

HIGHER UNIVERSITY TECHNICIAN IN AQUACULTURE PROJECTS SPECIALIST

COURSE SYLLABUS WITH BREAKDOWN OF THEMATIC UNITS

1. Course	CULTURE OF MOLLUSKS
2. Competencies	To coordinate aquaculture production, based on established production systems and under a sustainable scheme, to contribute to the profitability of the organization, to preserve and to improve the social, economic and environmental surroundings.
3. Four Month Period	3
4. Practical Hours	70
5. Theoretical Hours	50
6. Total Hours	120
7. Week Total Hours Four Month Period	8
8. Course Objective	The student will cultivate mollusks of commercial interest, through specialized techniques, to contribute to the development of the regional aquaculture sector.

Theme Units	Hours		
	Practical	Theoretical	Totals
I. Introduction to Mollusks Cultivation	10	10	20
II. Bivalves Cultivation	50	20	70
III. Gastropods and Cephalopods Cultivation	10	20	30
Totals	70	50	120

WRITTEN BY: LANGUAGE COMMITTEE

APPROVED BY: C. G. U. T.

REVISED BY: ACADEMIC COMMISSION AND LIASON OF THE AREA

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F-CAD-SPE-28-PE-5B-01-A2

CULTURE OF MOLLUSKS

THEMATIC UNITS I

1. Theme Unit	I. Introduction to Mollusks Cultivation
2. Practical Hours	10
3. Theoretical Hours	10
4. Total Hours	20
5. Objective	The student will distinguish the morpho-physiological characteristics and importance of the main mollusks, for their aquaculture exploitation.

Themes	Learning to know	Learning to do	Learning to be
Background and importance of mollusks.	To describe historical aspects about the use of mollusks and their importance for mankind.		Synthesis and analysis ability. Punctual Observer Proactive
Systematics	To identify the main groups of mollusks of commercial interest and their characteristics: Bivalves, gastropods and cephalopods.	To classify at the genus level the mollusk species of aquaculture importance.	Synthesis and analysis ability Punctual Observer Proactive
Biology.	To describe the morphophysiological characteristics of mollusks. To explain the life cycle of mollusks.	To differentiate mollusks with aquaculture importance, based on their morpho-physiological structure.	Synthesis and analysis ability Punctual Observer Proactive

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CULTURE OF MOLLUSKS

Evaluation Process		
Learning outcomes	Learning sequence	Instruments and type of reagents
<p>To collect, from a field practice, specimens and to present a catalog of mollusks of aquaculture importance that should include:</p> <ul style="list-style-type: none"> - Taxonomic category to which it belongs. - Description of the morpho-physiological characteristics with diagrams and photographs. - Aquaculture importance of the species collected: ecological, economic and social. 	<ol style="list-style-type: none"> 1. To understand the historical background of mollusks. 2. To identify mollusks species of commercial interest and their morpho-physiological characteristics. 3. To understand the life cycle of mollusks with aquaculture importance. 4. To understand the ecological, economic and social importance of mollusks cultivation. " 	<p>Essays Checklist</p>

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CULTURE OF MOLLUSKS

Teaching Learning Process	
Methods and teaching techniques	Media and didactic materials
<ol style="list-style-type: none"> 1. Research tasks 2. Directed discussion 3. Field trips with in situ practice 	<ul style="list-style-type: none"> • Projector • Computer • Internet • Whiteboard • Material for collecting mollusks • Classification Guide

Learning Space		
Classroom	Laboratory / Workshop	Company
X		

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THEMATIC UNITS II

1. Theme Unit	II. Bivalves Cultivation
2. Practical Hours	50
3. Theoretical Hours	20
4. Total Hours	70
5. Objective	The student will cultivate bivalve mollusks of commercial interest at any stage of development, for their production and commercialization.

Themes	Learning to know	Learning to do	Learning to be
Conditioning of the breeders.	To explain the characteristics, parameters and procedures of selection and maturation techniques of bivalve mollusks breeders.	To select bivalve mollusks according to their morphological and genetic characteristics. To condition bivalve mollusks towards reproduction.	Synthesis and analysis ability Systematic Responsibility Self-Discipline Ethical Punctual Spot Meticulous Accurate Efficiency Observer Patient Proactive Organized Cautious
Reproduction.	To explain the characteristics, parameters and procedures of the techniques of induction to spawning and fertilization of bivalve mollusks.	To induce spawning and fecundation of bivalve mollusks.	Synthesis and analysis ability Systematic Responsibility Self-Discipline Ethical Punctual Spot Meticulous Accurate Efficiency Observer Patient Proactive Organized Cautious

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Themes	Learning to know	Learning to do	Learning to be
Larval cultivation.	<p>To explain the characteristics, parameters and procedures of management techniques in cultivation of the stages of larval development of bivalves:</p> <ul style="list-style-type: none"> - Trocophore cultivation technique. - Veliger cultivation technique. - Juvenile cultivation technique. 	To cultivate larvae of bivalve mollusks.	<p>Synthesis and analysis ability</p> <p>Systematic</p> <p>Responsibility</p> <p>Self-Discipline</p> <p>Ethical</p> <p>Punctual</p> <p>Spot Meticulous</p> <p>Accurate</p> <p>Efficiency</p> <p>Observer</p> <p>Patient</p> <p>Proactive</p> <p>Organized</p> <p>Cautious</p>
Pre-fattening.	To identify the characteristics, parameters and procedures of the pre-fattening bivalve mollusks methods and techniques.	To perform the pre-fattening of bivalve mollusks.	<p>Synthesis and analysis ability</p> <p>Systematic</p> <p>Responsibility</p> <p>Self-Discipline</p> <p>Ethical</p> <p>Punctual</p> <p>Spot Meticulous</p> <p>Accurate</p> <p>Efficiency</p> <p>Observer</p> <p>Patient</p> <p>Proactive</p> <p>Organized</p> <p>Cautious</p>

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Themes	Learning to know	Learning to do	Learning to be
Fattening.	To identify the characteristics, parameters and procedures of the methods and techniques of fattening bivalve mollusks.	To perform the fattening of bivalve mollusks.	Synthesis and analysis ability Systematic Responsibility Self-Discipline Ethical Punctual Spot Meticulous Accurate Efficiency Observer Patient Proactive Organized Cautious
Depuration.	To describe the characteristics, parameters and procedures of bivalve mollusks purification techniques.	To depurate bivalve mollusks.	Synthesis and analysis ability Systematic Responsibility Self-Discipline Ethical Punctual Spot Meticulous Accurate Efficiency Observer Patient Proactive Organized Cautious

CULTURE OF MOLLUSKS

Evaluation Process		
Learning outcomes	Learning sequence	Instruments and type of reagents
<p>From a series of bivalve mollusks cultivation practices, the student will integrate a technical report which should include:</p> <ul style="list-style-type: none"> - Description of the species and cultivation techniques applied in each one of the phases of the crop: - Conditioning - Reproduction - Larvae - Pre-fattening - Fattening - Depuration - Logbook according to the manual of good practices - Schemes and photographs - Discussion and conclusions, contrasting the results with parameters of the good manual practices. 	<ol style="list-style-type: none"> 1. To understand the techniques of selection and maturation of bivalve mollusks. 2. To understand the techniques of spawning and fertilization of bivalve mollusks. 3. To identify the techniques applicable in the larval stages of bivalve mollusks. 4. To understand the pre-fattening and fattening techniques of bivalve mollusks. 5. To identify the techniques of purification of bivalve mollusks. 	<p>Project Checklist</p>

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CULTURE OF MOLLUSKS

Teaching learning process	
Methods and teaching techniques	Media and didactic materials
Project-based learning Practical exercises Collaborative teams	Projector Computer Internet Whiteboard Freshwater and salt water quality kits. Refractometer Secchi disk Oximeter Thermometer Microscope Potentiometer Cultivation media. Measuring rack and counting laboratory equipment. Culture strains. Harvest nets of microalgae. Boats Capture glasses Trawl nets for phytoplankton Field equipment Buckets. Laboratory glassware.

Learning Space		
Classroom	Laboratory / Workshop	Company
	X	

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THEMATIC UNITS III

1. Theme Unit	III. Gastropods and Cephalopods Cultivation
2. Practical Hours	10
3. Theoretical Hours	20
4. Total Hours	30
5. Objective	The student will propose a process of cultivation of gastropod mollusks and cephalopods of commercial interest, to contribute to the aquaculture development of the region.

Themes	Learning to know	Learning to do	Learning to be
Gastropods	<p>To explain the process of selection and maturation of gastropod mollusks.</p> <p>To explain the processes of induction of spawning and fecundation of gastropod mollusks.</p> <p>To explain the management processes in larval cultivation of gastropods.</p> <p>To identify the fattening processes of gastropod mollusks.</p>	To propose methods of cultivation of gastropod species available in the region.	<p>Synthesis and analysis ability</p> <p>Systematic</p> <p>Ethical</p> <p>Punctual</p> <p>Observer</p> <p>Proactive</p> <p>Organized</p>
Cephalopods	<p>To explain the process of selection and maturation of cephalopod mollusks.</p> <p>To explain the processes of induction to the spawning and fertilization of cephalopod mollusks.</p> <p>To identify the fattening processes of cephalopod mollusks.</p>	To propose methods of cultivation of cephalopod species available in the region.	<p>Synthesis and analysis ability</p> <p>Systematic</p> <p>Ethical</p> <p>Punctual</p> <p>Observer</p> <p>Proactive</p> <p>Organized</p>

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CULTURE OF MOLLUSKS

Evaluation process		
Learning outcomes	Learning sequence	Instruments and type of reagents
<p>The student will elaborate a proposal for the process for the cultivation of gastropod mollusks or cephalopods of commercial interest, based on a documentary investigation, which should include:</p> <ul style="list-style-type: none"> - Description of the species - Process of selection and maturation - Method of spawning and fertilization - Larval cultivation method (if applicable) - Process of fattening - Justification and conclusions - Annex of bibliography. 	<ol style="list-style-type: none"> 1. To understand the processes of gastropod mollusks cultivation. 2. To understand the processes of cephalopod mollusks cultivation. 3. To identify the possibilities of application of gastropod and cephalopod cultivation in your region. 	<p>Project Checklist</p>

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Teaching learning process	
Methods and teaching techniques	Media and didactic materials
Project-based learning Research tasks Collaborative teams	Projector Computer Internet Whiteboard

Learning Space		
Classroom	Laboratory / Workshop	Company
X		

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CULTURE OF MOLLUSKS

CAPACITIES DERIVED FROM THE PROFESSIONAL COMPETENCES TO WHICH THE COURSE CONTRIBUTES

Capacity	Performance Criteria
To program the activities of the productive cycle according to the biology of the species, the demand of the product and the climatic conditions, to optimize the resources and to fulfill the goals of production.	To prepare a program of the productive cycle based on the manual of good practices for the respective specie or species which should contain: <ul style="list-style-type: none"> - planting period (climatic and biology of the species) - morphometric measurements of the organisms - homogenization of sizes of the organisms - harvest period - feeding schedules - water quality monitoring - water refills - disinfection activities of the infrastructure and the system - acquisition of supplies
To conditioning the aquaculture production system through cleaning, disinfection, filling and fertilization techniques and based on the productive program, to plant the organisms according to the requirements of the species.	To prepare a report of activities for the conditioning of the system, based on the production cycle schedule, the species and the aquaculture system, which should contain: <ul style="list-style-type: none"> - Materials and methods for cleaning and disinfection. - Materials and methods used for the conditioning of the system.
To supervise the reproduction process in aquaculture systems by means of the methodology corresponding to each species, considering good management practices, for obtaining larvae and post-larvae and offspring.	To write a reproduction logbook and reproduced species logbook according to the of good practices manual where the students reports the following data: <ul style="list-style-type: none"> - Selection of breeders - Number of breeders (males and females) - Systems density breeders, degree of gonadal maturation - physicochemical parameters of reproduction systems data for statistical control (date, time, number of the pond, number of eggs, biometrics, percentage of survival)
To direct the sowing process through the methodology corresponding to each species and considering good management practices, to start the production cycle and avoid economic losses.	To prepare a report on the transportation, arrival and sowing process based on the good practices manual, including: <ul style="list-style-type: none"> - Transportation: conditions of reception of organisms, number of organisms, size, weight, temperature, oxygen, legal documentation, preventive treatments, method and time of transport. - Arrival at the farm: tempering methodology, number of organisms, weight, sizes, planting densities, preventive treatments. - Sowing method.

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Capacity	Performance Criteria
<p>To verify the fattening process of aquaculture organisms through biometric, health, safety and nutrition techniques, based on good practices to contribute to the performance and quality of aquaculture production.</p>	<p>The student prepares logbooks of the fattening process of aquaculture organisms, based on good practices, which should include:</p> <ul style="list-style-type: none"> - Morphometric records - Records of physicochemical parameters of water quality. - Observations of the signs of internal or external injuries, diseases and behavior alterations - Record of feeding (percentages of protein, food ration, feed conversion and pellet size). - Mortality records - Preventive, corrective treatments and adjustments.
<p>To supervise the process of harvesting aquaculture products based on the established program, the methods and techniques corresponding to the species and good practices, to meet the requirements of the organization and the market.</p>	<p>To prepare a report on the process of harvesting aquaculture products, based on good practices, specifying:</p> <ul style="list-style-type: none"> - Harvesting techniques according to the species and stage of development - Indicators of compliance with the goals or objectives of the organization - Analysis and interpretation of indicators - Conclusions and recommendations

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CULTURE OF MOLLUSKS BIBLIOGRAPHY

Author	Year	Title	City	Country	Publisher
Sevilla, M.L.	1993	Las ostras de México	Mexico, D.F.	Mexico	AGT
Brusca, R y G. Brusca	2005	<i>Invertebrados</i>			Mc Graw Hill
Hickman C. P. Et al	2006	<i>Principios integrales de zoología</i>	Madrid	España	Mc Graw Hill

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