job-specific tasks using contemporary tools and practices. The training must be undertaken in the student's own skill domain, aligned with the major area of study in their undergraduate program, to ensure relevance and coherence with their academic and career goals. The program also fosters essential workplace competencies such as communication, responsibility, adaptability, and teamwork. Furthermore, it offers students a platform for career exploration and networking, helping them evaluate potential career paths and align their aspirations with industry demands. | | | | |
| **Semester** | **3** | **Duration** | **5 hours/week** | **Credits** | **2** |

## COURSE OUTCOMES (CO)

| CO No: | Expected Course Outcome | Learning Domains | PO No: |
|---|---|---|---|
| | Upon the successful completion of the course, the student will be able to | | |
| 1 | Demonstrate understanding of industry operations, standards, and professional expectations through direct exposure to workplace environments. | Ap | PO1,PO3,PO6,PO10 |
| 2 | Apply job-specific skills effectively in real-world tasks and responsibilities within the assigned industry setting. | S | PO2,PO4,PO5,PO10 |
| 3 | Integrate academic knowledge with practical applications to solve work-related challenges and contribute to organizational goals. | An | PO1,PO2,PO3,PO6 |
| 4 | Exhibit essential workplace competencies such as punctuality, accountability, communication, teamwork, and adaptability. | S | PO4,PO5,PO8,PO9 |
| 5 | Identify and evaluate potential career opportunities by reflecting on their internship experiences and professional interactions. | E | PO1,PO9,PO10 |

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

| | | | |
|---|---|---|---|
| **Assessment Types** | **MODE OF ASSESSMENT** | | |
| | **A** | **Internal Evaluation** | |
| | | **Components** | **Marks** |
| | | Feedback from the hosting organization | 5 |
| | | Internal Supervisor feedback | 10 |
| | | **Total** | **15** |
| | **B** | **External Evaluation** | |
| | | **Components** | **Marks** |
| | | Presentation | 10 |
| | | Report | 10 |
| | | Viva Voce | 15 |
| | | **Total** | **35** |

# SEMESTER – IV

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ 4ST201 | Aquaculture Development, Planning and Management | SDC | 4 | 4 | 4 | 0 | 0 |
| 25SACVCQ 4SP201 | Seed Production and Hatchery Technology | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 4SP202 | Aquaculture Nutrition | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 4SE201 | Research Methodology | SEC | 3 | 3 | 3 | 0 | 0 |
| 25SACVCQ 4VA201 | Corporate Readiness | VAC | 3 | 3 | 3 | 0 | 0 |
| 25SACVCQ 4IN201 | Internship | INT | 2 | 20 days on Sem Break | | | |

L — Lecture, P — Practical/Practicum , O — On the Job Training

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

<table>
<tr><td>Faculty/ Discipline</td><td colspan="4">Aquaculture</td></tr>
<tr><td>Programme</td><td colspan="4">B.Voc (Honours) Commercial Aquaculture</td></tr>
<tr><td>Course Name</td><td colspan="4">Aquaculture Development Planning and Management</td></tr>
<tr><td>Type of Course</td><td colspan="4">SDC</td></tr>
<tr><td>Course Code</td><td colspan="4">25SACVCQ4ST201</td></tr>
<tr><td>Course Level</td><td colspan="4">200-299</td></tr>
<tr><td>Course Summary</td><td colspan="4">This course introduces students to the fundamentals of aquaculture development, planning, and management. It covers key aspects of project planning, institutional frameworks, and the role of government and rural development schemes in aquaculture. Students will also gain a basic understanding of participatory approaches, sustainability principles, and evaluation tools such as PERT, CPM, and cost-benefit analysis. The course is designed to build foundational knowledge in planning and implementing small-scale aquaculture programs, especially in community and rural contexts.</td></tr>
<tr><td>Semester</td><td>4</td><td colspan="2">Credits</td><td>4</td><td rowspan="2">Total Hours</td></tr>
<tr><td>Course Design</td><td>Learning Approach</td><td>Lecture</td><td>Practical</td><td>OJT</td></tr>
<tr><td></td><td></td><td>4</td><td>0</td><td>0</td><td>60</td></tr>
<tr><td>Pre-requisites, if any</td><td colspan="5">Interest in aquaculture and readiness to learn basic planning concepts</td></tr>
</table>

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Explain the fundamentals of aquaculture development, key aspects of planning, and the types and approaches to planning. | U | PO1,PO2 ,PO3,PO 7 |
| 2 | Identify major fisheries institutions and development schemes, and explain their role in rural aquaculture development. | K | PO1,PO2 ,PO3,PO 6,PO7 |
| 3 | Apply basic project planning and evaluation tools used in aquaculture project management. | A | PO1,PO2 ,PO4,PO 5,PO9 |
| 4 | Describe participatory approaches and the role of community involvement in aquaculture planning. | U | PO2,PO6 ,PO7,PO 8 |
| 5 | Appreciate the importance of sustainability and livelihood frameworks in fisheries planning. | Ap | PO6,PO7 ,PO8,PO 10 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 3 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| CO 2 | 3 | 3 | 2 | 0 | 0 | 2 | 2 | 0 | 0 | 0 |
| CO 3 | 3 | 3 | 0 | 2 | 2 | 0 | 0 | 0 | 2 | 0 |
| CO 4 | 0 | 2 | 0 | 0 | 0 | 2 | 2 | 2 | 0 | 0 |
| CO 5 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 2 | 0 | 2 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Introduction to Aquaculture Development and Planning (15 hours)** | | | |
| | 1.1 | Overview of aquaculture development-Introduction to planning and management in aquaculture | 5 | 1 |
| | 1.2 | Key aspects of program development- Importance, basic principles, and steps involved | 5 | 1 |
| | 1.3 | Types of planning: strategic and operational planning; top-down vs. bottom-up approaches (basic idea) | 5 | 1 |
| 2 | **Fisheries Institutions and Rural Development Programmes (15 hours)** | | | |
| | 2.1 | Key fisheries and aquaculture institutions – National and international organizations (FAO, NACA, MPEDA, CMFRI, CIFT, | 5 | 2 |

| | | | | |
|---|---|---|---|---|
| | | CIFA, CIFNET, KUFOS, Matsyafed, etc.) and their basic roles | | |
| | 2.2 | Institutional support in aquaculture development – Role of Panchayati Raj Institutions, State Fisheries Departments, and funding agencies (e.g., NABARD) | 5 | 2 |
| | 2.3 | Development schemes and rural integration – FFDA, BFDA, NREGA, and socio-economic impacts of aquaculture | 5 | 2 |
| | **Project Planning and Evaluation Techniques (15 hours)** | | | |
| | 3.1 | Aquaculture project planning- Basics of project preparation, appraisal and shadow pricing | 5 | 3 |
| | 3.2 | Project evaluation and scheduling tools –PERT and CPM, slack chart, bar chart, milestone chart and cost-benefit analysis (basic concepts) | 5 | 3 |
| | 3.3 | Project planning frameworks-Logical | 5 | 3 |

| | | | | |
|---|---|---|---|---|
| | | Framework Approach (LFA) and stakeholder analysis | | |
| 4 | **Participatory Approaches and Sustainable Fisheries Planning (15 hours)** | | | |
| | 4.1 | Participatory Monitoring and Evaluation – Introduction to PROME (basic idea and purpose in aquaculture) | 5 | 4 |
| | 4.2 | Community participation in aquaculture- Role of local communities in planning and implementation; fisheries for development | 5 | 4 |
| | 4.3 | Sustainable fisheries planning- Basic concepts of sustainable management and use of livelihood frameworks | 5 | 4, 5 |
| | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br><br>Lectures, Presentations, Group Discussions |

**Assessment Types**

**MODE OF ASSESSMENT**

**Continuous Comprehensive Assessment (CCA)**

**Theory**

| **Total Mark: 30** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 10 |
| Test | 10 |

**F. End Semester Evaluation (ESE) Theory**

| **Total mark: 70** | | |
|---|---|---|
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 2 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 25 out of 27 |
| Part B | 5 mark | Answer any 5 out of 7 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.



## REFERENCES

1. Pillay, T. V. R. (1991). *Planning of aquaculture development: An introductory guide*. Wiley/Fishing News Books in association with FAO.

2. Jhingran, V. G. (2002). *Fish and fisheries of India* (3rd rev. & enl. ed.). Hindustan Publishing Corporation.
3. Food and Agriculture Organization. (2000). *Guidelines for planning and management for sustainable aquaculture* (FAO Fisheries Technical Paper No. 542). FAO.
4. Santhosh, B., & Singh, S. N. P. (2007). *Manual of aquaculture economics and farm management*. ICAR Research Complex for NEH Region.
5. Boyd, C. E. (2005). *Aquaculture: Resource use and farm management*. Springer.

## SUGGESTED READINGS

6. FAO. (2016). *Aquaculture Planning Tools* — Free PDF covering methods like LFA, PERT/CPM, cost-benefit, and shadow pricing

7. Boyd, C.E. (2006). *Aquaculture: Resource Use and Farm Management* (Excerpt) — Covers resource planning and farm economics
8. Edwards, P. (2015). *Small-Scale Aquaculture Planning* — Discusses community participation, bottom-up approaches, and livelihood linkage.
9. Rahman, M.J. et al. (2019). "Socio-economic Impact of Aquaculture Schemes in India" — *Indian Journal of Fisheries*
10. FAO (2020). *Fisheries Institutions & Governance in India* — Overview of FAO/NACA initiatives and national fishery bodies

11. https://www.fao.org/aquaculture – FAO's comprehensive portal on global aquaculture guidance
12. https://www.naca.int – Network of Aquaculture Centres in Asia–Pacific (NACA)
13. https://www.mpeda.gov.in – India's Marine Products Export Development Authority
14. https://millets.icar.gov.in – ICAR Fisheries Portal (Central Institutes & Schemes)
15. https://nabard.org – Details on financing mechanisms for rural aquaculture development

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Seed Production and Hatchery Technology** | | | | |
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ4SP201** | | | | |
| **Course Level** | **200-299** | | | | |
| **Course Summary** | This course provides an insight into the process of fish seed production under controlled conditions. It covers key aspects such as broodstock management, induced breeding techniques, nursery rearing, and live feed culture. The course also introduces the essential infrastructure required for a hatchery, including different types of tanks for rearing fish and larvae, incubators, specialized equipment, and the role of trained manpower in successful hatchery operations. | | | | |
| **Semester** | 4 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Bsic knowledge of aquaculture, culturable species and hatchery | | | | |



## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | Explain the principles and techniques of hatchery operations for finfish and shellfish seed production. | U | PO1, PO2,PO10 |
| 2 | Describe the processes of induced breeding, spawning, and larval rearing in carps, catfish, tilapia, and other cultivable finfish species. | U | PO1,PO10 |
| 3 | Discuss the functioning and management of larval and post-larval production systems in commercial shellfish hatcheries. | U | PO2,PO6 ,PO10 |
| 4 | Design hatchery layouts considering species requirements, production targets, and biosecurity measures. | [illegible] | PO2, POPO7, 10 |
| 5 | Develop plans for cost-effective hatchery management, including record-keeping, disease management, and quality seed certification. | S | PO2, PO6,PO7 ,PO10 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| **CO 2** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| **CO 3** | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 |
| **CO 4** | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| **CO 5** | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 |
| | | | | | | | | | | |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Hatchery Technology and seed production** | | **16 hrs** | |
| | 1.1 | Fish seeds-different types of fish seeds- yolksac larvae, prolarvae, eggs, fry, fingerlings. Embryonic | 3 | 1, 5 |

| | | | | |
|---|---|---|---|---|
| | | development in fishes, seed counting, Seed collection methods, Transportation of fish seed. use of anaesthetics, Quality assessment of seeds. Current trends in seed production. | | |
| | 1.2 | Broodstock- Selection criteria for broodstock and brood stock management, sex determination, broodstock transportation. | 2 | 1 |
| | 1.3 | Methods of breeding- Induced breeding- Hypophysation, stripping, Eyestalk ablation, synthetic hormone analogues | 3 | 1, 2 |
| | 1.4 | Breeding in hatching hapa, structure of hatching hapa, Bundh breeding techniques- dry bundh, wet bundh modern bundh | 3 | 1 |
| | 1.5 | Practical- Demonstrate induced breeding (Hypophysation or stripping); Identification of Indian larval stages. | 5 | 1, 2 |
| 2 | **Seed production of finfishes** | | **22 hours** | |
| | 2.1 | Seed production and nursery rearing of Indian major carps, Production of common carp seeds - Methods followed in China and India | 3 | 1, 2, 5 |
| | 2.2 | Seed production and nursery rearing of coldwater fishes (Rainbow trout); air breathing fishes *(*Anabas, *Clarias batrachus, channa)* | 3 | 1, 2 |
| | 2.3 | Brackishwater fishes *(Mugil cephalus,* Tilapia*, Lates calcarifer)* | 3 | 1, 2 |

| | | | | |
|---|---|---|---|---|
| | 2.4 | Marine fishes *(*Cobia, Grouper, silver pompano*)*. | 3 | 1, 2 |
| | 2.5 | Practical- Visit any freshwater, brackishwater or marine hatchery | 10 | 1, 2 |
| 3 | **Seed production of shellfishes** | | **19 hours** | |
| | 3.1 | Site selection and facilities required for a shellfish hatchery. Reproductive hormones in crustaceans and molluscs. | 2 | 1, 2 |
| | 3.2 | Seed resources of various shellfishes. Current status of seed production of shellfishes. Site selection of seed resources, Collection methods and identification of different shellfish seed. | 3 | 3 |
| | 3.3 | Seed production and hatchery management of Crustaceans - *Penaeus monodon, Macrobrachium rosenbergii, Scylla serrata* and *Panulirus homarus.* | 3 | 1, 2, 3 |
| | 3.4 | Seed production and hatchery management of molluscs - pearl oysters and clams. | 3 | 1, 2, 3 |
| | 3.5 | Practical- Identification of brood stock of important crustaceans; Identification of larval stages of crustaceans; Demonstration of eyestalk ablation in *Penaeus monodon*. | 8 | 1,2,3 |
| 4 | **Design and management of hatcheries** | | **18 hours** | |
| | 4.1 | Hatchery design and management: Criteria for site selection of hatchery and nursery. Different parts of a hatchery, larval rearing | 3 | 1, 4 |

| | | | | |
|---|---|---|---|---|
| | | unit, broodstock unit, Live feed culture unit. | | |
| | 4.2 | Design and function of incubators, Jar hatchery, Chinese hatchery and other hatchery systems- design and operation, hatchery protocols, larval rearing stages, rearing technology. | 3 | 1,4 |
| | 4.3 | Water quality monitoring and management. Quarantine and disease management in hatcheries. Quality assessment of seeds. | 2 | 1,4,5 |
| | 4.4 | Equipments and infrastructure facilities - Mechanical and biological filters, Incubators, types of aerators. Ancillary facilities in a hatchery- electricity, pump, laboratory etc Hatchery protocols, Economics of seed production. | 3 | 1,4, 5 |
| | 4.5 | Practical- Estimation of water quality in a hatchery; Demonstrate packaging of fish seed and broodfishes. | 7 | 1,4,5 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>Lectures, Demonstration, Animations, Presentations, Discussions. |
| **Assessment Types** | **MODE OF ASSESSMENT** |
| | **Continuous Comprehensive Assessment (CCA)**<br>**Theory** |

| | |
|---|---|
| **Total Mark: 25** | |
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**Practical**

| | |
|---|---|
| **Total Mark: 15** | |
| **Assessment methods** | |
| Involvement | 5 |
| Punctuality | 5 |
| Record/PPT | 5 |

**C. End Semester Evaluation (ESE)**

**Duration of Examination**

**Pattern of examination** for Theory**: Non-MCQ**

**marks**

| | | |
|---|---|---|
| **Total mark: 50** | | |
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 1.5 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 15 out of 17 |

| | | |
|---|---|---|
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**H. Practical: End Semester Evaluation (ESE)**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |



## REFERENCES


- Arvind Kumar. (2005). *A textbook of applied aquatic biology*. Daya Publishing House.
- FAO. (1992). *Manual of seed production of carps*. FAO Publications.
- FAO. (2007). *Manual for operating a small scale recirculation freshwater prawn hatchery*. FAO.
- ICAR. (2006). *Handbook of fisheries and aquaculture*. ICAR.
- Jhingran, V. G., & Pullin, R. S. V. (1985). *Hatchery manual for the common, Chinese and Indian major carps*. ICLARM.
- Mandro, B. I., Anil, M. K., & Asha, A. (2021). *Package of aquaculture practices*. Department of Fisheries, Government of Kerala.
- McVey, J. P. (1983). *Handbook of mariculture*. CRC Press.
- Thomas, P. C., Rath, S. C., & Mohapatra, K. D. (2003). *Breeding and seed production*

*of finfish and shellfish*. Daya Publishing House.

## SUGGESTED READINGS


- Sundaray, K. M., Muthu, R., & Abishag, A. R. (n.d.). *Broodstock management and fish seed production*. Taylor & Francis. https://www.taylorfrancis.com/books/mono/10.1201/9781003111689/broodstock-management-fish-seed-production-karal-marx-sundaray-rathipriya-muthu-abishag
- Thomas, P. C., Rath, S. C., & Mohapatra, K. D. (n.d.). *Breeding and seed production of fin fish and shell fish* [eBook]. Perlego. https://www.perlego.com/book/3099338/breeding-and-seed-production-of-fin-fish-and-shell-fish-pdf


| | |
|---|---|
| | **Department of Fisheries and Aquaculture**<br>**St. Albert's College (Autonomous)**<br>**Ernakulam** |

| | |
|---|---|
| **Faculty/ Discipline** | **Aquaculture** |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** |
| **Course Name** | **Aquaculture Nutrition** |
| **Type of Course** | **SDC** |
| **Course Code** | **25SACVCQ4SP202** |
| **Course Level** | **200-299** |
| **Course Summary** | The course, Aquaculture nutrition involves designing and delivering balanced diets to aquatic species, such as fish, crustaceans, and molluscs, to enhance growth, health, and productivity. This field combines knowledge of species-specific nutritional needs, feed formulation, and feeding management to promote efficient and sustainable aquaculture practices. |

| Semester | 4 | Credits | | 4 | Total Hours |
|---|---|---|---|---|---|
| Course Details | Learning Approach | Lecture | Practical | OJT | |
| | | 3 | 1 | 0 | 75 |
| Pre-requisites, if any | Basic knowledge in science | | | | |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | To recognize the nutritional needs of cultivable aquatic organisms. | K | PO1, PO2 |
| 2 | To classify the types of fish feed that can be provided to the aquatic organisms. | K | PO1 |
| 3 | To identify the various conventional and non conventional fish feed ingredients used in fish feed formulation. | K | PO1 |
| 4 | To implement the knowledge in principles of feed formulation in manufacturing process of fish feeds. | A | PO1, PO2 |

| | | | |
|---|---|---|---|
| 5 | To prepare formulated fish feeds and determine the efficiency of prepared feed. | C | PO1, PO2, PO10 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 5 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| | **NUTRITIONAL REQUIREMENTS OF FINFISHES AND SHELLFISHES** | | **18Hrs** | |
| 1 | 1.1 | Requirement of major and minor nutrients and its functions.essential and non essential aminoacids, Lipids-fatty acids, Carbohydrates, Vitamins and Minerals- water soluble and fat soluble vitamins- Non nutrient constituents of fish feed. | 3 | 1,2 |
| | 1.2 | Nutritional deficiency associated diseases and its | 4 | 1 |

| | | | | |
|---|---|---|---|---|
| | | effects.carbohydrate deficiencies, protein deficiencies, lipid deficiencies, vitamin and mineral deficiencies. | | |
| | 1.3 | Fish nutritional bioenergetics. definitions of : Gross energy, Intake energy, faecal energy, digestible energy, urinary energy, gill excretion energy, Metabolizable energy and retained energy. | 4 | 1 |
| | 1.4 | Estimation of average daily growth rate, food conversion ratio, food conversion efficiency. | 7 | 1,2,4 |
| | **TYPES OF FISH FEEDS** | | **17Hrs** | |
| | 2.1 | Different types of feeds- its advantages and disadvantages. Different size and grades of fish / shrimp feeds - starter, grower and finisher feeds. Larval feeds- Minced diets, Microparticulate diets, Spray dried diets, Microbound diets, Microcoated diets and Microencapsulated diets. | 3 | 2,3 |
| | 2.2 | Different forms of fish feed. Characteristics of pellets. Farm made feeds, factory made fish & shrimp feeds in India. | 4 | 1,2 |
| | 2.3 | Practical feeding in grow out fish farms. Feeding devices. | 4 | 1,2,4 |

| | | | | |
|---|---|---|---|---|
| | 2.4 | Preparation of formulated feeds using locally available feed ingredients and determination of its sinking rate and stability. | 6 | 1,2 |
| | **FISH FEED INGREDIENTS** | | **18Hrs** | |
| 3 | 3.1 | Conventional and non conventional feed ingredients.- animal origin and plant origin (groundnut oil cake, soybean meal, palm kernel meal, Brewers dried yeast, fish meal, poultry byproduct meal and wheat offal) **Nonconventional feed ingredients**- Anima source (tadpole, fly la , earthworm meal, toad meal, shrimp waste, crab meal, and animal wastes such as pig and poultry droppings and blood meal), plant source (leaf protein, leaf meal, aquatic macrophytes). SCP, silages. | 3 | 3.4 |
| | 3.2 | Feed additives as fish feed ingredient.Nutrient and non-nutrient feed additives. Nutrient feed additives- Synthetic Amino acids and Vitamins | 4 | 1,3 |
| | 3.3 | Antinutritional factors as feed ingredient. Protease inhibitors, phytase, saponins, tanins, lectins. | 4 | 1,3 |
| | 3.4 | Collection and analysis of different fish feeds. | 7 | 1,3 |

| | | | | |
|---|---|---|---|---|
| 4 | **FEED MANUFACTURING, FEED MANAGEMENT AND FEED QUALITY** | | **19Hrs** | |
| | 4.1 | Principles of feed formulation. (Pearson's Square and Linear programming). | 3 | 4, 5 |
| | 4.2 | Process of fish feed manufacturing. - Grinding, Mixing, Conditioning and Expansion, Pelleting, Cooling and drying, Crumbling and Screening Coating (Top-Dressing), Shipping and Storage. | 3 | 1, 4, 5 |
| | 4.3 | Equipments used in Feed mills .grinders, mixers, mincers, sieves, pellet extruders. | 3 | 4, 5 |
| | 4.4 | Feed quality analysis; Evaluation process in farms and labs. | 10 | 4, 5 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Discussion-based learning**<br>**Lecture**<br>**Interactive instructions**<br>**Group assignments**<br>**Group discussion**<br>**Practicals** |

<table>
<tr><td rowspan="3">Assessment Types</td><td>MODE OF ASSESSMENT</td></tr>
<tr><td>Continuous Comprehensive Assessment (CCA)<br><br>Theory : 25 marks<br>● Internal Test<br>● Assignment/ oral prsentation<br>● Quiz<br>● In class discussion and involvement<br><br>Practical : 15 marks<br>Internal test<br>Record<br>Lab involvement and punctuality</td></tr>
<tr><td>I. End Semester Evaluation (ESE)<br>Theory : 50 marks<br><br>Duration of Examination 1.50 Hrs<br>Pattern of examination for Theory : Non-MCQ
<table>
<tr><td>Part A</td><td>1 mark</td><td>Answer any 15 out of 17</td></tr>
<tr><td>Part B</td><td>5 marks</td><td>Answer any 3 out of 5</td></tr>
<tr><td>Part C</td><td>10 marks</td><td>Answer any 2 out of 4</td></tr>
</table>
Part A can be objective type, fill in the blanks, multiple choice etc.<br>Practical : 35 marks<br>Duration of Examination : 2hrs<br>Assesment methods<br>Theory or procedure understanding : 10 marks<br>Skill & performance/ Data collection : 10 marks<br>Calculation/ analysis and result : 10 marks<br>Viva : 5 marks</td></tr>
</table>

## REFERENCES


- Benitez, L. V. (1989). Amino acid and fatty acid profiles in aquaculture nutrition studies. In *Fish nutrition research in Asia. Proceedings of the third Asian fish nutrition network meeting. Asian fish. Society Special Publication* (Vol. 4, No. 166, pp. 23-35).
- Bu, X., Li, Y., Lai, W., Yao, C., Liu, Y., Wang, Z., ... & Ai, Q. (2024). Innovation and development of the aquaculture nutrition research and feed industry in China. *Reviews in Aquaculture*, *16*(2), 759-774.
- Merrifield, D. L., & Ringo, E. (Eds.). (2014). *Aquaculture nutrition: gut health, probiotics and prebiotics*. John Wiley & Sons.
- Turchini, G. M., Trushenski, J. T., & Glencross, B. D. (2019). Thoughts for the future of aquaculture nutrition: realigning perspectives to reflect contemporary issues related to judicious use of marine resources in aquafeeds. *North American Journal of Aquaculture*, *81*(1), 13-39.


## SUGGESTED READINGS


1. CMFRI.(1987). Proceedings of the Summer Institute in Recent Advances in Finfish and Shellfish nutrition.11-30, May 1987. CMFRI, Kochi.
2. Das.D. (2005). Biochemistry. (Edn.12). Academic Publishers. Calcutta.
3. DeSilva. Sena. S. and Anderson. T.A. (1995). Fish nutrition in Aquaculture. Chapman & Hall. London
4. Halver John.E. and Hardy.R.W. (Eds.). (2002). Fish Nutrition. Academic Press.
5. ICAR. 2006. Handbook of Fisheries and Aquaculture. ICAR.
6. Marine Products Export Development Authority. (1993). Fish Nutrition.Handbook on Aquafarming Series. MPEDA. Kochi.
7. Parsons TR, Maita Y &Lalli CM. 1984. A Manual of Chemical andBiological Methods for Seawater Analysis. Pergamon Press.
8. Rajagopalsamy CBT &Ramadhas V. 2002. Nutrient Dynamics inFreshwater Fish Culture System. Daya Publ.
9. Sharma LL, Sharma SK, Saini VP & Sharma BK. (Eds.). 2008.

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B. Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Research Methodology** | | | | |
| **Type of Course** | **SEC** | | | | |
| **Course Code** | **25SACVCQ4SE201** | | | | |
| **Course Level** | **200-299** | | | | |
| **Course Summary** | 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. | | | | |
| **Semester** | 4 | **Credits** | | 3 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 0 | 0 | 45 |
| **Pre-requisites, if any** | Basic knowledge in science. | | | | |



**COURSE OUTCOMES (CO)**

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Discuss the role and importance of research. | K | PO1,PO2 ,PO3 |
| 2 | Able to identify the complex issues inherent in selecting a research | U | PO1,PO2 ,PO3 |

| | | | |
|---|---|---|---|
| | problem, selecting an appropriate research design and to understand the steps needed for conducting a research study. | | |
| 3 | Acquire knowledge on methods of sample collection, data collection and different types of data. | U | PO1,PO2 ,PO3 |
| 4 | Analysis and interpretation of data, report writing and data presentation. | An | PO1,PO2 ,PO3 |

**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 3 | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 4 | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| | **Introduction to Research Methodology** | | **15** | |
| | 1.1 | Research methodology- meaning, objectives, characteristics, significance, criteria for good research. | 10 | 1 |
| | 1.2 | Different types of research - descriptive, analytical, applied, fundamental, quantitative, qualitative, empirical and conceptual. | 5 | 1 |
| 2 | **Research design and steps in research process** | | **15** | |
| | 2.1 | Research design- meaning,need. | 5 | 2 |
| | 2.2 | Sampling design-steps, criteria of selecting a | 5 | 2, 3 |

| | | | | |
|---|---|---|---|---|
| | | sampling procedure- sampling process. | | |
| | 2.3 | Research process, different steps in research process – Flow Chart. | 5 | 2 |
| | **Collection and interpretation of data** | | **15** | |
| 3 | 3.1 | Methods of data collection. Types of data- primary and secondary. Collection, meaning, sources, advantages and disadvantages of primary data and secondary data. | 5 | 3 |
| | 3.2 | Data Analysis: Interpretation-meaning, techniques of interpretation. | 5 | 4 |
| | 3.3 | 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 | 4 |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions.**<br>**Lecture**<br>**E-learning**<br>**Interactive instructions**<br>**Group assignments** |

**Assessment Types**

**MODE OF ASSESSMENT**

**A. Continuous Comprehensive Assessment (CCA)**
**Theory**

| **Total Mark: 25** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**B. End Semester Evaluation (ESE)**
**Theory**

| **Total mark: 50** | | |
|---|---|---|
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 1.5 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 10 out of 12 |
| Part B | 5 mark | Answer any 4 out of 6 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.



**REFERENCES**


- Krishnamoorthi, O. R. (n.d.). *Research methodology*. Mumbai: Himalaya Publishing House.
- Kumar, R. (n.d.). *Research methodology* (2nd ed.). Pearson Education.

- Shajahan, S. (n.d.). *Research methods for management*. Mumbai: Jaico Publishing House.
- Kothari, C. R. (n.d.). *Research methodology: Methods and techniques*. New Delhi: New Age International Publishers.
- Ahuja, R. (n.d.). *Research methods*. Jaipur: Rawat Publications.
- Sharma, K. R. (n.d.). *Research methodology*. New Delhi: National Publishing House.


**SUGGESTED READINGS**


- **Creswell, J. W., & Creswell, J. D. (2018).** *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). SAGE Publications.
- **Denzin, N. K., & Lincoln, Y. S. (Eds.). (2018).** *The SAGE Handbook of Qualitative Research* (5th ed.). SAGE Publications.




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

| | |
|---|---|
| **Faculty/ Discipline** | **Aquaculture** |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** |
| **Course Name** | **Corporate Readiness Program** |
| **Type of Course** | **VAC** |
| **Course Code** | **25SACVCQ4VA201** |
| **Course Level** | **200-299** |
| **Course Summary** | This course is designed to equip students with the skills, knowledge, and mindset required to excel in the corporate world. It focuses on developing essential competencies such as communication, teamwork, problem-solving, and adaptability, making students more employable and industry-ready. The program aims to bridge the gap between academic learning and corporate |

| | | | | | |
|---|---|---|---|---|---|
| | expectations, providing students with a competitive edge in the job market. Through a combination of theoretical foundations, practical exercises, and real-world applications, students will gain the confidence and expertise needed to succeed in their professional careers. | | | | |
| **Semester** | 4 | **Credits** | | 3 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 0 | 0 | 45 |
| **Pre-requisites, if any** | General education. | | | | |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Make use of SWOT test for self-analysis for career setting. | U | PO1, PO5 |
| 2 | Familiarize to the skills required in workplaces, communication and presentation skill. Identify the problems in workplace and finding it's solutions. | R | PO1, PO2, PO5 |

| | | | |
|---|---|---|---|
| 3 | Develop abilities for interview and Group discussion skills | C | PO4, PO5 |
| 4 | Develop unique abilities for planning and networking | C | PO1, PO3, PO5, PO6, PO9 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 2 | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| CO 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| CO 4 | 0 | 0 | 0 | 3 | 3 | 2 | 0 | 0 | 3 | 0 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **UNDERSTANDING SELF** | | **15Hrs** | |
| | 1.1 | Identify oneself: SWOT analysis. | 2 | 1 |
| | 1.2 | SWOT analysis for identifying the potential for setting career. Identifying strenghth, weakness, | 2 | 1 |

| | | | | |
|---|---|---|---|---|
| | | opportunities and threats of a student for building the career. | | |
| | 1.3 | Setting goals. Goal setting for setting a career. | 2 | 1 |
| | 1.4 | Career setting. Career researching, finding the best careers. | 3 | 1 |
| 2 | **CAREER AND WORK WORLD** | | **11Hrs** | |
| | 2.1 | Skills required in workplaces.writing skills (Business correspondence) Business communication and presentation skills. The Work World: How Do People really Get Jobs: Beliefs about how people get jobs, | 3 | 2 |
| | 2.2 | Job discrimination. Job discrimination in different jobs. What Are Different Jobs Like: Interviews in different job fields. | 3 | 2 |
| | 2.3 | Identifying and coping with the problems of job. Identifying the potential problems and developing solutions. | 3 | 2 |
| | 2.4 | Management and organisational skills. Time | 2 | 2 |

| | | | | |
|---|---|---|---|---|
| | | management, task management. | | |
| | **INTERVIEW AND GROUP DISCUSSION** | | **13Hrs** | |
| 3 | 3.1 | Importance of interviews and group discussions in job recruitments.need, advantages and disadvantages of interviews. | 3 | 3 |
| | 3.2 | Etiquettes : physical and digital. Etiquettes to be followed in society and social media platforms, rules to be followed while sending a mail. | 4 | 3 |
| | 3.3 | Building a resume, CV and biodata. Difference between resume, CV and biodata. | 3 | 3 |
| | 3.4 | Applying for a job. Writing an application letter, drafting a mail. | 3 | 3 |
| 4 | **PREPARATION FOR JOB RECRUITMENTS** | | **15Hrs** | |
| | 4.1 | Mould the students to acquire leadership skills. | 3 | 2,4 |
| | 4.2 | Networking for job. Sources if finding a job. | 3 | 2, 4 |
| | 4.3 | Mock interviews and group discussion. | 3 | 4 |

| | | | | |
|---|---|---|---|---|
| | 4.4 | Time management for better functioning in the workplace | 3 | 4 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | | |
|---|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions.**<br>**Lecture**<br>**E-learning**<br>**Interactive instructions**<br>**Group assignments** | |
| **Assessment Types** | **MODE OF ASSESSMENT** | |
| | **A. Continuous Comprehensive Assessment (CCA)**<br>**Theory** | |
| | **Total Mark: 25** | |
| | **Assessment methods** | |
| | Assignment | 10 |
| | Seminar/ Quiz/ Group Discussion | 5 |
| | Test | 10 |
| | **B. End Semester Evaluation (ESE)**<br>**Theory** | |
| | **Total mark: 50** | |
| | **Assessment methods: Written Exam** | |

| | | |
|---|---|---|
| | **Duration of Examination: 1.5 hrs** | |
| | **Pattern of Examination: Non-MCQ** | |
| Part A | 1 mark | Answer any 10 out of 12 |
| Part B | 5 mark | Answer any 4 out of 6 |
| Part C | 10 mark | Answer any 2 out of 4 |
| | Part A can be objective type, fill in the blanks, multiple choice etc. | |

## REFERENCES


- Alvarez Sainz, M., Ferrero, A. M., & Ugidos, A. (2019). Time management: skills to learn and put into practice. *Education+ Training*, *61*(5), 635-648.
- Trueman, M., & Hartley, J. (1996). A comparison between the time-management skills and academic performance of mature and traditional-entry university students. *Higher education*, *32*(2), 199-215.
- Cemaloğlu, N., & Filiz, S. (2010). The relation between time management skills and academic achievement of potential teachers. *Educational Research Quarterly*, *33*(4), 3-23.
- Hardavella, G., Gaga nat, A. A., Xhamalaj, D., & Saad, N. (2016). How to prepare for an interview. *Breathe*, *12*(3), e86.


## SUGGESTED READINGS

- "The 7 Habits of Highly Effective People" by Stephen R. Covey:
- "The Power of Habit" by Charles Duhigg
- How to Win Friends and Influence People" by Dale Carnegie: A timeless guide to effective communication and building relationships.
- "Thinking, Fast and Slow" by Daniel Kahneman: Delves into the two systems of thought that drive judgment and decision-making.
- "Rising Strong" by Brené Brown: Addresses resilience and vulnerability in leadership and personal growth.

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Summer Internship** | | | | |
| **Type of Course** | **INT** | | | | |
| **Course Code** | **25SACVCQ4IN201** | | | | |
| **Course Level** | **200-299** | | | | |
| **Course Summary** | The internship is designed to provide students with real-world exposure and hands-on experience in professional environments aligned with their skill domain and major area of study. It acts as a vital link between academic learning and industry application, allowing students to apply theoretical concepts to practical situations. Through active engagement in industry, research institutions, or academic labs, students gain insights into organizational operations, workplace practices, and professional expectations. The internship also supports the development of key professional competencies such as communication, teamwork, time management, and ethical responsibility. Additionally, it encourages critical thinking, reflection, and self-assessment, helping students identify personal strengths and explore potential career pathways. Students shall undergo the internship in a Firm, Industry, or Organization, or engage in Training in Labs with faculty and researchers, or other Higher Education or Research Institutions, ensuring alignment with their area of academic specialization. | | | | |
| **Semester** | **4** | **Duration** | **60 hours** | **Credits** | **2** |

## COURSE OUTCOMES (CO)

| CO No: | Expected Course Outcome | Learning Domains | PO No: |
|---|---|---|---|
| | Upon the successful completion of the course, the student will be able to | | |
| 1 | Demonstrate practical understanding of operational aspects in their domain by engaging in real-world industry settings. | Ap | PO1,PO3,PO6,PO10 |
| 2 | Apply academic knowledge and skills to identify and solve industry-relevant problems. | A | PO1,PO2,PO3,PO10 |
| 3 | Exhibit professional competencies including effective communication, teamwork, time management, and ethical responsibility. | | PO4,PO5,PO8,PO9 |
| 4 | Develop an understanding of workplace practices, expectations, and challenges. | U | PO1,PO6,PO10 |
| 5 | Reflect critically on their internship experience to identify personal strengths, growth areas, and career aspirations. | E | PO1,PO6,PO10 |
| ***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I), Appreciation (Ap)*** | | | |

| | | | |
|---|---|---|---|
| **Assessment Types** | **MODE OF ASSESSMENT** | | |
| | **A** | **Internal Evaluation** | |
| | | **Components** | **Marks** |
| | | Feedback from the hosting organization | 5 |
| | | Internal Supervisor feedback | 10 |
| | | **Total** | **15** |
| | **B** | **External Evaluation** | |
| | | **Components** | **Marks** |
| | | Presentation | 10 |
| | | Report | 10 |
| | | Viva Voce | 15 |
| | | **Total** | **35** |

# SEMESTER – V

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ 5ST301 | Sustainable Aquaculture | SDC | 4 | 4 | 4 | 0 | 0 |
| 25SACVCQ 5EP301 | Pathology in Aquaculture (E) | SDCE | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 5SP301 | Fish Preservation and Processing | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 5SP302 | Microbiology and Health Management of Fishes | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 5SE301 | Live Feed and Artificial Feed Preparation | SEC | 3 | 4 | 2 | 1 | 0 |
| 25SACVCQ 5VA301 | Aquaculture Marketing and Entrepreneurship | VAC | 3 | 3 | 3 | 0 | 0 |

L — Lecture, P — Practical/Practicum , O — On the Job Training

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam



| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Sustainable Aquaculture** | | | | |
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ5ST301** | | | | |
| **Course Level** | **300-399** | | | | |
| **Course Summary** | The course emphasizes the need and methods for sustainable aquaculture. Sustainable aquaculture is the aquaculture practice which focuses on environmental, economic, and social sustainability to improve capacity building and utilize land effectively for the aquaculture sector. Aquaculture encompasses a wide range of different aquatic farming practices with regard to species (including seaweeds, molluscs, crustaceans, fish and other aquatic species groups), environments and systems utilized, with very distinct resource use patterns involved, offering a wide range of options for diversification of avenues for enhanced food production and income generation in many rural and peri-urban areas. The student gains ideas on the 4 Pathways for sustainable aquaculture- Responsible production; Improving livelihoods; Healthy Consumption and an enabling environment. | | | | |
| **Semester** | V | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 4 | 0 | 0 | 60 |
| **Pre-requisites, if any** | Student should know basic aquaculture | | | | |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Developing skill to assess issues and thereby maintain sustainability of ecosystems through responsible production | S | PO1, PO 2, PO 3, PO 6, PO 7 |
| 2 | Utilize aquaculture practices which focuses on environmental, economic and social sustainability to improve capacity building and utilize land effectively for the aquaculture sector. | An | PO 2, PO 6, PO 7, PO 8, PO 10 |
| 3 | Formulate methods for enhancing the economic viability of aquaculture practices. | C | PO 2, PO 6, PO 7, PO 8, PO 10 |
| 4 | Evaluate the basic concepts about planning and aquaculture development | E | PO 2, PO 6, PO 7, PO 8, PO 10 |
| 5 | Acquire indepth knowledge and field exposure on sustainable aquaculture practices | A, S | PO 2, PO 6, PO 7, PO 8, PO 10 |

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

**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 2 | 1 | 3 | 2 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 0 | 3 | 0 | 0 | 0 | 1 | 3 | 1 | 0 | 1 |
| CO 3 | 0 | 3 | 0 | 0 | 0 | 1 | 3 | 1 | 0 | 1 |
| CO 4 | 0 | 3 | 0 | 0 | 0 | 2 | 3 | 1 | 0 | 1 |
| CO 5 | 0 | 3 | 0 | 0 | 0 | 2 | 3 | 1 | 0 | 1 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Present scenario and problems** | | 15 hours | |
| | 1.1 | Introduction to aquaculture. Trends in global and Indian aquaculture. Social conflicts between users of land and aquatic resources. | 3 | 1, 2 |
| | 1.2 | Destruction of aquatic ecosystems, habitat destruction. Use of harmful chemicals and veterinary drugs. Social and cultural effects on aquaculture workers and communities.. | 4 | 1 |
| | 1.3 | Advanced farming systems- Biofloc and its importance in aquaculture. Aquaponics- relevance and advantages, Integrated Multi-trophic Aquaculture (IMTA | 4 | 2 |
| | 1.4 | Constraints - environmental degradation and disease outbreaks - infectious and non-infectious disease | 4 | 2 |
| 2 | Technical aspects and dimension of sustainable aquaculture 15 hours | | | |
| | 2.1 | Carrying capacity; Factors influencing carrying capacity in water- water quality, fish species and size, feed, nutrients, | 3 | 3 |
| | 2.2 | Factors influencing growth rate- water quality, age and genetics, fish health, size, stocking density, production rate. Factors influencing yield rate and economics- survival, harvest frequency and restocking, economics | 4 | 3 |

| | | | | |
|---|---|---|---|---|
| | 2.3 | Site selection, construction of ponds and water reservoir-surveying tools and types of measurement, pond construction plan, building the pond, dams for fish pond construction | 4 | 3 |
| | 2.4 | Seed production, nutrition and feed-Management of seed production. | 4 | 3 |
| 3 | **Environmental and socio-economic issues** | | 15 hours | |
| | 3.1 | Exotic species introduction, Major exotic species in India, Impacts of exotic fish introduction. Guidelines for invasive species planning and management: Escapement-contamination of indigenous gene pool, disease transfer; | 4 | 4 |
| | 3.2 | Environmental impact-habitat destruction, water abstraction: over exploitation of wild stocks: | 3 | 4 |
| | 3.3 | Mangrove deforestation and its effects in aquaculture – global warming and climatic changes, desertification, loss of fish stock, flooding, coastal damage. Urbanisation and mining activities | 4 | 2 |
| | 3.4 | Salinization of soil and water. Conflicts over water and land use; conflicts of interest between aqua farmers and fishermen; resistance from local public; anti-dumping duties. | 4 | 3 |
| 4 | **Strategies for sustainability and economics** 15 hours | | | |

| | | | | |
|---|---|---|---|---|
| | 4.1 | Sustainability concept- food security; biosecurity; organic farming; integrated farming; responsible aquaculture; rotational aquaculture; bioremediation | 3 | 5 |
| | 4.2 | Selection of species, farm site, farm design and layout, feed management, restrictions to chemicals and veterinary drugs, propagation of native plant vegetation. Restrictions to overfishing, bycatch reduction, antibiotics, antifoulants and pesticides. | 5 | 5 |
| | 4.3 | Application of renewable energy in aquaculture - solar energy, wind, and tidal energy. Seed certification. | 3 | 2 |
| | 4.4 | Economic dimension of sustainable aquaculture-Factors affecting economics and production, record keeping, capital | 4 | 3 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions**<br>**Lecture**<br>**Interactive instructions**<br>**Group assignments**<br>**Group discussion** |
| **Assessment** | **MODE OF ASSESSMENT** |

<table>
<tr><td>ent Types</td><td>
A. Continuous Comprehensive Assessment (CCA)<br>Theory
<table>
<tr><td colspan="2">Total Mark: 30</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Assignment</td><td>10</td></tr>
<tr><td>Seminar/ Quiz/ Group Discussion</td><td>10</td></tr>
<tr><td>Test</td><td>10</td></tr>
</table>
</td></tr>
<tr><td></td><td>
B. End Semester Evaluation (ESE)<br>Theory
<table>
<tr><td colspan="3">Total mark: 70</td></tr>
<tr><td colspan="3">Assessment method: Written Exam</td></tr>
<tr><td colspan="3">Duration of Examination: 2 hrs</td></tr>
<tr><td colspan="3">Pattern of Examination: Non-MCQ</td></tr>
<tr><td>Part A</td><td>1 mark</td><td>Answer any 25 out of 27</td></tr>
<tr><td>Part B</td><td>5 mark</td><td>Answer any 5 out of 7</td></tr>
<tr><td>Part C</td><td>10 mark</td><td>Answer any 2 out of 4</td></tr>
</table>
Part A can be objective type, fill in the blanks, multiple choice etc.
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</table>



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



| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Pathology in Aquaculture** | | | | |
| **Type of Course** | **SDCE** | | | | |
| **Course Code** | **25SACVCQ5EP301** | | | | |
| **Course Level** | **300-399** | | | | |
| **Course Summary** | This course explores the causes, mechanisms, and consequences of disease in aquatic animals, including fish, shellfish, and other farmed species. Students will learn about the various pathogens that affect aquatic animals, including bacteria, viruses, parasites, and fungi, as well as the diagnostic techniques and management strategies used to prevent and control disease outbreaks in aquaculture.<br>By understanding the principles of pathology in aquaculture, students will gain the knowledge and skills necessary to identify and manage disease issues in aquatic animals, promoting healthy and sustainable aquaculture practices. | | | | |
| **Semester** | 5 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Basic knowledge on fish culture. | | | | |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Define fish pathology and explain its history, scope, and relevance to aquaculture and fisheries. | K | PO1 |
| 2 | List common bacterial, viral, fungal, and parasitic diseases that affect fish and shellfish and suggest basic measures to prevent and control infectious diseases, including good management practices, water quality maintenance, and biosecurity steps. | K | PO1, PO6 |
| 3 | Analyze the causes, signs, and effects of nutritional deficiencies, environmental stress-related conditions, and toxin-related disorders in aquatic organisms and apply suitable management practices to prevent and control non-infectious diseases in cultured fish and shellfish. | An | PO1, PO2, PO6 |
| 4 | Analyze the role of chemotherapeutics, probiotics, vaccines, and immunostimulants in effective fish health management and disease control strategies and application of molecular tools | An | PO9 |
| 5 | Evaluate the suitability and effectiveness of different diagnostic methods for specific disease conditions in aquaculture. | S | PO1, PO6, PO9 |

**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| CO 3 | 1 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| CO 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| CO 5 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Introduction to Fish Pathology** | | **18Hrs** | |
| | 1.1 | Importance and scope of pathology studies in aquaculture. Importance of fish health in aquaculture and wild populations. | 3 | 1 |
| | 1.2 | Various causes of diseases. infectious (bacterial, viral, fungal, parasitic) and non-infectious (nutritional, environmental, genetic). | 3 | 1,3,5 |
| | 1.3 | Signs of diseases and pathogenesis. Symptoms | 5 | 1,2 |

| | | | | |
|---|---|---|---|---|
| | | associated with different diseases. | | |
| | 1.4 | Observation and identification of common diseases in cultivable fishes. | 7 | 1,2,3,5 |
| | **Infectious Diseases** | | **20Hrs** | |
| 2 | 2.1 | Common bacterial diseases occurring in cultivable fin fishes . Etiology, clinical signs, diagnosis, prevention, and control of major bacterial infections: *Aeromonas* spp., *Vibrio* spp., *Edwardsiella*, *Streptococcus* spp. | 5 | 1, 2 |
| | 2.2 | Common fungal diseases occurring in cultivable fin fishes. Common fungal pathogens: *Saprolegnia*, *Branchiomyces,* Important ecto- and endoparasites: *Ichthyophthirius*, *Dactylogyrus*, *Gyrodactylus*, protozoan parasites, crustacean parasites. | 4 | 1, 2 |
| | 2.3 | Common viral diseases occurring in cultivable fin fishes. Major viral infections of finfish and shellfish, | 3 | 1, 2 |

| | | | | |
|---|---|---|---|---|
| | | Diagnosis, control strategies (vaccines, biosecurity), Examples: Infectious pancreatic necrosis (IPN), Viral nervous necrosis (VNN), White spot syndrome virus (WSSV). | | |
| | 2.4 | Identification and treatment of diseases in fishes. | 8 | 1, 2 , 5 |
| | **Non Infectious Diseases** | | **16 Hrs** | |
| 3 | 3.1 | Nutritional deficiency and environmental stress related diseases in fishes. ( Blocken back syndrome), Environmental and stress-related diseases (gas – bubble syndrome, ammonia, nitrite toxicity, hypoxia), | 4 | 3 |
| | 3.2 | Toxin related effects in fishes. (pesticide or heavy metal poisoning), | 3 | 3 |
| | 3.3 | Metabolic disorders and neoplastic disorders in fishes. proper management and husbandary practices to mitigate the diseases. | 3 | 3 |
| | 3.4 | visit to aquatic pathobiology lab to study the basic | 6 | 3, 5 |

| | | | | |
|---|---|---|---|---|
| | | techniques in aquatic pathobiology | | |
| | **Diagnostic and Control Measures** | | **21Hrs** | |
| 4 | 4.1 | Disease diagnostic measures in fishes.Sampling, necropsy, and gross pathology; Wet mount, smear, histopathology, microbiological culture; | 4 | 1, 3, 3 |
| | 4.2 | Introduction to molecular tools for disease diagnosis: ELISA, PCR | 4 | 4, 5 |
| | 4.3 | Study on biosecurity and quarantine measures to be followed in culture sites. Biosecurity and quarantine measures, Epidemiology and disease surveillance, Prophylaxis, hygiene, and therapy, Use of chemotherapeutics, probiotics, vaccines, immunostimulants. Development of SPF and SPF aquatic organisms. | 4 | 1, 4 |
| | 4.4 | wet mount preparation, histopathology, smear preparation, culture, Field visit to a fish pathology laboratory | 9 | 1, 4, 5 |

| 5. | **TEACHER SPECIFIC CONTENT** |
|---|---|

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions**<br>**Lecture**<br>**Interactive instructions**<br>**Group assignments**<br>**Group discussion**<br>**Practicals** |
| **Assessment Types** | **MODE OF ASSESSMENT** |
| | **A. Continuous Comprehensive Assessment (CCA)**<br>**Theory** |

| **Total Mark: 25** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**Practical**

| **Total Mark: 15** |
|---|
| **Assessment methods** |

| | |
|---|---|
| Involvement | 5 |
| Punctuality | 5 |
| Record/PPT | 5 |

**B. End Semester Evaluation (ESE)**
**Theory**

| | | |
|---|---|---|
| **Total mark: 50** | | |
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 1.5 hrs** | | |
| **Pattern of Examination: Non- MCQ** | | |
| Part A | 1 mark | Answer any 15 out of 17 |
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |

| | | | |
|---|---|---|---|
| | | Viva | 5 |

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- Noga, E.J. (2010). Fish Disease: Diagnosis and Treatment (2nd Edition) Wiley-Blackwell.
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- Handbook of Fish Biology and Fisheries: V. 2 by Paul J.B. Hart and John D. Reynolds (Ed.).

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

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Fish Preservation and Processing** | | | | |
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ5SP301** | | | | |
| **Course Level** | **300-399** | | | | |
| **Course Summary** | This course provides a comprehensive overview of traditional and modern seafood processing methods, with emphasis on hygienic handling, spoilage prevention, quality evaluation, and packaging techniques. Through a combination of theoretical instruction and hands-on practical sessions, students gain essential skills in assessing fish quality, understanding preservation technologies, and preparing seafood for domestic and export markets. The course is designed to build both conceptual understanding and technical competence in fish post-harvest technology. | | | | |
| **Semester** | 5 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Basic understanding of fish handling and interest in seafood preservation techniques. | | | | |



## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Understand the proximate composition of fish and the principles of spoilage and hygienic handling in seafood. | U | PO1,PO2,PO3 |
| 2 | Explain traditional fish preservation methods and identify quality changes in dried and salted fish products. | K | PO1,PO2,PO3,PO7 |
| 3 | Describe modern fish processing techniques including freezing, fermentation, and packaging for export. | U | PO1,PO2,PO3,PO9 |
| 4 | Apply freshness evaluation methods and interpret fish quality standards for domestic and international markets. | A | PO2,PO4,PO6,PO8,PO9 |
| 5 | Demonstrate hygienic handling, traditional processing, and quality packaging skills through observation and field practice | S | PO3,PO5,PO6,PO9,PO10 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 3 | 3 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| CO 3 | 3 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| CO 4 | 0 | 3 | 0 | 2 | 0 | 2 | 0 | 2 | 2 | 0 |
| CO 5 | 0 | 0 | 2 | 0 | 2 | 2 | 0 | 0 | 2 | 2 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

### Content for Classroom transaction (Units)

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Handling and Hygienic Practices in Seafood Processing ( 18 hours)** | | | |
| | 1.1 | Proximate composition of fish-Introduction to moisture ,protein ,fat, and ash content | 5 | 1, 2 |
| | 1.2 | **Fish spoilage and quality loss** – Basic understanding of how fish spoils, signs of spoilage, and common spoilage indicators | 5 | 1, 4 |
| | 1.3 | **Practical session -** Demonstration of hygienic fish handling, ice usage, and cleanliness practices at landing centres or harbours; observation of spoilage signs and safe water use | 8 | 1, 5 |
| 2 | **Traditional Fish Preservation Methods (20 hours)** | | | |
| | 2.1 | Traditional drying methods- Introduction to sun drying, tray drying, and solar drying | 6 | 2 |
| | 2.2 | Salting and quality changes in dried fish- Basic salting techniques and common spoilage signs in preserved fish | 5 | 2, 4 |

| | | | | |
|---|---|---|---|---|
| | 2.3 | **Practical session** – Demonstration of drying, salting, and smoking methods through field exposure at traditional dry fish yards or central fisheries institutions like CIFT; observation of sensory changes (colour, odour, texture) in preserved fish products | 9 | 2, 5 |
| 3 | **Modern Processing Techniques ( 20 hours)** | | | |
| | 3.1 | **Chilling and freezing methods** – Introduction to low-temperature preservation and common changes during cold storage | 6 | 3, 4 |
| | 3.2 | **Fermentation and thermal processing** – Basics of fish fermentation; boiling, steaming, and use of retort pouches | 5 | 3 |
| | 3.3 | **Practical session / Industrial visit** – Visit to a seafood processing unit, cold storage centre, or export-oriented facility to observe commercial operations such as canning, | 9 | 3, 5 |

| | | | | |
|---|---|---|---|---|
| | | vacuum packing, or freeze-drying | | |
| | **Packaging, Quality Evaluation, and Export Readiness ( 17 hours)** | | | |
| 4 | 4.1 | **Freshness evaluation methods** – Overview of organoleptic (sensory), chemical (e.g., TVB-N, TMA), microbial (e.g., Total Plate Count), and instrumental (e.g., Torrymeter) techniques to assess fish quality | 5 | 4 |
| | 4.2 | **Fish quality grading and standards** – Introduction to grading systems based on appearance, texture, and freshness; overview of **national standards** (FSSAI, EIC, MPEDA, BIS) and **international standards** (Codex, EU, USFDA, HACCP) for domestic and export markets | 8 | 4 |
| | 4.3 | **Practical session / Demonstration** – Observation of seafood packaging types and materials; introduction to certification systems, traceability procedures, and | 4 | 4, 5 |

| | | | | |
|---|---|---|---|---|
| | | export documentation in a **fish processing facility or seafood unit** | | |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>Lectures, demonstrations, animations, presentations, and discussions. |
| **Assessment Types** | **MODE OF ASSESSMENT**<br>**Continuous Comprehensive Assessment (CCA)**<br>**Theory** |

| **Total Mark: 25** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**Practical**

| **Total Mark: 15** | |
|---|---|
| **Assessment methods** | |
| Involvement | 5 |

| | |
|---|---|
| Punctuality | 5 |
| Record/PPT | 5 |

**End Semester Evaluation (ESE) Theory**

| | | |
|---|---|---|
| **Total mark: 50** | | |
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 1.5 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 15 out of 17 |
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |

| | | | |
|---|---|---|---|
| | Calculation/ Analysis and Result | 10 | |
| | Viva | 5 | |

## REFERENCES


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20. https://www.cift.res.in – Central Institute of Fisheries Technology – research and training resources.
21. https://www.ifst.org – Institute of Food Science & Technology – food safety and quality standards.
22. https://www.fssai.gov.in – Food Safety and Standards Authority of India – regulations for seafood processing and labeling.



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

| | |
|---|---|
| **Faculty/ Discipline** | **Aquaculture** |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** |
| **Course Name** | **Microbiology and Health Management** |
| **Type of Course** | **SDC** |
| **Course Code** | **25SACVCQ5SP302** |
| **Course Level** | **300-399** |

| | | | | | |
|---|---|---|---|---|---|
| **Course Summary** | This course provides students with comprehensive knowledge of microbiological principles and their applications in aquaculture health management. It covers the classification, structure, nutrition, and growth of microorganisms, with emphasis on aquatic environments. Students learn about culture techniques, sterilization methods, staining procedures, and microbial isolation from water and sediment. The health management component focuses on major diseases of finfish and shellfish, diagnostic procedures, epidemiology, disease monitoring, surveillance, quarantine measures, and import risk analysis. The aim is to equip students with the ability to apply microbiological knowledge to promote aquatic animal health, ensure biosecurity, and enhance sustainable aquaculture production. | | | | |
| **Semester** | 5 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Students should possess basic knowledge on microorganisms and aquaculture | | | | |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Explain the key concepts in microbiology by relating historical developments to modern applications, and apply creative thinking to reinterpret learned facts. | U | PO1 |
| 2 | Analyze the health significance, culture characteristics, and epidemiology of major bacteria found | An | PO2,PO6 |

| | | | |
|---|---|---|---|
| | in aquaculture ponds and seafood, their role in contamination, spoilage, and potential risks to food safety and aquaculture health. | | |
| 3 | analyze bacterial growth patterns under various conditions and suitability of different culture media and techniques for isolating specific groups of bacteria, fungi and parasites. | K | PO1,PO2 |
| 4 | Evaluate the effectiveness of implemented biosecurity strategies in safeguarding aquatic health and the environment. | AN | PO2, PO6 |
| 5 | Apply microbiological and diagnostic techniques to isolate, identify, and maintain bacteria from fish and aquatic environments and perform sterilization, media preparation, and Gram staining; and analyze clinical signs for the identification of common diseases in finfish and shellfish. | S | PO2,PO6 ,PO10 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO 2** | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO 3** | 2 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| **CO 4** | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| **CO 5** | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 |
| | | | | | | | | | | |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Introduction** | | **17 hours** | |
| | 1.1 | Introduction - History and development of microbiology – Contributions of Louis Pasteur, Koch and Winogradsky – Microscopy- types of microscopes | 3 | 1 |
| | 1.2 | Diversity of microbial community – General characteristics of bacteria, fungi, viruses, algae and protozoans. Microflora of aquatic environment. Autotrophic and heterotrophic microorganisms in aquatic environment. | 4 | 1, 2 |
| | 1.3 | Nutrient regeneration, role of microbes in biogeochemical cycles – Carbon, Nitrogen, Phosphorus and Sulphur cycles. Autochthonous and allochthonous microorganisms in aquatic environment. | 4 | 1,2 |

| | | | | |
|---|---|---|---|---|
| | 1.4 | Practical-identify microorganisms, identify microscopes. | 6 | 1,5 |
| 2 | **Bacteria in culture pond and seafood** | | **18 marks** | |
| | 2.1 | Health significant bacteria in culture pond. Culture characteristics and epidemiology of *E. coli*, pathogenic Vibrios, *Salmonella*, *Aeromonas hydrophila*, and *Pseudomonas*. | 4 | 2,5 |
| | 2.2 | Perishability of seafood - Microbial spoilage of fish and shellfish. Spoilage microflora. Intrinsic and extrinsic factors affecting spoilage. | 4 | 2, 5 |
| | 2.3 | Microflora associated with body parts. Food borne pathogens. Sources of contamination. | 3 | 2,5 |
| | 2.4 | Practical- Isolation and maintenance of bacteria from fishes and water, estimation of coliform from water. | 7 | 2, 5 |
| 3 | **Isolation and culture methods** | | **21 hours** | |
| | 3.1 | Types of media, types of sterilization - physical and chemical agents, staining techniques. Different culture | 4 | 3, 5 |

| | | | | |
|---|---|---|---|---|
| | | techniques. Isolation and Culture of Microbes | | |
| | 3.2 | Prokaryotic growth – characteristic features of bacterial growth curve – Effect of environmental factors on growth. | 4 | 3, 5 |
| | 3.3 | Nutrition and growth of bacteria – different types of media for isolation of bacteria and fungi. Isolation and cultivation of microorganisms from water and sediment. | 3 | 3, 5 |
| | 3.4 | Practical- Sterilization techniques, media preparation, gram staining, identification of equipments- autoclave, hot air oven. | 10 | 3, 5 |
| | **Health management** | | **19 hours** | |
| | 4.1 | Review of various diseases of finfish and shellfish significant to aquaculture; diagnostic procedures and their application in aquaculture. | 3 | 4, 5 |
| | 4.2 | Disease monitoring, surveillance, epidemiology, quarantine, certification and import risk analysis. Prophylaxis, hygiene and | 3 | 4, 5 |

| | | | | |
|---|---|---|---|---|
| | | therapy of fish and shellfish diseases. | | |
| | 4.3 | Commonly used drugs/chemicals in aquaculture, drug delivery. Vaccines and vaccination, probiotics and bioremedial measures; Advances in disease control and management; Principles of SPF/SPR. | 3 | 4,5 |
| | 4.4 | Parasitology - General characteristics of parasites symptoms, life cycle, diagnosis, prophylaxis, prevention and treatment of parasites. | 3 | 4 |
| | 4.5 | Practical-Identification of various finfish / shellfish diseases, identify the parasites. | 7 | 5 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>Lectures, Demonstration, Animations, Presentations, Discussions. |
| **Assessment Types** | **MODE OF ASSESSMENT**<br>**Continuous Comprehensive Assessment (CCA)**<br>**Theory**<br>**Total Mark: 25** |

| Assessment methods | |
|---|---|
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**Practical**

| Total Mark: 15 | |
|---|---|
| **Assessment methods** | |
| Involvement | 5 |
| Punctuality | 5 |
| Record/PRT | 5 |

**End Semester Evaluation (ESE)**

**Pattern of examination** for Theory**: Non-MCQ**

| Total mark: 50 |
|---|
| **Assessment methods: Written Exam** |
| **Duration of Examination: 1.5 hrs** |
| **Pattern of Examination: Non-MCQ** |

| | | |
|---|---|---|
| Part A | 1 mark | Answer any 15 out of 17 |
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**J. Practical: End Semester Evaluation (ESE)**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2 hr** | |
| **Assessment methods** | |
| Theory/ Proced[illegible]/Understanding | 10 |
| Skill a[illegible] Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |



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*control and eradication of aquatic animal diseases*. Blackwell, World Aquaculture Society.

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

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Live Feed and Artificial Feed Preparation** | | | | |
| **Type of Course** | **SEC** | | | | |
| **Course Code** | **25SACVCQ5SE301** | | | | |
| **Course Level** | **300-399** | | | | |
| **Course Summary** | This course explores the nutritional requirements of fish and the art of preparing feeds that promote optimal growth, health, and sustainability in aquaculture. Students will learn about the principles of fish nutrition, feed formulation, and manufacturing processes, as well as strategies for optimizing feed efficiency and minimizing environmental impacts.<br>By combining theoretical knowledge with practical skills, this course will equip students with the expertise to develop and implement effective feeding strategies in aquaculture, enhancing the productivity and sustainability of fish farming operations. | | | | |
| **Semester** | 5 | **Credits** | | 3 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 2 | 1 | 0 | 60 |

| | |
|---|---|
| **Pre-requisites, if any** | Basic knowledge and interest in hands on culture activties. |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Identify the nutritional needs of different fish species and life stages. | A | PO1 |
| 2 | Design and formulate nutritionally balanced feeds for various fish species. | C | PO1, PO9 |
| 3 | Apply knowledge of feed manufacturing processes to produce high-quality fish feeds. | A | PO9, PO10 |
| 4 | Implement environmentally friendly and sustainable feeding practices in aquaculture | C | PO6 |
| 5 | Identify live food organisms. | U | PO6 |



### CO PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| CO 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| CO 4 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 5** | **0** | **0** | **0** | **0** | **0** | **3** | **0** | **0** | **0** | **0** |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | | **NUTRITIONAL VALUE OF LIVE FEED AND ARTIFICIAL FEED** | **15** | |
| | 1.1 | Fish nutrition: Principles of fish nutrition and terminologies, nutritional requirement of cultivable finfish and shellfish: larvae, juveniles and adults. Feed Resources: Nutritional value of feed ingredients and live feed. | 4 | 1 |
| | 1.2 | Formulation of nutritionally balanced diet for various fish species. | 3 | 2 |
| | 1.3 | Contribution from natural food to nutrient requirements of fish. Methods of qualitative and quantitative requirements of nutrients for finfish and shellfish; Growth evaluation- FCR, SGR, Absolute and Relative | 3 | 1, 4 |

| | | | | |
|---|---|---|---|---|
| | | growth; Factors affecting nutritional requirements. | | |
| | 1.4 | Hands on preparation of artificial feed using readily available ingredients. | 5 | 1, 3 |
| 2 | **PREPARATION OF ARTIFICIAL FEED** | | **15Hrs** | |
| | 2.1 | Feed Formulation -various methods.General principles; Pearson's methods, and computerized least cost feed formulation method for aqua feed formulation. | 3 | 2,3 |
| | 2.2 | Equipments used in fish feed mill. Grinders, mincers, dryer, sieve, pellet extruders, coolers. | 4 | 2, 3 |
| | 2.3 | Feed manufacturing process. Grinding, mixing, extrusion, drying, coating. | 3 | 2 |
| | 2.4 | Visit to fish feed manufacturing industries. | 5 | 2 |
| | **PRODUCTION OF LIVE FOOD ORGANISMS** | | **15Hrs** | |
| 3 | 3.1 | Candidate species of phytoplankton and zoo-plankton as live food organisms. Phytoplanktons: chlorella, skeletonema, lab | 3 | 2, 4 |

| | | | | |
|---|---|---|---|---|
| | | lab, nanochloropsis, isochrysis.<br>Zooplanktons: artemia, moina, copepod, rotifer, infusoria, bloodworms | | |
| | 3.2 | Culture of live food organisms. as live food organisms. Requirements and set up for the culture of Phytoplanktons: chlorella, skeletonema, lab lab, nanochloropsis, isochrysis.<br>Zooplanktons: artemia, moina, copepod, rotifer, infusoria | 4 | 2, 4, 5 |
| | 3.3 | Importance of live feed: nutritional benefits, improved survival rates, enhanced growth rate. | 3 | 1, 3 |
| | 3.4 | Hands on culture of candidate species of live food organisms. | 5 | 1, 3, 4 |
| 4 | **IDENTIFICATION OF LIVE FOOD ORGANISMS** | | **15Hrs** | |
| | 4.1 | Identification and sampling of live food organisms. Identifying features of live food organisms, sampling methods of livefood | 3 | 4 |

| | | | | |
|---|---|---|---|---|
| | | organisms: plankton nets, water samplers, microscopy | | |
| | 4.2 | Introducing live food organisms to fishes. Advantages of live food to fishes. Feeding frequency, feeding rate. | 4 | 4 |
| | 4.3 | Sustainable feeding practices in aquaculture. | 3 | 4 |
| | 4.4 | Collection and categorization of live food organisms | 5 | 4 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions.**<br>**Lecture**<br>**E-learning**<br>**Interactive instructions**<br>**Group assignments.**<br>**Practicals** |
| **Assessment Types** | **MODE OF ASSESSMENT**<br>**A. Continuous Comprehensive Assessment (CCA) Theory** |

| | |
|---|---|
| **Total Mark: 15** | |
| **Assessment methods** | |
| Assignment | 5 |
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 5 |

**Practical**

| | |
|---|---|
| **Total Mark: 15** | |
| **Assessment methods** | |
| Involvement | 5 |
| Punctuality | 5 |
| Record/PPT | 5 |

**B. End Semester Evaluation (ESE)**
**Theory**

| | | |
|---|---|---|
| **Total mark: 35** | | |
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 1 hr** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 5 out of 7 |
| Part B | 5 mark | Answer any 2 out of 4 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |

## REFERENCES


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- Lavens, P., & Sorgeloos, P. (1996). Manual on the production and use of live food for aquaculture.
- Li, Y., Li, J., Lu, J., Li, Z., Shi, S., & Liu, Z. (2017). Effects of live and artificial feeds on the growth, digestion, immunity and intestinal microflora of mandarin fish hybrid (Siniperca chuatsi♀× Siniperca scherzeri♂). *Aquaculture research*, *48*(8), 4479-4485.
- Samir Malla, S. M., & Banik, S. (2015). Production and application of live food organisms for freshwater ornamental fish larviculture.


## SUGGESTED READINGS

- Manual on the Production and Use of Live Food for Aquaculture:
- Textbook On Fish Food Organisms
- Culture and Utilization of Live Food Organisms for Aquahatcheries:
- Important Live Food Organisms and Their Role in Aquaculture" by Pronob Das et al.
- "Potentiality of Natural Live Food Organisms in Shrimp Culture: A Review"
- "Rotifers, Artemia and Copepods as Live Feeds for Fish Larvae"

| | |
|---|---|
| | **Department of Fisheries and Aquaculture**<br>**St. Albert's College (Autonomous)**<br>**Ernakulam** |

| | | | | |
|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | |
| **Programme** | **B.Voc (Honours) Commercial aquaculture** | | | |
| **Course Name** | **Aquaculture Marketing and Entrepreneurship** | | | |
| **Type of Course** | **VAC** | | | |
| **Course Code** | **25UACVCQ5VA301** | | | |
| **Course Level** | **300-399** | | | |
| **Course Summary** | This course provides students with the knowledge and skills required to understand and apply core concepts of marketing and entrepreneurship in the aquaculture sector. It covers the fundamentals of aquaculture marketing, including market structure, pricing, distribution channels, consumer trends, and export procedures. Students will explore the role of intermediaries, cooperatives, and institutional support from agencies like MPEDA, NFDB, and Matsyafed. | | | |
| **Semester** | 5 | **Credits** | 3 | **Total Hours** |

| Course Details | Learning Approach | Lecture | Practical | OJT | |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 45 |
| Pre-requisites, if any | Students should possess foundational knowledge of general introductory biology. | | | | |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Understand the principles, scope, and importance of marketing in the aquaculture sector, including product characteristics and market structures. | U | PO1,PO2 |
| 2 | Analyze various aquaculture marketing channels, pricing mechanisms, and the roles of intermediaries, institutions, and cooperatives. | An | PO1,PO10 |
| 3 | To make the students understand concepts and practices of entrepreneurship skills. | U | PO1,PO2,PO10 |
| 4 | Identify viable business ideas and transform them into actionable aquaculture business proposals, while developing essential entrepreneurial | S | PO2, PO6,PO10 |

| | | | |
|---|---|---|---|
| | skills for establishing and managing aquaculture ventures. | | |

**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO 2** | 1 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 2 |
| **CO 3** | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| **CO 4** | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| | | | | | | | | | | |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **Introduction to Aquaculture Marketing** | | 15 hours | |
| | 1.1 | Definition, nature, scope, and importance of marketing; Micro and macro environment, factors influencing buying behavior. | 3 | 1 |
| | 1.2 | Market segmentation, targeting, and positioning. Features of aquaculture products as market commodities. | 3 | 1 |
| | 1.3 | Role of marketing in aquaculture development and | 3 | 1, 4 |

| | | | | |
|---|---|---|---|---|
| | | rural livelihood; Types of markets: local, regional, national, and international | | |
| | 1.4 | Market structure for fish and shellfish: fresh, frozen, live, and value-added products | 3 | 1, 4 |
| | 1.5 | Marketing functions: assembling, grading, storage, transportation, processing, and distribution; Role of intermediaries: commission agents, wholesalers, retailers | 3 | 1 |
| 2 | **Aquaculture Marketing Channels and Institutional support** | | 15 hours | |
| | 2.1 | Traditional vs. modern marketing channels; Supply chain of key aquaculture products (shrimp, carp, tilapia, mussel, etc.). | 3 | 2 |
| | 2.2 | Cooperative marketing and direct marketing, Export marketing and role of MPEDA. | 4 | 2 |
| | 2.3 | Price formation and marketing margins; Institutional support in marketing: Matsyafed, MPEDA, NFDB, cooperative societies. | 4 | 2 |

| | | | | |
|---|---|---|---|---|
| | 2.4 | Role of government schemes and subsidies (e.g. PMMSY, E-Markets); International trade and export documentation in aquaculture. | 4 | 2,4 |
| 3 | **Business Planning and Enterprise Development** | | 15 hours | |
| | 3.1 | Concept of entrepreneurship; entrepreneurial and managerial characteristics; motivation and entrepreneurship development | 3 | 3,4 |
| | 3.2 | importance of planning, monitoring, evaluation and follow up; managing competition | 3 | 3 |
| | 3.3 | Steps in setting up an aquaculture enterprise; Project formulation and financial planning; Farm budgeting: capital cost, operational cost, break-even analysis; Sources of finance: institutional (banks, NABARD), non-institutional, subsidies | 3 | 3,4 |
| | 3.4 | Risk assessment and mitigation in aquaculture business; Record keeping and performance monitoring. Entrepreneurial opportunities | 3 | 3,4 |

| | | | | |
|---|---|---|---|---|
| | | in aquaculture (hatcheries, nurseries, grow-out farms, feed production, ornamental fish, value-added products). | | |
| | 3.5 | Preparation of business plan and project proposal; Farm budgeting: fixed and recurring costs, profit analysis. | 3 | 3, 4 |
| 4 | **TEACHER SPECIFIC CONTENT** | | | |

<table>
<tr><td>Teaching and Learning Approach</td><td>Classroom Procedure (Mode of transaction)<br><br>Lecture, Presentations, Group Discussions</td></tr>
<tr><td>Assessment Types</td><td>MODE OF ASSESSMENT<br><br>A. Continuous Comprehensive Assessment (CCA)<br><br>Theory
<table>
<tr><td colspan="2">Total Mark: 25</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Assignment</td><td>10</td></tr>
<tr><td>Seminar/ Quiz/ Group Discussion</td><td>5</td></tr>
<tr><td>Test</td><td>10</td></tr>
</table>
B. End Semester Evaluation (ESE)<br><br>Theory
<table>
<tr><td colspan="3">Total mark: 50</td></tr>
<tr><td colspan="3">Assessment methods: Written Exam</td></tr>
<tr><td colspan="3">Duration of Examination: 1.5 hrs</td></tr>
<tr><td colspan="3">Pattern of Examination: Non-MCQ</td></tr>
<tr><td>Part A</td><td>1 mark</td><td>Answer any 10 out of 12</td></tr>
<tr><td>Part B</td><td>5 mark</td><td>Answer any 4 out of 6</td></tr>
</table></td></tr>
</table>

| | | | | |
|---|---|---|---|---|
| | | Part C | 10 mark | Answer any 2 out of 4 |
| | Part A can be objective type, fill in the blanks, multiple choice etc. | | | |

**REFERENCES**


- Chaston, I. (1983). *Marketing in fisheries and aquaculture*. Fishing News Books.
- Dholakia, A. D. (2004). *Fisheries and aquatic resources of India*. Daya Publishing House.
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- Hishrich, R. D., & Peters, M. P. (2008). *Entrepreneurship: Starting, developing and managing a new enterprise*. Irwin.
- Ian, C. (1984). *Marketing in fisheries and aquaculture*. Fishing News Books.
- Kumar, A. (2010). *Entrepreneurship: Creating and leading an entrepreneurial organization*. Pearson.
- Kuratko, D. F., & Rao, T. V. (2010). *Entrepreneurship: A South-Asian perspective*. Cengage Learning.
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- Shang, Y. C. (1981). *Aquaculture economics*. Westview Press.


**SUGGESTED READINGS**


- Amazon India. (n.d.). *Marketing management*. https://www.amazon.in/marketing-management/s?k=marketing+management

- Sultan Chand & Sons. (n.d.). *Entrepreneurship: Business and management*. https://www.sultanchandandsons.com/book/572/entrepreneurship--business-and-management

# SEMESTER – VI

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ 6EP301 | Aquaculture Engineering (E) | SDCE | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 6SP301 | Mariculture | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 6SP302 | Cage Designing and Cage Farming Technology | SDC | 4 | 5 | 3 | 2 | 0 |
| 25SACVCQ 6SE301 | Aquaculture Biotechnology | SEC | 3 | 3 | 3 | 0 | 0 |
| 25SACVCQ 6VA301 | Aquafarm Management | VAC | 3 | 3 | 3 | 0 | 0 |
| 25SACVCQ 6PR301 | Project | PRJ | 4 | 8 | | | |

L — Lecture, P — Practical/Practicum , O — On the Job Training

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Aquaculture Engineering** | | | | |
| **Type of Course** | **SDEC** | | | | |
| **Course Code** | **25SACVCQ6EP301** | | | | |
| **Course Level** | **300-399** | | | | |
| **Course Summary** | Aquaculture Engineering focuses on the design, construction and management of system for cultivating aquatic organisms. This interdisciplinary filed combine element of civil, mechanical and environmental engineering to address the unique challenges of fish and shellfish farming. Topics covered include water quality management, system design, aquaponics, and sustainable practices to optimize production while minimizing environmental impact. Students learn to apply engineering principles to create efficient and environmentally sound aquaculture systems fostering the responsible growth of the aquaculture industry | | | | |
| **Semester** | 6 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Student should know basic aquaculture | | | | |



**COURSE OUTCOMES (CO)**

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Understand technical components of farm designing, different components of aquafarms – peripheral dikes, secondary dikes, feeder canals, sluicegate and monks. Recent trends in aquaculture engineering | U, An | PO1, PO 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 | PO 2, PO 3, PO 7, PO 10 |
| 3 | 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 | PO 2, PO 3, PO 7, PO 10 |
| 4 | Construct different types of feeding equipment, feed control systems, dynamic feeding systems, and instruments for measuring water quality. | C | PO 2, PO 3, PO 7, PO 10 |
| 5 | Analyze pipeline, water flow and head loss, pumps different types; understand and develop equipment used for water treatment, filters, ultraviolet light, ozone, heating and | U, An | PO 2, PO 3, PO 7, PO 10 |

| | | | |
|---|---|---|---|
| | cooling and other processes of disinfection | | |

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

**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 1 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| CO 3 | 1 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| CO 4 | 1 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| CO 5 | 1 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| | **General characteristics** | | 22 hours | |
| | 1.1 | Criteria for the selection of site for aquaculture - Surveying – chain survey, plane table survey, levelling. Calculation of earthwork for the construction of ponds | 3 | 1 |
| | 1.2 | Types of soil, soil sampling methods, prevention of erosion. | 3 | 2 |
| | 1.3 | Design of freshwater and brackish water farms. Different components of aquafarms – peripheral dikes, secondary dikes, feeder canals, sluice gate and monks. | 4 | 2 |

| | | | | |
|---|---|---|---|---|
| | 1.4 | Various farm equipment. Pumps in aquaculture, different type of pumps | 4 | 3 |
| | 1.5 | Practical- Determination of organic carbon in pond soil and Determination of soil pH, Calculation of lime requirement of soil | 8 | 2 |
| 2 | **Food and growth** | | 23 hours | |
| | 2.1 | Components and design of shrimp hatcheries – various components and infrastructure facilities required | 4 | 2 |
| | 2.2 | Equipment used for water treatment, filters, ultraviolet light, ozone, heating and cooling and other processes of disinfection | 4 | 2 |
| | 2.3 | Aeration of pond water and different types of Aerators.. | 3 | 3 |
| | 2.4 | Various hatchery equipment including aeration devices and pumps, design and fabrication of aerators, compressors, blowers, paddle wheel aerators, oxygen injection system | 4 | 3 |
| | 2.5 | Practical- Determination of pump efficiency | 4 | 3 |
| 3 | **Feeding System and EIA** | | 16 hours | |
| | 3.1 | Automatic feeding system – Feed dispensers – Demand feeders | 2 | 4 |

| | | | | |
|---|---|---|---|---|
| | 3.2 | Environmental Monitoring and Impact Assessment- Impact assessment and impact evaluation -EIA processes, stages, EIA statement environment management plan. | 2 | 4 |
| | 3.3 | National Policy on EIA and regulatory framework | 2 | 5 |
| | 3.4 | Practical- Water quality analysis; Construct feeding equipment, EIA assessment of a farm | 10 | 4 |
| 4 | **Recirculatory Aquaculture Systems** | | 14 hours | |
| | 4.1 | Recirculating aquaculture system; aeration, sterilization and disinfection | 2 | 3 |
| | 4.2 | Ponds, tanks and other impounding structures; filtration. | 2 | 3 |
| | 4.3 | Aeration – Gases in water. Types of aerations. Recirculation and water – Recirculation – Advantage – Designs of re-use systems | 2 | 3 |
| | 4.4 | Practical- Design a recirculatory system | 8 | 3 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

<table>
<tr><td>Teaching and Learning Approach</td><td>Classroom Procedure (Mode of transaction)<br><br>Lecture, Presentations, Group Discussions</td></tr>
<tr><td>Assessment Types</td><td>MODE OF ASSESSMENT<br><br>A. Continuous Comprehensive Assessment (CCA)<br><br>Theory<br><br>
<table>
<tr><td colspan="2">Total Mark: 25</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Assignment</td><td>10</td></tr>
<tr><td>Seminar/ Quiz/ Group Discussion</td><td>5</td></tr>
<tr><td>Test</td><td>10</td></tr>
</table>
<br>Practical<br><br>
<table>
<tr><td colspan="2">Total Mark: 15</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Involvement</td><td>5</td></tr>
<tr><td>Punctuality</td><td>5</td></tr>
<tr><td>Record/PPT</td><td>5</td></tr>
</table>
<br>B. End Semester Evaluation (ESE)<br><br>Theory<br><br>
<table>
<tr><td>Total mark: 50</td></tr>
<tr><td>Assessment methods: Written Exam</td></tr>
</table>
</td></tr>
</table>

| | | |
|---|---|---|
| **Duration of Examination: 1.5 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 15 out of 17 |
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |



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- Swift, D. R. (1993). Aquaculture training manual. Fishing News Books.
- Stickney, R. R. (1994). Principles of aquaculture. John Wiley and Sons, Inc..
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- Coche, A. G., & Muir, J. R. (2002). Simple method for aquaculture pond construction for fresh water. Fish
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- Mishra, R., & Dora, K. C. (2015). Text Book on Aquaculture Engineering. Narendra Publishing House.
- Garg, S. K. (2018). Water supply Engineering.


**SUGGESTED READINGS**


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- Lawson, T. B. (Ed.). (1994). Fundamentals of aquacultural engineering. Springer Science & Business Media.
- Bose, A. N., Ghosh, S. N., Yang, C. T., & Mitra, A. (1991). Coastal aquaculture engineering. CUP Archive.
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- Review of environmental impact assessment and monitoring in aquaculture in Asia-Pacific.
- Bhari, B., & Visvanathan, C. (2018). Sustainable aquaculture: Socio-economic and environmental assessment. In Sustainable Aquaculture, 63-93.




| | |
|---|---|
| | **Department of Fisheries and Aquaculture**<br>**St. Albert's College (Autonomous)**<br>**Ernakulam** |

| | |
|---|---|
| **Faculty/ Discipline** | **Aquaculture** |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** |
| **Course Name** | **Mariculture** |
| **Type of Course** | **SDC** |

<table>
<tr><td>Course Code</td><td colspan="5">25SACVCQ6SP301</td></tr>
<tr><td>Course Level</td><td colspan="5">300-399</td></tr>
<tr><td>Course Summary</td><td colspan="5">Mariculture is the cultivation of marine organisms, such as fish, shellfish, and seaweed, in coastal areas or open ocean environments. This course explores the principles and practices of mariculture, including species selection, hatchery operations, grow-out systems, and environmental management. Students will gain a comprehensive understanding of the opportunities and challenges associated with mariculture, including sustainable production methods, disease management, and regulatory frameworks. By combining theoretical knowledge with practical skills, this course will equip students with the expertise to contribute to the development of sustainable mariculture practices and the growth of the marine aquaculture industry.</td></tr>
<tr><td>Semester</td><td>6</td><td colspan="2">Credits</td><td>3</td><td rowspan="2">Total Hours</td></tr>
<tr><td rowspan="2">Course Details</td><td rowspan="2">Learning Approach</td><td>Lecture</td><td>Practical</td><td>OJT</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>75</td></tr>
<tr><td>Pre-requisites, if any</td><td colspan="5">Basic knowledge in science.</td></tr>
</table>

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Recognize and know the status and the major candidate species for mariculture and their techniques. | An | PO1 |

| | | | |
|---|---|---|---|
| 2 | Demonstrate about steps and procedures involved in the culture of various marine fishes, crustaceans, molluscs, aquatic plants and invertebrates. | A | PO1, PO2 |
| 3 | Illustrate about the artificial breeding technique in fin fishes and crustaceans | A | PO1, PO2, PO10 |
| 4 | Awareness on broodstock maintenance, hatchery technology, induced breeding technology and larval rearing of sea cucumbers and seaweeds. | C | PO1, PO2, PO10 |
| 5 | Identification of candidate species of finfishes, shellfishes, seagrasees and seacucumbers. | A | PO1, PO9 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| CO 4 | 1 | 2 | | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| CO 5 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

### Content for Classroom transaction (Units)

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **CULTURE OF FINFISHES** | | **19Hrs** | |
| | 1.1 | Scope and Global status of Mariculture. Mariculture in India. Different culture technologies for mariculture. | 4 | 1 |
| | 1.2 | Criteria for the selection of fish for mariculture: market demand, growth rate, environmental tolerance, stocking density, ease of handling etc. | 5 | 1 |
| | 1.3 | Different kinds of grow-out culture systems for finfishes and shellfishes. Sea cages, pond culture, pen culture, rack culture, raft culture, stake culture, pole and line culture | 4 | 1 |
| | 1.4 | Identification of important cultivable finfishes: seabass, groupers, pompano, cobia. | 6 | 1 |
| 2 | **CULTURE OF CRUSTACEANS** | | **18Hrs** | |
| | 2.1 | Major species of lobsters and their culture: spiny lobster, rock lobster | 5 | 2, 3 |
| | 2.2 | Major species of shrimps-culture and seed production. | 4 | 2, 3 |

| | | | | |
|---|---|---|---|---|
| | | Penaeid and non penaeid shrimps. | | |
| | 2.3 | Induced maturation methods in crustaceans. Thermal shock, eyestalk ablation | 4 | 2, 3 |
| | 2.4 | Study on induced maturation techniques. | 5 | 2 |
| | **CULTURE OF MOLLUSCS AND CEPHALOPODS** | | **19Hrs** | |
| 3 | 3.1 | Broodstock management, induced maturation and spawning of molluscs and cephalopods.Seed production – Natural seed resources and oysters, Mussels and Clams collection techniques. | 5 | 3 |
| | 3.2 | Major species of edible oysters: *Crassostrea madrasensis, Saccostrea cucculata* and pearl oysters: *Pinctada fucata, Pinctada margatifera, Pinctada maxima* hatchery technology and culture. | 4 | 3 |
| | 3.3 | Artificial pearl production techniques: breeding and rearing, nucleation, post nucleation care, pearl formation, harversting | 4 | 3 |

| | | | | |
|---|---|---|---|---|
| | 3.4 | Collection and identification of shellfishes. | 6 | 3 |
| 4 | **CULTURE OF SEAWEED AND SEACUCUMBER** | | **19Hrs** | |
| | 4.1 | Taxonomy of economically important seaweeds and sea cucumbers of India. | 5 | 4 |
| | 4.2 | Seaweed morphology, life cycle and reproduction. | 5 | 4, 5 |
| | 4.3 | Industrial use of seaweeds and seagrass: pharmaceutical, cosmetics production, food products agriculture and horticulturebiofuels and bioenergy, bioremediation. | 4 | 4,5 |
| | 4.4 | Visit to mariculture facilities /institutions. | 5 | 4, 5 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions**<br>**Lecture**<br>**Interactive instructions**<br>**Group assignments**<br>**Group discussion**<br>**Practicals** |

<table>
<tr><td></td><td></td></tr>
<tr><td>Assessment Types</td><td>

**K. Continuous Comprehensive Assessment (CCA)**

**Theory**

| **Total Mark: 25** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**Practical**

| **Total Mark: 15** | |
|---|---|
| **Assessment methods** | |
| Involvement | 5 |
| Punctuality | 5 |
| Record/PPT | 5 |

</td></tr>
</table>

**End Semester Evaluation (ESE)**

**Theory**

| |
|---|
| **Total mark: 50** |
| **Assessment methods: Written Exam** |
| **Duration of Examination: 1.5 hrs** |
| **Pattern of Examination: Non-MCQ** |

| | | |
|---|---|---|
| Part A | 1 mark | Answer any 15 out of 17 |
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| | |
|---|---|
| **Total mark: 35** | |
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |



## REFERENCES


- Gopakumar, G. (2023). Introduction to mariculture.

- Khan, S. I., & Satam, S. B. (2003). Seaweed mariculture: scope and potential in India. *Aquaculture asia*, *8*(4), 26-29.
- Megarajan, S., Ranjan, R., Xavier, B., Muktha, M., Edward, L., Sadhu, N., & Ghosh, S. (2017). Perspectives on mariculture in India. *Aquaculture Asia Pacific*, *13*(2), 12-16.
- Ranjan, R., Muktha, M., Ghosh, S., Gopalakrishnan, A., Gopakumar, G., & Imelda, J. (2017). *Prioritized species for mariculture in India*. ICAR-Central Marine Fisheries Research Institute.
- Suresh, V. V. R., Rajesh, N., Ignatius, B., & Gopalakrishnan, A. (2023). Mariculture in India: an overview.


## SUGGESTED READINGS

- "Marine Aquaculture: Opportunities and Challenges" by Frank Aspey - A comprehensive overview of mariculture, including its history, current practices, and future prospects.
- "Mariculture: The Responsible Development of Marine Aquaculture" by Barry .
- Costa-Pierce - A guide to sustainable mariculture practices, covering topics such as species selection, site selection, and environmental impact assessment.
- "Marine Fish Farming: Principles and Practices" by John F. Wickins and Daniel O'C Lee - A detailed guide to marine fish farming, including hatchery and grow-out operations, nutrition, and disease management.



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

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|---|---|
| **Faculty/ Discipline** | **Aquaculture** |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** |
| **Course Name** | **Cage Designing and Cage Farming Technology** |

| | | | | | |
|---|---|---|---|---|---|
| **Type of Course** | **SDC** | | | | |
| **Course Code** | **25SACVCQ6SP302** | | | | |
| **Course Level** | **300-399** | | | | |
| **Course Summary** | This comprehensive course covers the design, fabrication, and management of cage systems for fish farming. Students will learn about the principles of cage design, materials, and construction techniques, as well as the latest technologies and best practices in cage farming. The course will also cover fish health management, water quality monitoring, and sustainable aquaculture practices.By the end of this course, students will have a comprehensive understanding of cage fabrication and cage farming technology, enabling them to design, operate, and manage successful and sustainable fish farms. | | | | |
| **Semester** | 6 | **Credits** | | 4 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 1 | 0 | 75 |
| **Pre-requisites, if any** | Basic knowledge and interest in fish farming. | | | | |

**COURSE OUTCOMES (CO)**

| CO No | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Understand the advantages of technology of farming fish in cages, guidelines and the current status of cage culture in India | K | PO1, PO2 |

| | | | |
|---|---|---|---|
| 2 | Knowledge on necessary infrastructure and equipment required for successful fish farming in cages. | U | PO1, PO2 |
| 3 | Analyze the suitable fish breeds for cage culture. | A | PO1, PO2, PO10 |
| 4 | Understanding government schemes, subsidies and opportunities for cage farming. | U | PO1, PO2 |
| 5 | Visit to study cage fabrication technology. | A | PO1, PO2, PO10 |

**CO-PO ARTICULATION MATRIX**

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| CO 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| CO 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| CO 4 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CO 5 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

**COURSE CONTENT**

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1 | **INTRODUCTION TO CAGE FARMING** | | **18Hrs** | |
| | 1.1 | Introduction to the cage. Status of cage farming in the world and India. | 3 | 1 |
| | 1.2 | Guidelines for cage culture in marine and inland water bodies of India. | 4 | 1, 2 |
| | 1.3 | Relevance and scope for cage culture in India. Advantages and disadvantages of cages | 4 | 1 |
| | 1.4 | Study the recent trends in cage culture in India | 7 | 1, 2 |
| | **SITE SELECTION AND FABRICATION OF CAGE** | | **18Hrs** | |
| | 2.1 | Site selection: Topographical considerations: bottom condition, physical and biological criteria. Selection of species | 4 | 1, 2, 3 |
| | 2.2 | Fabrication of a cage culture unit, parts of a cage unit, unit cost for developing a cage culture system. | 4 | 1, 2, 3 |
| | 2.3 | Infrastructure requirements: cage frame, nets, floats, mooring system. Different | 4 | 1, 2, 3 |

| | | | | |
|---|---|---|---|---|
| | | types of netting materials; Nylon and HPPE | | |
| | 2.4 | Introduction to infrastructure requirements for cage. | 6 | 2, 5 |
| | **POTENTIAL SPECIES TO BE CULTURED IN CAGES** | | **20Hrs** | |
| 3 | 3.1 | Feed ingredients, feed formulation, feed storage, feed ration, feeding schedule, monitoring growth rate. | 3 | 1, 2, 3 |
| | 3.2 | Species selection. Seed selection, Government fish hatcheries in India, procurement of seed. | 4 | 2, 3 |
| | 3.3 | Culture of major species in cages: *Trachinotus blochii, Rachycentron canadum, Lates calcarifer, Epinephelus malabaricus, Etroplus suratensis, Lutjanus argentimaculatus, Acanthopagarus latus, Pangasianodon hypophthalmus*, GIFT | 3 | 3 |
| | 3.4 | Identification of fishes cultured in cages. | 10 | 3, 4 |
| 4 | **CAGE MANAGEMENT AND FINANCIAL ASSISTANCE** | | **18Hrs** | |

| | | | | |
|---|---|---|---|---|
| | 4.1 | Cage maintenance and Health management. Disease and prevention methods. Good management practices. | 3 | 1,4 |
| | 4.2 | Harvesting the stock: harvesting protocols and safety measures. Fouling organisms in cage nets: management and prevention. Factors affecting economic viability of cage farming. | 4 | 1, 4, 5 |
| | 4.3 | Regulations and specifications for establishing units. Sea cage farming: unit specification and financial assistance: Janakeeya Matsya Krishi project, PMMSY project, NFDB and other agencies. | 3 | 4, 5 |
| | 4.4 | Visit to cage culture units. | 7 | 1, 4, 5 |
| 5 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions**<br>**Lecture**<br>**Interactive instructions**<br>**Group assignments** |

<table>
<tr><td></td><td>Group discussion<br><br>Practicals</td></tr>
<tr><td rowspan="2">Assessment Types</td><td>MODE OF ASSESSMENT</td></tr>
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<tr><td>Assignment</td><td>10</td></tr>
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</table>
Practical
<table>
<tr><td colspan="2">Total Mark: 15</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Involvement</td><td>5</td></tr>
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<tr><td>Total mark: 50</td></tr>
<tr><td>Assessment methods: Written Exam</td></tr>
<tr><td>Duration of Examination: 1.5 hrs</td></tr>
</table>
</td></tr>
</table>

| Pattern of Examination: Non-MCQ | | |
|---|---|---|
| Part A | 1 mark | Answer any 15 out of 17 |
| Part B | 5 mark | Answer any 3 out of 5 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**Practical**

| **Total mark: 35** | |
|---|---|
| **Duration of Examination: 2 hrs** | |
| **Assessment methods** | |
| Theory/ Procedure/ Understanding | 10 |
| Skill and Performance/ Data Collection | 10 |
| Calculation/ Analysis and Result | 10 |
| Viva | 5 |



## REFERENCES


- Bolta, M. (2016). Cage culture of freshwater fish. *Rep Number*.
- Gopakumar, G. (2009). History of cage culture, cage culture operations, advantages and disadvantages of cages and current global status of cage farming.
- Tacon[1], A. G., Halwart, M., Tacon, A. G. J., & Halwart, M. (2007). Cage aquaculture: a global overview. *Cage aquaculture: Regional reviews and global overview*, *498*, 3.
- Manna, R. K., & Hassan, M. A. (2004). Cage culture of fish. *Bull*, (132).
- Rajesh, N., & Ignatius, B. (2023). Cage culture systems and management.


## SUGGESTED READINGS

- "Fishes of the World" by Joseph S. Nelson
- "The Mollusks: A Guide to Their Study, Collection, and Preservation" by Charles F. Sturm, Timothy A. Pearce, and Ángel Valdés - A comprehensive guide to mollusk taxonomy and identification.
- "Crustacea: An Introduction" by Gary C. B. Poore - An introduction to crustacean taxonomy and biology.
- "Marine Fish Identification Guide" by various authors - A practical guide to identifying marine fish species.
- Systematics and Taxonomy of Fishes" by T. Iwatsuki and T. Nakabo - A detailed overview of fish systematics and taxonomy.



# Department of Fisheries and Aquaculture

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

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Aquaculture Biotechnology** | | | | |
| **Type of Course** | **SEC** | | | | |
| **Course Code** | **25SACVCQ6SE301** | | | | |
| **Course Level** | **300-399** | | | | |
| **Course Summary** | This course provides an overview of the applications of biotechnology in aquaculture for enhancing productivity, sustainability, and resource conservation. It covers the principles and techniques involved in genetic improvement of aquatic species, including selective breeding, hybridization, ploidy manipulation and transgenesis. | | | | |
| **Semester** | 6 | **Credits** | | 3 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |

| | | | | | |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 45 |
| **Pre-requisites, if any** | Students should possess foundational knowledge of general introductory biology. | | | | |

**COURSE OUTCOMES (CO)**

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Understand the applications of biotechnology tools in aquaculture breeding, including genetic manipulation, ploidy induction, and cryopreservation, for improving growth, disease resistance, and production efficiency in aquatic species. | U | PO1,PO2 |
| 2 | Evaluate the principles, methods, and ethical considerations of transgenics, genetic engineering, and hybridoma technology, and design innovative strategies for applying these tools in aquaculture improvement, disease diagnosis, and monoclonal antibody production. | E | PO2, PO6,PO10 |
| 3 | Analyze and evaluate the application of biotechnology in aquaculture, including innovations in feed development, disease management, microalgal biotechnology, and postharvest technology, and design strategies to enhance productivity, sustainability, and product quality in the sector.. | An | PO1,PO2 ,PO10 |
| 4 | Develop the ability to apply biotechnological knowledge to their own research, extension work, and innovative aquaculture projects. | S | PO2, PO6,PO10 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO 2** | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 2 |
| **CO 3** | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| **CO 4** | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| | | | | | | | | | | |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| | **Fish breeding and gene manipulation** | | **15 hours** | |
| | 1.1 | Introduction to genetics and biotechnology- Structure of DNA, chromosomes and gene. Replication of DNA. | 3 | 1 |
| | 1.2 | Synthetic hormones for induced breeding- GnRH analogue structure and function. | 3 | 1 |
| | 1.3 | Hormonal manipulation of sex in fishes-, Triploidy, tetraploidy, Sex reversal, androgenesis, gynogenesis and its applications. Monosex production, super male fish production techniques. | 3 | 1 |
| | 1.4 | Cryopreservation of gametes and embryos-. Principles and procedures. | 3 | 1 |
| | 1.5 | Hybridisation in fishes - structural changes, quantitative changes, qualitative changes. Characteristics of hybrids - phenotype characters. | 3 | 1 |

| | | | | |
|---|---|---|---|---|
| 2 | **Transgenics and genetic engineering** | | **15 hours** | |
| | 2.1 | Methods of gene transfer in fishes- electroporation, microinjection, sperm mediated gene transfer. | 3 | 2 |
| | 2.2 | Regulation of Genetically Modified Organisms (GMOs), IPR, Evaluation of GFP transgenics. | 4 | 2 |
| | 2.3 | Single gene traits- Physical traits with single gene inheritance. Inbreeding and cross breeding. Biosafety regulations and ethics. | 4 | 2, 4 |
| | 2.4 | Hybridoma – principles. preparation and selection of hybridoma in selective growth medium, screening and cloning of hybridoma. | 4 | 2, 4 |
| | **Application of biotechnology in aquaculture** | | **15 hours** | |
| | 3.1 | Incorporation of chemicals-additives in fish nutrition. Use of enzymes to enhance nutrient availability and to reduce feed wastage. Immune supplements to inhibit pathogenic organisms. | 3 | 2, 4 |
| | 3.2 | Nutrigenomics tools. Fish cell line. DNA and RNA vaccines, Molecular diagnosis of viral diseases-PCR, Dot-blot, ribotyping of pathogenic microbes, RNAi | 3 | 3 |
| | 3.3 | Biofilms and its impact on health management, genetically modified microorganisms as probiotics, immunostimulants, bioremediation. | 3 | 3,4 |
| | 3.4 | Microalgae - indoor and mass culture methods. Photobioreactors. Biotechnological approaches | 3 | 3,4 |

| | | | | |
|---|---|---|---|---|
| | | for production of important microalgae, single cell protein from Spirulina, raceway system of micro algae culture, biofuel production. | | |
| | 3.5 | Scope of post- harvest biotechnology. Delaying of spoilage. Detection of toxic substances and pathogenic microbes, biosensors. | 3 | 3, 4 |
| 4 | **TEACHER SPECIFIC CONTENT** | | | |

<table>
<tr><td>Teaching and Learning Approach</td><td>Classroom Procedure (Mode of transaction)<br><br>Lecture, Presentations, Group Discussions</td></tr>
<tr><td>Assessment Types</td><td>MODE OF ASSESSMENT<br><br>A. Continuous Comprehensive Assessment (CCA)<br>Theory<br><br>
<table>
<tr><td colspan="2">Total Mark: 25</td></tr>
<tr><td colspan="2">Assessment methods</td></tr>
<tr><td>Assignment</td><td>10</td></tr>
<tr><td>Seminar/ Quiz/ Group Discussion</td><td>5</td></tr>
<tr><td>Test</td><td>10</td></tr>
</table>
<br>B. End Semester Evaluation (ESE)<br>Theory<br><br>
<table>
<tr><td colspan="3">Total mark: 50</td></tr>
<tr><td colspan="3">Assessment methods: Written Exam</td></tr>
<tr><td colspan="3">Duration of Examination: 1.5 hrs</td></tr>
<tr><td colspan="3">Pattern of Examination: Non-MCQ</td></tr>
<tr><td>Part A</td><td>1 mark</td><td>Answer any 10 out of 12</td></tr>
<tr><td>Part B</td><td>5 mark</td><td>Answer any 4 out of 6</td></tr>
<tr><td>Part C</td><td>10 mark</td><td>Answer any 2 out of 4</td></tr>
</table>
<br>Part A can be objective type, fill in the blanks, multiple choice etc.</td></tr>
</table>

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- Ambily, V. (2024). *Genetics and biotechnology in aquaculture*. Astitva Prakashan.
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# Department of Fisheries and Aquaculture
# St. Albert's College (Autonomous)
# Ernakulam



| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Aquafarm Management** | | | | |
| **Type of Course** | **VAC** | | | | |
| **Course Code** | **25SACVCQ6VA301** | | | | |
| **Course Level** | **300-399** | | | | |
| **Course Summary** | Aquafarm management is a specialized field that focuses on the planning, organization, and operation of aquaculture farms. It encompasses a range of activities, including water quality management, feed management, disease control, and environmental sustainability. Effective aquafarm management is crucial for ensuring the health and productivity of farmed aquatic species, minimizing environmental impacts, and promoting sustainable aquaculture practices.<br>This course will provide students with a comprehensive understanding of the principles and practices of aquafarm management, preparing them for careers in the aquaculture industry. | | | | |
| **Semester** | 6 | **Credits** | | 3 | **Total Hours** |
| **Course Details** | **Learning Approach** | **Lecture** | **Practical** | **OJT** | |
| | | 3 | 0 | 0 | 45 |

| | |
|---|---|
| **Pre-requisites, if any** | Basic knowledge in science. |

## COURSE OUTCOMES (CO)

| CO No. | Expected Course Outcome | Learning Domains | PO No |
|---|---|---|---|
| 1 | Practice the method of feeding fishes in intensive farms. | A | PO1, PO9, PO10 |
| 2 | Acquire proficiency in analyzing soil and water quality parameters in aquafarms. | C | PO10 |
| 4 | Develop knowledge in health management of cultured fishes. | C | PO1, PO9, PO10 |
| 5 | Create skill in management of aquafarms | C | PO1, PO9, PO10 |

## CO-PO ARTICULATION MATRIX

| CO/PO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | **1** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **2** | **3** |
| **CO 2** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **10** |
| **CO 3** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **3** |
| **CO 4** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **2** | **2** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO 5** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **2** | **3** |

***'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).***

## COURSE CONTENT

**Content for Classroom transaction (Units)**

| Module | Units | Course description | Hrs | CO No. |
|---|---|---|---|---|
| 1 | **FEEDING IN AQUAFARMS** | | **15Hrs** | |
| | 1.1 | Practical feeding in grow-outs of fishes & shrimps. Feed ration, feed quantity estimation and feeding frequency. Rules for feeding. | 3 | 1, 5 |
| | 1.2 | Feeding methods. Hand feeding, Broadcasting, mechanised and non-mechanised feeders. | 3 | 1,5 |
| | 1.3 | Types of feeding devices. Mechanical and non-mechanical, electrically operated feeding devices. | 4 | 1,5 |
| | 1.4 | Practice the techniques of feeding in intensive farms. | 5 | 1,5 |
| 2 | **AQUATIC ANIMAL HEALTH MANAGEMENT** | | **15Hrs** | |
| | 2.1 | Bottom soil management in ponds.good practices for bottom soil management, | 4 | 2 |

| | | | | |
|---|---|---|---|---|
| | | Liming in fish ponds, fertilization, sustainable pond productivity. | | |
| | 2.2 | Water quality and its management in aquafarms. water resources, water quality: physical and chemical factors. | 3 | 2,5 |
| | 2.3 | Study of physical and chemical factors in aquafarms. | 3 | 2,5 |
| | 2.4 | Measurement and analysis of water quality parameters of aquafarms. | 5 | 2,5 |
| | **ECOFRIENDLY AND SUSTAINABLE AQUACULTURE** | | **15Hrs** | |
| | 3.1 | General preventive methods and prophylaxis. Environment management, chemotherapeutic agents, prophylaxis- vaccines, immunostimulants and probiotics. | 3 | 3,5 |
| | 3.2 | Eco-friendly and sustainable aquaculture. Use and abuse of antibiotics and chemicals in health management . | 4 | 3,5 |
| | 3.3 | Methods of pathological examination of fish. Fish health and quarantine | 3 | 3,5 |

| | | | | |
|---|---|---|---|---|
| | | systems. Production of disease-free seeds. SPF and SPR stocks-development and applications. | | |
| | 3.4 | Identification of major fish diseases and its prevention. Infectious and non-infectious diseases. | 5 | 3,5 |
| 4 | **TEACHER SPECIFIC CONTENT** | | | |

| | |
|---|---|
| **Teaching and Learning Approach** | **Classroom Procedure (Mode of transaction)**<br>**Direct instructions.**<br>**Lecture**<br>**E-learning**<br>**Interactive instructions**<br>**Group assignments** |
| **Assessment Type** | **MODE OF ASSESSMENT**<br>**A. Continuous Comprehensive Assessment (CCA) Theory** |

| **Total Mark: 25** | |
|---|---|
| **Assessment methods** | |
| Assignment | 10 |
| Seminar/ Quiz/ Group Discussion | 5 |
| Test | 10 |

**B. End Semester Evaluation (ESE)**
**Theory**

| | | |
|---|---|---|
| **Total mark: 50** | | |
| **Assessment methods: Written Exam** | | |
| **Duration of Examination: 1.5 hrs** | | |
| **Pattern of Examination: Non-MCQ** | | |
| Part A | 1 mark | Answer any 10 out of 12 |
| Part B | 5 mark | Answer any 4 out of 6 |
| Part C | 10 mark | Answer any 2 out of 4 |

Part A can be objective type, fill in the blanks, multiple choice etc.

**REFERENCES**


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- AIT. 1986. Buffalo, fish and duck/fish integrated systems for small-scale farmers at the family level. AIT Research Report No. 198. Bangkok, Asian Institute of Technology. 138pp.

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam

| | | | | | |
|---|---|---|---|---|---|
| **Faculty/ Discipline** | **Aquaculture** | | | | |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** | | | | |
| **Course Name** | **Project** | | | | |
| **Type of Course** | **PRJ** | | | | |
| **Course Code** | **25SACVCQ6PR01** | | | | |
| **Course Level** | **300-399** | | | | |
| **Course Summary** | The project work provides students with an opportunity to identify, analyze, and solve real-world problems relevant to their field of study by integrating and applying the theoretical knowledge and skills acquired throughout their academic program. It fosters independent research, critical thinking, innovation, and the practical use of methodologies, tools, and techniques to design effective solutions. Students are encouraged to work individually or in teams, enhancing their collaboration, time management, ethical responsibility, and self-directed learning. The project also develops competencies in academic writing, documentation, and technical communication. Each project is expected to culminate in a comprehensive report, a working model or prototype (where applicable), and a formal presentation followed by a viva voce examination, demonstrating the student's ability to apply knowledge creatively and professionally in a real-world context. | | | | |
| **Semester** | **6** | **Duration** | **8 hours/week** | **Credits** | **4** |



## COURSE OUTCOMES (CO)

| CO No: | Expected Course Outcome | Learning Domains | PO No: |
|---|---|---|---|

| | | | |
|---|---|---|---|
| | Upon the successful completion of the course, the student will be able to | | |
| 1 | Identify, analyze, and define problems relevant to the field of study. | An | PO1,PO2,PO3 |
| 2 | Apply appropriate methodologies, tools, and techniques to design and implement effective solutions. | C | PO2,PO3,PO10 |
| 3 | Demonstrate skills in research, critical thinking, project planning, and systematic execution. | S | PO1,PO2,PO5 ,PO10 |
| 4 | Produce well-structured academic reports and communicate project outcomes effectively. | S | PO4,PO8,PO1 0 |
| 5 | Exhibit teamwork, time management, ethical responsibility, and initiative in a self-directed project environment. | S | PO5,PO8,PO9 ,PO10 |
| 6 | Address real-world challenges with innovative and context-aware solutions. | An | PO1,PO2,PO6 ,PO10 |

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

| | | | |
|---|---|---|---|
| **Assessment Types** | **MODE OF ASSESSMENT** | | |
| | **A** | **Internal Evaluation** | |
| | | **Components** | **Marks** |
| | | Commitment and Involvement | 5 |
| | | Periodic progress review | 10 |
| | | Quality of work/Implementation effort | 10 |
| | | Report | 5 |
| | | **Total** | **30** |
| | **B** | **External Evaluation** | |
| | | **Components** | **Marks** |
| | | Problem Identification and Objectives | 10 |
| | | Methodology / Design / Technical Content | 15 |
| | | Implementation / Analysis / Results | 15 |
| | | Final Report | 10 |
| | | Presentation | 10 |
| | | Viva Voce | 10 |
| | | **Total** | **70** |

# SEMESTER – VII and VIII

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ7SN401 | Apprenticeship | APPRENTICESHIP | 28 | 280 days | 0 | 28 | 0 |
| | | | | | | | |

| Course Code | Title of the Course | Type of the Course | Credit | Hours/ week | Hour Distribution /week | | |
|---|---|---|---|---|---|---|---|
| | | | | | L | P | O |
| 25SACVCQ7SR401 | RESEARCH INTERNSHIP | RESEARCH INTERNSHIP | 20 | 200 days | 0 | 20 | 0 |
| | | | | | | | |

# Department of Fisheries and Aquaculture

# St. Albert's College (Autonomous) Ernakulam

| | |
|---|---|
| **Faculty/ Discipline** | **Aquaculture** |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** |
| **Course Name** | **Apprenticeship** |
| **Type of Course** | **APT** |
| **Course Code** | **25SACVCQ7SN401** |
| **Course Level** | **400-499** |
| **Summary** | As an integral component of the B.Voc Honours degree programme, students are required to complete a structured apprenticeship or work-integrated learning programme in collaboration with relevant industries, organizations, or institutions. This component, spanning a duration of 280 days, carries 28 academic credits and is compulsory in the student's designated skill domain. It is designed to enhance industry preparedness by reinforcing academic knowledge through sustained, domain-relevant practical experience.<br>The apprenticeship offers students the opportunity to engage directly with real-world professional environments, enabling them to apply domain-specific competencies, gain exposure to industry-standard tools and practices, and participate meaningfully in ongoing operations and projects. This extended, immersive experience serves to bridge the gap between theoretical learning and professional expectations, thereby fostering critical skills for career development and employability.<br>To ensure the effectiveness, academic relevance, and accountability of the apprenticeship:<br>• Each student will be assigned an academic mentor from the parent institution and an industry supervisor from the host organization.<br>• Students are required to maintain a weekly activity logbook, which |

| | |
|---|---|
| | must be regularly reviewed and signed by the industry supervisor.<br>• Monthly progress reports will be submitted to and reviewed by the academic mentor in consultation with the industry supervisor.<br>• Mid-term and final evaluations will be conducted based on a combination of employer feedback, student outputs/deliverables, and academic performance metrics.<br>• The institution will conduct site visits, virtual check-ins, or regular follow-ups to ensure student engagement, address issues promptly, and uphold the quality of the apprenticeship experience.<br>This structured apprenticeship is a critical step in preparing students for the dynamic demands of the professional world, ensuring that their academic journey culminates in a well-rounded and industry-aligned skill set. |

| | | | | | |
|---|---|---|---|---|---|
| **Semester** | **7&8** | **Duration** | **280 days** | **Credits** | **28** |

## COURSE OUTCOMES (CO)

| CO No: | Expected Course Outcome | Learning Domains | PO No: |
|---|---|---|---|
| | Upon the successful completion of the course, the student will be able to | | |
| 1 | Gain hands-on professional experience by engaging in long-term, domain-specific apprenticeship in real-world industry environments. | S | PO1,PO3,PO6,PO10 |
| 2 | Apply domain-specific theoretical knowledge to solve real-time problems, enhancing technical and problem-solving competencies. | A | PO1,PO2,PO3,PO10 |
| 3 | Demonstrate professional competencies such as workplace etiquette, communication skills, and teamwork in a collaborative work culture. | S | PO4,PO5,PO8,PO9 |
| 4 | Build a professional portfolio by achieving practical outcomes and establishing credible industry references and credentials. | C | PO5,PO9,PO10 |
| 5 | Cultivate reflective thinking, adaptability, and a lifelong learning mindset through structured and mentored work experience. | Ap | PO1,PO6,PO8,PO10 |
| 6 | Transition smoothly from academic study to professional practice by developing job-specific skills and industry-aligned competencies. | S | PO2,PO3,PO5,PO10 |

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

| Assessment Types | MODE OF ASSESSMENT | | |
|---|---|---|---|
| | **A** | **Internal Evaluation** | |
| | | **Components** | **Marks** |
| | | Commitment, Punctuality & Professional Conduct | 20 |
| | | Monthly Progress Reviews & Logbook Maintenance | 25 |
| | | Skill Development & Application | 25 |
| | | Interim Report | 20 |
| | | **Total** | **90** |
| | **B** | **External Evaluation** | |
| | | **Components** | **Marks** |
| | | Feedback & Evaluation Report from Host Organization | 50 |
| | | Skill Demonstration / Summary of Work Exposure | 40 |
| | | Final Report / Learning Portfolio | 40 |
| | | Domain Knowledge and Experience Communication (Presentation) | 40 |
| | | Viva Voce | 40 |
| | | **Total** | **210** |

**Note:**

This assessment framework is intended as a guiding structure for evaluating apprenticeship performance. However, in order to remain responsive to the evolving needs of industry and society, the evaluation criteria may be revised from time to time. Such changes aim to enhance the relevance, effectiveness, and fairness of the assessment process.

# Department of Fisheries and Aquaculture

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

| | |
|---|---|
| **Faculty/ Discipline** | **Aquaculture** |
| **Programme** | **B.Voc (Honours) Commercial Aquaculture** |
| **Course Name** | **Research Internship** |
| **Type of Course** | **RIN** |
| **Course Code** | **25SACVCQ7SR401** |
| **Course Level** | **400-499** |
| **Summary** | As an integral requirement of the B.Voc. Honours with Research degree programme, the Research Internship is designed to provide students with hands-on exposure to real-world research practices in their designated skill domain. This component carries 20 academic credits and extends over a duration of 200 days. The internship must be undertaken in collaboration with a research organization, industry, or university department, under the mentorship of a qualified research guide.<br>The primary aim of this internship is to engage students in industry-linked research projects that allow them to apply theoretical knowledge to practical, domain-specific problems. Students are expected to work on meaningful research inquiries, contribute to data collection and analysis, develop critical thinking and problem-solving skills, and enhance their communication and documentation abilities. In addition to the research internship, students must earn 8 credits through Skill Development Courses (SDCs), specifically chosen for their research orientation, thereby reinforcing their academic and practical foundation.<br>This component not only contributes significantly to the academic rigor of the Honours with Research degree but also ensures a seamless transition from classroom learning to workplace research, preparing students for advanced |

| | | | | | |
|---|---|---|---|---|---|
| | studies or professional roles in their respective domains. | | | | |
| **Semester** | **7&8** | **Duration** | **200 days** | **Credits** | **20** |

## COURSE OUTCOMES (CO)

| CO No: | Expected Course Outcome | Learning Domains | PO No: |
|---|---|---|---|
| | Upon the successful completion of the course, the student will be able to | | |
| 1 | Demonstrate research aptitude and inquiry-based learning by actively engaging in real-time research projects. | S | PO1,PO2,PO10 |
| 2 | Apply academic knowledge in a professional research environment to bridge the gap between theory and real-world research practices. | A | PO2,PO3,PO6,PO10 |
| 3 | Strengthen domain-specific knowledge and technical competencies through systematic investigation and practical application. | S | PO1,PO2,PO3 |
| 4 | Address real-world research problems using problem-solving, analytical, and critical thinking skills. | S | PO1,PO2,PO6 |
| 5 | Communicate scientific ideas and findings effectively through research reports, documentation, and presentations. | S | PO4,PO8,PO10 |
| 6 | Collaborate with researchers and peer groups to gain exposure to interdisciplinary perspectives and collaborative learning practices. | S | PO2,PO3,PO5,PO10 |
| 7 | Demonstrate professional growth and readiness for higher education, entrepreneurship, or research-oriented careers. | I | PO5,PO9,PO10 |

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



| | | | |
|---|---|---|---|
| | **MODE OF ASSESSMENT** | | |
| | **A** | **Internal Evaluation** | |
| | | **Components** | **Marks** |
| | | Commitment, Punctuality & Professional Conduct | 10 |
| | | Monthly Progress Reviews & Logbook Maintenance | 15 |

| | | | |
|---|---|---|---|
| **Assessment Types** | | Skill Development & Application | 15 |
| | | Interim Report | 20 |
| | | **Total** | **60** |
| | **B** | **External Evaluation** | |
| | | **Components** | **Marks** |
| | | Feedback & Evaluation Report from Host Organization | 40 |
| | | Skill Demonstration / Summary of Work Exposure | 20 |
| | | Final Report / Learning Portfolio | 25 |
| | | Domain Knowledge and Experience Communication (Presentation) | 25 |
| | | Viva Voce | 30 |
| | | **Total** | **140** |

**Note:**

This assessment framework serves as a guiding structure for evaluating research internship performance. However, to remain responsive to the evolving needs of industry, academia, and society, the evaluation criteria may be revised periodically. Such revisions aim to enhance the relevance, effectiveness, and fairness of the overall assessment process.

# STUDY TOUR

A Study tour of minimum three days duration is recommended by the Board of Studies, during the third year of the B.Voc (Honours) programme. The Tour may be undertaken to public Aquariums, Aquaculture farms, Fish Processing and Aquaculture related enterprises/Industries/ locations or to reputed Government/ Private institutions/organizations related to the subject. The objectives of the study Tour are

1. **Enhancing learning:** Study tours can bring classroom concepts to life by allowing students to see and experience them firsthand. This can lead to a deeper understanding of the material and a stronger memory of what is learned
2. **Developing critical thinking:** Being exposed to new environments and cultures can challenge students to think outside the box and consider different perspectives.
3. **Building practical skills:** Study tours can provide opportunities for students to develop practical skills that may be difficult to learn in a classroom setting, such as communication, teamwork, and problem-solving.
4. **Increasing engagement:** A change of scenery from the traditional classroom can boost student engagement and motivation.

A study tour can be valuable learning experiences that complements classroom instruction and helps students develop a well-rounded understanding of the subject matter.

## LIST OF FACULTIES ATTENDED ONE DAY WORKSHOP ON MAHATMA GANDHI UNIVERSITY B. VOC (HONOURS) SYLLABUS FRAMING

| SL NO. | NAME | DESIGNATION |
|---|---|---|
| 1 | Dr. Sree Renjima G, Asst. Prof., Research Department of Fisheries and Aquaculture, St. Albert's College (Autonomous), Ernakulam. | Internal (Member) |
| 2 | Dr. Ambily V, Asst. Prof., Research Department of Fisheries and Aquaculture, St. Albert's College (Autonomous), Ernakulam. | Internal (Member) |
| 3 | Ms. Abhitha J Karun, Asst. Prof., Research Department of Fisheries and Aquaculture, St. Albert's College (Autonomous), Ernakulam. | Internal (Member) |
| 4 | Ms. Sharanya Manilal, Asst. Prof., Research Department of Fisheries and Aquaculture, St. Albert's College (Autonomous), Ernakulam. | Internal (Member) |