HIGHER UNIVERSITY TECHNICIAN IN AQUACULTURE
PROJECTS SPECIALIST

COURSE SYLLABUS WITH BREAKDOWN OF THEMATIC UNITS

1. Course	**Culture of Auxiliary Organisms**
2. Competencies	To direct the production of auxiliary organisms, based on the evaluation of the conditions of the Aquaculture systems, to contribute to the profitability of the organization.
3. Four Month Period	Second
4. Practical Hours	60
5. Theoretical Hours	30
6. Total Hours	90
7. Week Total Hours Four Month Period	6
8. Course Objective	The student will cultivate auxiliary organisms, through cultivation and harvesting techniques, according to the good practices in this field to contribute to the development of the sector.

Theme Units	Hours		
	Practical	**Theoretical**	**Total**
I. Fundamentals of Auxiliary Organism Cultivation		5	5
II. Culture of Microalgae	2	10	3
III. Rotifers	1	5	2
IV. Artemia	1	5	2
V. Copepods	1	5	1
Total	**60**	**30**	**90**

CULTURE OF AUXILIARY ORGANISMS

THEMATIC UNITS

1. Theme Unit	**I. Fundamental of Auxiliary Organism Cultivation**
2. Practical Hours	0
3. Theoretical Hours	5
4. Total Hours	5
5. Objectives	The student will identify the types and applications of cultivating auxiliary organism for its use in Aquaculture.

Themes	Learning to know	Learning to do	Learning to be
Basic concepts	Explain the background and concepts related to auxiliary organisms. Identify the main types of auxiliary organisms: microalgae, rotifers, artemia and copepods.		Analytical. Honest. Methodical. Proactive. Enthusiastic. Responsible. Ethical. Organized and Neat Teamwork. Assertive. Punctual
Applications of auxiliary organisms	Identify the applications of auxiliary organisms and the economic importance in: aquaculture, food industry, pharmaceutical industry, biofertilizers, water treatment, energy industry		Analytical. Honest. Methodical. Proactive. Enthusiastic. Responsible. Ethical. Organized and Neat Teamwork. Assertive. Punctual

CULTURE OF AUXILIARY ORGANISMS

Evaluation Process		
Learning outcome	**Learning sequences**	**Instruments and type of reagents**
Prepare a conceptual map that contains: - background - relevant species - applications in the aquaculture and industrial sector	1. Understand the background and concepts of auxiliary organisms 2. Identify the types of helper organisms 3. Identify the applications of auxiliary organisms	Essays Checklist

CULTURE OF AUXILIARY ORGANISMS

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic materials**
Research Task Directed Discussion Conceptual maps	Projector Computer Internet, Whiteboard

Learning Space		
Classroom	**Laboratory / Workshop**	**Company**
X		

CULTURE OF AUXILIARY ORGANISMS

THEMATIC UNITS

1. Theme Unit	**II. Culture of Microalgae**
2. Practical Hours	20
3. Theoretical Hours	10
4. Total Hours	30
5. Objective	The student will cultivate microalgae, for its utilization as food of species and the production of secondary metabolites.

Themes	Learning to know	Learning to do	Learning to be
Introduction	Identify the origin and general characteristics of microalgae in Aquaculture. Describe the applications of microalgae in the industry.		Analytical. Honest. Methodical. Proactive. Enthusiastic. Responsible. Ethical. Organized and Neat Teamwork. Assertive. Punctual
Biology of microalgae	Explain the process of photosynthesis in microalgae. Describe the biological characteristics of microalgae - taxonomy - morphology and physiology - reproduction	Classify at the level of the genus the microalgae more important in Aquaculture	Analytical. Honest. Methodical. Proactive. Enthusiastic. Responsible. Ethical. Organized and Neat Teamwork. Assertive. Punctual

Themes	Learning to know	Learning to do	Learning to be
Cultivation of microalgae	Identify the good practices of microalgae cultivation. Explain the techniques employed in microalgae cultivation: - Small scale cultivation technique: Interiors, laboratory. - Cultivation scaling technique - Technique of continuous cultivation: interior and exterior. Describe the methods of harvesting microalgae.	Cultivate microalgae	Analytical. Honest. Methodical. Proactive. Enthusiastic. Responsible. Ethical.

CULTURE OF AUXILIARY ORGANISMS

Evaluation Process		
Learning outcome	**Learning sequence**	**Instruments and type of reagents**
From a practical case, the student will cultivate a given species of microalgae and a technical report including the following aspects: - Biological characteristics: - Taxonomy - Morphology and physiology - Reproduction - Cultivation and harvesting technique	1. Identify the characteristics and applications of microalgae. 2. Identify the biological characteristics of microalgae. 3. Identify microalgae at the genus level. 4. Understand the good practices of the cultivation of microalgae. 5. Understand the techniques of cultivation and harvesting of microalgae.	Project Checklist

CULTURE OF AUXILIARY ORGANISMS

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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CULTURE OF AUXILIARY ORGANISMS

CAPACITIES DERIVED FROM THE PROFESSIONAL COMPETENCES TO WHICH THE COURSE CONTRIBUTES

Capacity	Performance Criteria
To diagnose the conditions of aquaculture systems through physicochemical and biological analysis techniques and historical records, to ensure the health, innocuousness and profitability of the production.	To prepare a report about the conditions under which an aquaculture system is found, that includes: - The steps for obtaining and processing the samples and their justification. - The analysis and interpretation of information (logs, histories, results analysis, laboratory reports). - Conclusions and recommendations.
To schedule aquaculture system conditioning activities, the product demand and climatic conditions, to optimize resources and meet production goals.	To elaborate a program of the productive cycle based on the manual of good practices that includes: - water quality monitoring - water refills - disinfection activities of the infrastructure and the system - acquisition of supplies
To supervise the operations of production of auxiliary organism cultured, based on the Manual of Good Practice, the characteristics of the species, to obtain live food.	To write a production log with the following data: - species - density of organisms - physicochemical parameters of production systems - data for statistical control (date, time, number of pond, percentage of survival) - harvesting techniques - indicators of compliance with goals and interpretation - Conclusions and recommendations

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 production goals.	To elaborate a program of the productive cycle based on the manual of good practices for the respective species or species and that includes: - 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 supervise the reproduction process in aquaculture systems by means of the methodology corresponding to each species, considering the good management practices, for obtaining larvae and post-larvae and offspring.	To write a reproduction log according to the manual of good practices and reproduced species where it reports the following data: - selection of reproductive species - number of reproductive species (males and females) - reproductive density in systems, 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 the 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, that includes: - 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 - Planting method.

Capacity	Performance Criteria
To verify the fattening process of the aquaculture organisms through biometric, health, innocuousness and nutrition techniques, based on the good practices to contribute to the performance and quality of aquaculture production.	To write a log of the fattening process of aquaculture organisms, based on the good practices, that includes: - 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, and corrective treatments and adjustments.
To supervise the process of harvesting aquaculture products based on the established program, the methods and techniques corresponding to the species and the good practices, to meet the requirements of the organization and the market.	To prepare a report on the harvesting process of aquaculture products, based on the good practices, specifying: - 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

CULTURE OF AUXILIARY ORGANISMS
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James P. McVey	(1993)	CRC Handbook of Mariculture, Volume I: Crustacean Aquaculture	New York	USA	CRC Press; 2 edition
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Amos Richmond	(2004)	*Handbook Of Microalgal Culture*	Oxford	OK	Blackwell
Harold C. Bold and Michael J. Wynne	(1997)	*Introduction to the algae*	New Jersey	USA	Benjamin-Cummings Po