HIGHER UNIVERSITY TECHNICIAN IN AQUACULTURE
PROJECTS SPECIALIST

COURSE SYLLABUS WITH BREAKDOWN OF THEMATIC UNITS

1. Course	**Water Quality.**
2. Competencies	Direct the production of auxiliary organism cultured, based on the conditions evaluation of the aquaculture systems to contribute to the profitability of the organization. Coordinate aquaculture production, based on established production systems and under a sustainable scheme, to contribute to the profitability of the organization, preserve and improve the social, economic and environmental surroundings. Develop sustainable aquaculture projects, based on market needs and established regulations, to contribute to the development of the sector.
3. Four Month Period	First
4. Practical Hours	75
5. Theoretical Hours	45
6. Total Hours	120
7. Week Total Hours Four Month Period	8
8. Course Objective	The student will determine the water quality of aquatic ecosystems through the analysis of water properties, considering the applicable regulations, to guarantee the effectiveness and viability of the system.

Theme Units	Hours		
	Practical	**Theoretical**	**Total**
I. Introduction to Aquatic Environment.	20	20	40
II. Water Chemistry.	40	20	60
III. Water Quality.	15	5	20
Total	**75**	**45**	**120**

WATER QUALITY

THEMATIC UNITS

1. Theme Unit	**I. Introduction to Aquatic Environment.**
2. Practical Hours	20
3. Theoretical Hours	20
4. Total Hours	40
5. Objective	The student will identify the physical, chemical and biological properties of water to understand its interactions in the aquatic environment.

Themes	Learning to Know	Learning to Do	Learning to Be
Basic concepts of water	To describe the concept of water. To identify the chemical composition of water.		Honesty Efficiency Responsibility Observer Systematic Confidentiality

Themes	Learning to Know	Learning to Do	Learning to Be
Characteristics and physical, chemical and biological properties of water.	To identify the physical properties of water: temperature, superficial tension, boiling point, freezing, fusion point, specific heat, capillarity, sublimation, density, viscosity, thermal and electrical conductivity, osmotic pressure, refractive index, condensation, vapor. To identify the chemical properties of water: saltiness, solubility, normality, molarity, ph alkalinity, oxygen dissolved, ammonium, hardness, nitrites, nitrates. To identify the biological properties of water: trophic interaction in the system, algae and aquatic grasses, phytoplankton, zooplankton, microbiological.	To measure the physical, chemical and biological variables.	Honesty Efficiency Responsibility Observer Systematic Confidentiality
Hydrologic cycle.	To identify the physical states of water within the hydrological cycle and its characteristics.	To demonstrate the physical states of water.	Honesty Efficiency Responsibility Observer Systematic Confidentiality

Themes	Learning to Know	Learning to Do	Learning to Be
Distribution and origin of water.	To identify the characteristics of salty, brackish and freshwater aquatic systems. To identify the causes that gave rise to the marine and continental basins. To identify water sources: - superficial: sea, lagoons, dams, rivers. - underground: aquifers, cenotes, underground rivers.	To locate water sources in your region and characterize them.	Honesty Efficiency Responsibility Observer Systematic Confidentiality
Uses of water	To identify the uses of water: Industrial, human consumption, biological. To explain the importance of the water quality in aquaculture.		Honesty Efficiency Responsibility Observer Systematic Confidentiality

WATER QUALITY

Evaluation Process		
Learning Outcomes	**Learning Sequence**	**Instruments and Type of Reagents**
- From a case study, the student will prepare a report that includes: - Water sample. - Values of the physical, chemical and biological variables. - Characteristics of the sampling source.	1. To identify the basic concepts of water. 2. To understand the interaction of the physical, chemical and biological properties of water. 3. To identify the physical states of water and their properties. 4. To identify the characteristics and properties of the water sources. 5. To identify the uses and importance of water in aquaculture.	Practical Exercises. Checklist.

WATER QUALITY

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic materials**
Practical Exercises Research Tasks Directed Debate	Projector Computer Internet Whiteboard Equipment and measuring instruments Laboratory equipment

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

WATER QUALITY

THEME UNITS

1. Theme Unit	**II. Water Chemistry.**
2. Practical Hours	40
3. Theoretical Hours	20
4. Total Hours	60
5. Objective	The student will identify the physical-chemical interactions of water, to promote water quality.

Themes	Learning to Know	Learning to Do	Learning to Be
Water Chemistry	To identify the molecular structure, types of chemical bonds and ions, cations and anions. To explain the changes in the chemical links in the water states. To identify the most important chemical elements in biological systems: C, H, O, N, P, Ca. To identify the concepts of solubility, solute, solvent.	To model the molecular structure of the physical states of water. Modeling chemical bonds of water.	Honesty Efficiency Responsibility Observer Systematic Confidentiality

Themes	Learning to Know	Learning to Do	Learning to Be
Water Interactions	To identify the physical-chemical interactions of water: ph, salinity, dissolved oxygen, alkalinity, CO2, ammonium, nitrites, nitrates, temperature, hardness, electrical conductivity, turbidity, phosphates, salts, contaminants, photosynthesis, eutrophication . To describe the law of the gases of Gay-Lussac.	To outline the physical-chemical interactions of water in a 24-hour cycle.	Honesty Efficiency Responsibility Observer Systematic Confidentiality
Stoichiometry	To explain the methods of balancing equations: grope, algebraic and oxide-reduction.	To balance equations. Prepare Solutions.	Honesty Efficiency Responsibility Observer Systematic Confidentiality

WATER QUALITY

Evaluation Process		
Learning Outcomes	**Learning Sequence**	**Instruments and Type of Reagents**
Based on a practical case of a 24-hour cycle, the student will prepare a report that includes: - Graphs of the parameters of the physicochemical interactions. - Proposal and procedure of modification of the parameters. - Calculation memory of the rolling of equations-results and conclusions.	1. To identify the molecular structure and chemical bonds of the physical states of water. 2. To identify the relevant chemical elements in biological systems. 3. To understand the interaction of the physicochemical properties of water. 4. To understand the methods of balancing equations and preparing solutions. 5. To adjust water quality parameters.	Practical Exercises. Checklist.

WATER QUALITY

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic materials**
Practical Exercises Research Tasks Directed Debate	Projector Computer Internet Whiteboard Equipment and measuring instruments Laboratory equipment

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

WATER QUALITY

THEME UNITS

1. Theme Unit	**III. Water Quality.**
2. Practical Hours	15
3. Theoretical Hours	5
4. Total Hours	20
5. Objective	The student will determine the water quality parameters, to prevent and solve contingencies.

Themes	Learning to Know	Learning to Do	Learning to Be
Water quality concepts.	To identify the concept of water quality in aquaculture. To identify the concepts waste, types of waste, drinking water, residual water.		Honesty Efficiency Responsibility Observer Systematic Confidentiality
Water quality parameters.	To identify the basic parameters of water quality in aquaculture.	To conduct water quality analysis. To determine the adjustments required to promote water quality.	Honesty Efficiency Responsibility Observer Systematic Confidentiality
Legal framework	To distinguish the official standards of water quality, drinking water, wastewater and its structure.		Honesty Efficiency Responsibility Observer Systematic Confidentiality

WATER QUALITY

Evaluation Process		
Learning Outcomes	**Learning Sequence**	**Instruments and Type of Reagents**
- The learner will develop a technical manual on water quality for aquaculture use that contains: - Measuring techniques of water quality variables. - Parameters of water quality. - Procedures for solving and preventing the most common contingencies related to water quality. - Regulations.	1. To identify the concepts related to water quality in aquaculture. 2. To analyze the parameters of water quality in aquaculture. 3. To identify the regulations applicable to water quality. 4. To prevent and solve water quality contingencies.	Project. Checklist.

WATER QUALITY

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic materials**
Practical Exercises Research Tasks Collaborative Teams	Projector Computer Internet Whiteboard Equipment and measuring instruments. Laboratory equipment. Standard and good practice manuals.

WATER QUALITY

CAPACITIES DERIVED FROM THE PROFESSIONAL COMPETENCES TO WHICH THE COURSE CONTRIBUTES

Capacity	Performance Criteria
To oversee the process of harvesting aquaculture products based on the established program, the methods, the techniques relevant to the species and the good practices to meet the requirements of the organization and the market.	- The student elaborates a report of the harvesting process of aquaculture products, supported by the good practices, specifying: - Harvesting techniques according to the species and stage of development. - Indicators of achievement of the goals or objectives of the organization. - Analysis and interpretation of indicators. - Conclusions and recommendations.
To supervise the production operations of auxiliary organism cultured, based on the handbook of good practices, the characteristics of the species, for obtaining live food.	- The learner integrates a production logbook with the following data: - Species. - Density of organisms. - Physicochemical parameters of production systems. - Data for statistical control (date, time, number of pond, survival percentage.) - Harvesting techniques. - Goals achievement indicators and interpretation. - Conclusions and recommendations.
To schedule aquaculture system conditioning activities, the product demand and climatic conditions, to optimize resources and to achieve production goals.	- The student elaborates a program of the productive cycle based on the manual of good practices, that contains: - Monitoring of water quality. - Water refill. - Activities of disinfection of the infrastructure and the system. - Supplies acquisition.

Capacity	Performance Criteria
To condition the aquaculture production system through cleaning, disinfection, filling and fertilization techniques and based on the productive program, to carry out the sowing of the organisms according to the requirements of the species.	- The graduate prepares a report of activities for the system conditioning, based on the timetable of the production cycle, the species and the aquaculture system, which contains: - Materials and methods for cleaning and disinfecting. - Materials and methods used for the system conditioning.
To direct the sowing process by means of the methodology corresponding to each species and considering the good management practices, to start the production cycle and to avoid economic losses.	- The learner prepares a report about the transportation, arrival and sowing process based on the handbook of good practices, which includes: - Transportation: conditions of reception of organisms, number of organisms, size, weight, temperature, oxygen, legal documentation, preventive treatments, method and time of transportation. - Arrival at the farm: Tempering methodology, number of organisms, weight, sizes, stocking densities, preventive treatments.
To verify the fattening process of aquaculture organisms through biometric, health, safety and food techniques, based on good practices to contribute to the performance and quality of aquaculture production.	- The student integrates logs of the fattening process of aquaculture organisms, based on good practices, including: - Records morphometric. - Records of physicochemical parameters of water quality. - Observations of the signs of internal or external injuries, diseases and alterations to the behavior. - Feeding register (percentages of protein, food ration, feed conversion and caliber of pellets). - Mortality Registers. - Preventive, corrective treatments and adjustments.

Capacity	Performance Criteria
To monitor the reproduction process in aquaculture systems using the methodology corresponding to every species considering the good management practices, for the obtaining of larvae, post larvae and offspring.	- The learner integrates a reproduction logbook according to the handbook of good practices and species reproduced where he/she reports the following data: - Breeding animal selection. - Number of breeding animals (males and females) - Breeding animals thickness in systems, grade of maturation gonadal. - Physicochemical parameters of reproduction systems. Information for statistical control (date, hour, number of pond, number of eggs, biometrics, percentage of survival)

WATER QUALITY

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