HIGHER UNIVERSITY TECHNICIAN IN AQUACULTURE
PROJECTS SPECIALIST
PROFESSIONAL COMPETENCIES

COURSE SYLLABUS WITH BREAKDOWN OF THEMATIC UNITS

1. Course	**HEALTH MANAGEMENT IN AQUACULTURE**
2. Competencies	Coordinate the aquaculture production, based on the established production systems and under a sustainable framework, to contribute to the profitability of the organization as well as to preserve and improve the environmental, social and economic surrounding.
3. Four Month Period	1
4. Practical Hours	52
5. Theoretical Hours	38
6. Total Hours	90
7. Week Total Hours Four Month Period	6
8. Course Objective	The student will implement good practices in the aquaculture value chain, based on the identification of pollutants and the analysis of risks and critical points, as well as the applicable regulations, to ensure the safety of by-products, products and supplies in Aquaculture.

Theme Units	Hours		
	Practical	Theoretical	Totals
I. Introduction to Health Management in Aquaculture	5	15	20
II. Pollution Sources	12	8	2
III. Risk Analysis and Good Practices	35	15	5
Totals	**52**	**38**	**90**

HEALTH MANAGEMENT IN AQUACULTURE

THEMATIC UNITS

1. Theme Unit	**I. Introduction to Health Management in Aquaculture**
2. Practical hours	0
3. Theoretical hours	8
4. Total Hours	8
5. Objective	The student will identify the importance of Health Management in Aquaculture. Its socioeconomic aspects as well as the diseases and risk factors, to diagnose, prevent, and cure the diseases in an aquaculture cultivation.

Themes	Learning to know	Learning to do	Learning to be
Background of Aquaculture Health Management	Identify the importance and the socioeconomic aspects, as well as the concepts and characteristics of Health Management in Aquaculture.		Honest Ethical Responsible Self-disciplined
Classification of diseases in Aquaculture	Identify the origin and classification of diseases in aquatic organisms.		Honest Ethical Responsible Self-disciplined
The organism and its environment	Identify the risk factors in the aquaculture systems that propitiate diseases in the organisms' cultivation.		Honest Ethical Responsible Self-disciplined

HEALTH MANAGEMENT IN AQUACULTURE

Evaluation Process		
Learning outcomes	**Learning sequence**	**Instruments and type of reagents**
The student will prepare a report including: - The importance and the socioeconomic aspects of Health Management in Aquaculture - A description of the classification of the diseases that affect the aquaculture sector. - The risk factors that cause diseases in the organisms cultured.	1. Understand the importance of Aquaculture Health Management and its socioeconomic aspects. 2. Understand the concepts of Aquaculture Health Management. 3. Understand the characteristics of Aquaculture Health Management. 4. Distinguish the origins and classification of aquaculture diseases 5. Distinguish the risk factors that cause diseases in an aquaculture cultivation.	Essay Checklist

HEALTH MANAGEMENT IN AQUACULTURE

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic material**
Case analysis Research tasks Group discussion	Projector Computer Internet Whiteboard Good Practice Manuals

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

HEALTH MANAGEMENT IN AQUACULTURE

THEMATIC UNITS

1. Theme Unit	**II. Mollusks Health Management.**
2. Practical Hours	10
3. Theoretical Hours	6
4. Total Hours	16
5. Objective	The student will make the diagnosis of the main diseases in a mollusk cultivation, for its prevention and control.

Themes	Learning to know	Learning to do	Learning to be
Viral diseases	Identify the signs of the main viral diseases in mollusks. Explain the techniques of prevention and control in viral diseases in mollusks.	Diagnose the main viral diseases in mollusks Propose alternatives for the prevention of viral diseases. Propose alternatives treatment of viral diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Patient Efficient
Bacterial diseases	Identify the signs of the main bacterial diseases in mollusks. Explain the techniques of prevention and control in bacterial diseases in mollusks	Diagnose the main bacterial diseases in mollusks Propose alternatives for the prevention of bacterial diseases Propose alternatives treatment of bacterial diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient

Themes	Learning to know	Learning to do	Learning to be
Fungal diseases	Identify the signs of the main fungal diseases in mollusks. Explain the techniques of prevention and control in fungal diseases in mollusks.	Diagnose the main fungal diseases in mollusks Propose alternatives for the prevention of fungal diseases. Propose alternatives treatment of fungal diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient
Parasitic diseases	Identify the signs of the main parasitic diseases in mollusks. Explain the techniques of prevention and control in parasitic diseases in mollusks	Diagnose the main parasitic diseases in mollusks Propose alternative for the prevention of parasitic diseases. Propose alternatives treatment of parasitic diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient
Nutritional diseases	Identify the signs of the main nutritional diseases in mollusks. Explain the techniques of prevention and control in nutritional diseases in mollusks.	Diagnose the main nutritional diseases in mollusks Propose alternatives for the prevention of nutritional diseases. Propose alternatives treatment of nutritional diseases	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient

HEALTH MANAGEMENT IN AQUACULTURE

Evaluation Process		
Learning outcomes	**Learning sequence**	**Instruments and type of reagents**
From a study case about mollusks cultivation, the student will write a report including: - Diagnosis : - Signs observed - Origin of the disease - Presumptive diagnosis - A proposal suggesting prevention and control of diseases as appropriate.	1. Identify the signs and origin of the main diseases in mollusks 2. Understand the procedure for the diagnosis of diseases in mollusks. 3. Identify the techniques for prevention and control of diseases in mollusks.	Case studies Checklist

HEALTH MANAGEMENT IN AQUACULTURE

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic material**
Research tasks In situ practice Case analysis	Computer Projector Whiteboard Internet Printed: Registration forms Log Sample-taking Material and laboratory analysis

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

HEALTH MANAGEMENT IN AQUACULTURE

THEMATIC UNITS

1. Theme Unit	**III. Crustaceans Health Management.**
2. Practical Hours	30
3. Theoretical Hours	10
4. Total Hours	40
5. Objective	The student will make the diagnosis of the main diseases in a crustaceans cultivation, for its prevention and control

Theme	Learning to know	Learning to do	Learning to be
Viral diseases	Identify the signs of the main viral diseases in crustaceans. Explain the techniques for prevention and control of viral diseases in crustaceans.	Diagnose the main viral diseases in crustaceans Propose alternatives for the prevention of viral diseases. Propose alternatives treatment of viral diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient
Bacterial diseases	Identify the signs of the main bacterial diseases in crustaceans. Explain the techniques for prevention and control of bacterial diseases in crustaceans.	Diagnose the main bacterial diseases in crustaceans Propose alternatives for the prevention of bacterial diseases. Propose alternatives treatment of bacterial diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient Meticulous

Themes	Learning to know	Learning to do	Learning to be
Fungal diseases	Identify the signs of the main fungal diseases in crustaceans. Explain the techniques for prevention and control of fungal diseases in crustaceans.	Diagnose the main fungal diseases in crustaceans Propose alternatives for the prevention of fungal diseases. Propose alternatives treatment of fungal diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient Meticulous
Parasitic diseases	Identify the signs of the main parasitic diseases in crustaceans. Explain the techniques for prevention and control of parasitic diseases in crustaceans.	Diagnose the main parasitic diseases in crustaceans Propose alternatives for the prevention of parasitic diseases. Propose alternatives treatment of parasitic diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient Meticulous
Nutritional diseases	Identify the signs of the main nutritional diseases in crustaceans. Explain the techniques for prevention and control of nutritional diseases in crustaceans.	Diagnose the main nutritional diseases in crustaceans Propose alternatives for the prevention of nutritional diseases. Propose alternatives treatment of nutritional diseases	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient Meticulous

HEALTH MANAGEMENT IN AQUACULTURE

Evaluation Process		
Learning outcomes	**Learning sequence**	**Instruments and type of reagents**
From a study case about crustaceans cultivation, the student will write a report including: - Diagnosis : - Signs observed - Origin of the disease - Presumptive diagnosis A proposal suggesting prevention and control of diseases as appropriate.	1. Identify the signs and origin of the main diseases in crustaceans. 2. Understand the procedure for the diagnosis of diseases in crustaceans. 3. Identify the techniques for prevention and control of diseases in crustaceans.	Case studies Checklist

HEALTH MANAGEMENT IN AQUACULTURE

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic materials**
Reseach tasks In situ Practice Case analysis	Computer Projector Whiteboard Internet Printed: Registration forms Log Sample-taking Material and laboratory analysis

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

HEALTH MANAGEMENT IN AQUACULTURE

THEMATIC UNITS

6. Theme Unit	**IV. Fish Health Management.**
7. Practical hours	30
8. Theoretical hours	10
9. Total hours	40
10. Objective	The student will make the diagnosis of the main diseases in a fish cultivation, for its prevention and control

Themes	Learning to know	Learning to do	Learning to be
Viral diseases	Identify the signs of the main viral diseases in fish. Explain the techniques for prevention and control of viral diseases in fish.	Diagnose the main viral diseases in fish Propose alternatives for the prevention of viral diseases. Propose alternatives treatment of viral diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient Meticulous
Bacterial diseases	Identify the signs of the main bacterial diseases in fish. Explain the techniques for prevention and control of bacterial diseases in fish.	Diagnose the main bacterial diseases in fish Propose alternatives for the prevention of bacterial diseases. Propose alternatives treatment of bacterial diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient Meticulous

Themes	Learning to know	Learning to do	Learning to be
Fungal diseases	Identify the signs of the main fungal diseases in fish. Explain the techniques for prevention and control of fungal diseases in fish.	Diagnose the main fungal diseases in fish Propose alternatives for the prevention of fungal diseases. Propose alternatives treatment of fungal diseases.	Meticulous Patient Punctual Observer Systematic Analytical and synthesis ability Organized Ethical
Parasitic diseases	Identify the signs of the main parasitic diseases in fish. Explain the techniques for prevention and control of parasitic diseases in fish.	Diagnose the main parasitic diseases in fish Propose alternatives for the prevention of parasitic diseases. Propose alternatives treatment of parasitic diseases.	
Nutritional diseases	Identify the signs of the main nutritional diseases in fish. Explain the techniques for prevention and control of nutritional diseases in fish.	Diagnose the main nutritional diseases in fish Propose alternatives for the prevention of nutritional diseases. Propose alternatives treatment of nutritional diseases	

HEALTH MANAGEMENT IN AQUACULTURE

Evaluation Process		
Learning outcomes	**Learning sequence**	**Instruments and type of reagents**
From a study case about fish cultivation, the student will write a report including: - Diagnosis : - Signs observed - Origin of the disease - Presumptive diagnosis A proposal suggesting prevention and control of diseases as appropriate.	1. Identify the signs and origin of the main diseases in fish. 2. Understand the procedure for the diagnosis of diseases in fish. 3. Identify the techniques for prevention and control of diseases in fish.	Case studies Checklist

HEALTH MANAGEMENT IN AQUACULTURE

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic materials**
Reseach tasks In situ Practice Case analysis	Computer Projector Whiteboard Internet Printed: Registration forms Log Sample-taking Material and laboratory analysis

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

HEALTH MANAGEMENT IN AQUACULTURE

THEMATIC UNITS

1. Theme Unit	**V. Amphibians and Reptiles Health Management.**
2. Practical Hours	10
3. Theoretical Hours	6
4. Total Hours	16
5. Objective	The student will make the diagnosis of the main diseases in amphibians and reptiles cultivation, for its prevention and control

Themes	Learning to know	Learning to do	Learning to be
Viral diseases	Identify the signs of the main viral diseases in amphibians and reptiles. Explain the techniques for prevention and control of viral diseases in amphibians and reptiles.	Diagnose the main viral diseases in amphibians and reptiles. Propose alternatives for the prevention of viral diseases. Propose alternatives treatment of viral diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient Meticulous
Bacterial diseases	Identify the signs of the main bacterial diseases in amphibians and reptiles. Explain the techniques for prevention and control of bacterial diseases in amphibians and reptiles.	Diagnose the main bacterial diseases in amphibians and reptiles. Propose alternatives for the prevention of bacterial diseases. Propose alternatives treatment for bacterial diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient Meticulous

Themes	Learning to know	Learning to do	Learning to be
Fungal diseases	Identify the signs of the main fungal diseases in amphibians and reptiles. Explain the techniques for prevention and control of fungal diseases in amphibians and reptiles.	Diagnose the main fungal diseases in amphibians and reptiles. Propose alternatives for the prevention of fungal diseases. Propose alternatives treatment of fungal diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient Meticulous
Parasitic diseases	Identify the signs of the main parasitic diseases in amphibians and reptiles. Explain the techniques for prevention and control of parasitic diseases in amphibians and reptiles.	Diagnose the main parasitic diseases in amphibians and reptiles. Propose alternatives for the prevention of parasitic diseases. Propose alternatives treatment of parasitic diseases.	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient Meticulous
Nutritional diseases	Identify the signs of the main nutritional diseases in amphibians and reptiles. Explain the techniques for the prevention and control of nutritional diseases in amphibians and reptiles.	Diagnose the main nutritional diseases in amphibians and reptiles. Propose alternatives for the prevention of nutritional diseases. Propose alternatives treatment of nutritional diseases	Analytical and synthesis ability Systematic Observer Ethical Methodical Systematic Patient Efficient Meticulous

HEALTH MANAGEMENT IN AQUACULTURE

Evaluation Process		
Learning outcomes	**Learning sequence**	**Instruments and type of reagents**
From a study case about amphibian and reptile cultivation, the student will write a report including: - Diagnosis : - Signs observed - Origin of the disease - Presumptive diagnosis A proposal suggesting prevention and control of diseases as appropriate.	1. Identify the signs and origin of the main diseases in amphibians and reptiles. 2. Understand the procedure for the diagnosis of diseases in amphibians and reptiles. 3. Identify the techniques for prevention and control of diseases in amphibians and reptiles.	Case studies Checklist

HEALTH MANAGEMENT IN AQUACULTURE

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic materials**
Reseach tasks In situ Practice Case analysis	Computer Projector Whiteboard Internet Printed: Registration forms Log Sample-taking Material and laboratory analysis

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

HEALTH MANAGEMENT IN AQUACULTURE

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 inspect the operating conditions of the productive process through the analysis of the infrastructure, personnel and supplies, based on good management practices, to contribute to the quality of production.	Prepare an evaluation file according to the guidelines of the good practices manual for the respective species or species that includes: - The internal verification forms of good production practices duly completed - Formats of corrective recommendations for non-conformities detected - Schedule of corrections.
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

Capacity	Performance Criteria
To supervise the operations of production of auxiliary organism cultured based on the manual of good practices, 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
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: - harvesting 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).

Capacity	Performance Criteria
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.
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.

HEALTH MANAGEMENT IN AQUACULTURE

BIBLIOGRAPHY

Author	Year	Title	City	Country	Publisher
Boyd, C.	1999	*Codes of Practice for Responsible Shrimp Farming*		USA.	
Derrick, S. and M. Dillon	2004	*A guide to traceability within the fish industry.*	*Grimsby*	U.K.	*Humber Institute Food & Fisherie*
Lee, J.S	1991	*Commercial Catfish Farming.*	Illinois	USA	*Interstate Publishers, Inc*
Marín Zaldivar, L., A. Pérez Velásquez, E. Bermúdez Rodríguez y O. Loaiza Jiménez.	2000	*Cultivo de bagre. Estado de Salud de la Acuacultura.*	Distrito Federal	México	*Instituto Nacional de Pesca-DGIA*
Otwell, S., Garrido, L., Garrido, V. y R. Benner.	2001	*Camarón de Cultivo. Buenas Prácticas de Acuacultura para la Calidad e SANIDAD del Producto*	Florida	USA	
Secretaría de Salud	2000	*Guía de Análisis de Riesgos, Identificación y Control de Puntos Críticos*	Distrito Federal	México	Dirección General Sanitaria de Bienes y Servicio.