

**HIGHER UNIVERSITY TECHNICIAN IN AQUACULTURE  
PROJECTS SPECIALIST  
PROFESSIONAL COMPETENCIES**

**COURSE SYLLABUS WITH BREAKDOWN OF THEMATIC UNITS**

<b>1. Course Name</b>	<b>Safety in Aquaculture</b>
<b>2. Competencies</b>	Conduct the production of auxiliary organisms cultured, based on the evaluation of the conditions of the Aquaculture systems, to contribute to the profitability of the organization.
<b>3. Four Month Period</b>	Second
<b>4. Practical Hours</b>	52
<b>5. Theoretical Hours</b>	38
<b>6. Total Hours</b>	90
<b>7. Week total Hours Four Month Period</b>	6
<b>8. Course Objective</b>	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	Total
<b>I. Introduction to Safety in Aquaculture</b>	5	15	2
<b>II. Pollution Sources</b>	1	8	2
<b>III. Risk Analysis and Good Practices</b>	3	15	5
<b>Totals</b>	<b>52</b>	<b>38</b>	<b>90</b>

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**REVISED BY:** ACADEMIC AND LIAISON COMMISSION OF THE AREA  
**EFFECTIVE DATE:** SEPTEMBER 2010

# SAFETY IN AQUACULTURE

## THEMATIC UNITS

<b>1. Thematic Unit</b>	<b>I. Introduction to Safety in Aquaculture</b>
<b>2. Practical Hours</b>	5
<b>3. Theoretical Hours</b>	15
<b>4. Total Hours</b>	20
<b>5. Objective</b>	The student will determine the applicable safety regulations in order to contribute to its compliance with the production stages of the aquaculture value chain.

<b>Theme</b>	<b>Learning to know</b>	<b>Learning to do</b>	<b>Learning to be</b>
Safety background	Identify the concept and characteristics of safety  Identify causes and effects of pollution in aquaculture products.  Identify the importance of offering unsafety products of aquaculture origin and the relationship with food quality.		Honest Analytical and synthesis ability Systematic Responsible Self-disciplined Ethical

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Themes	Learning to know	Learning to do	Learning to be
National and international regulatory agencies	<p>Identify regulatory agencies related to the sanitary quality and safety of aquaculture products, and their authority:</p> <ul style="list-style-type: none"> <li>- Food and Agriculture Organization of the United Nations (FAO)</li> <li>- Federal Drug Administration (FDA)</li> <li>- Ministry of Environment and Natural Resources (SEMARNAT)</li> <li>- Public Health Department (SSA)</li> <li>- Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA)</li> <li>- National Commission on Aquaculture and Fisheries (CONAPESCA)</li> <li>- Service for the National Health for Food Safety and Food Quality (SENASICA)</li> </ul>		<p>Honest Analytical and synthesis ability Systematic Responsible Self-disciplined Ethical</p>

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Themes	Learning to know	Learning to do	Learning to be
Regulations on Aquaculture safety	Identify national and international regulations enforced in the aquaculture field related to safety in the areas of: <ul style="list-style-type: none"> <li>- Production</li> <li>- Transportation</li> <li>- Supplies</li> <li>- Process</li> <li>- Commercialization</li> <li>- Environmental</li> <li>- Infrastructure</li> <li>- Importation and exportation</li> <li>- Water quality, food, breeding</li> <li>- Breeding</li> <li>- Unloading</li> </ul>	Determine the applicable regulations regarding safety in a given situation.	Honest Analytical and synthesis ability Systematic Responsible Self-disciplined Ethical

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## SAFETY IN AQUACULTURE

Evaluation Process		
Learning outcomes	Learning sequences	Instruments and type of reagents
<p>From a study case about aquaculture supply chain, the student will prepare a report including:</p> <ul style="list-style-type: none"> <li>- The regulatory agencies involved</li> <li>- Applicable regulations</li> <li>- Actions to be considered according to the applicable regulations</li> </ul>	<ol style="list-style-type: none"> <li>1. Understand the concept of aquaculture safety and its importance.</li> <li>2. Identify national and international regulatory agencies involved in the aquaculture value chain.</li> <li>3. Identify the regulations regarding safety in the aquaculture value chain.</li> <li>4. Relate the regulations regarding safety with aquaculture production.</li> </ol>	<p>Case study Checklist</p>

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# SAFETY IN AQUACULTURE

Teaching Learning Process	
Methods and teaching techniques	Media and didactic materials
Case analysis Research tasks Directed Discussion	Projector Computer Internet Whiteboard Good Practice Manuals

Learning Space		
Classroom	Laboratory / Workshop	Company
X		

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# SAFETY IN AQUACULTURE

## THEMATIC UNITS

<b>1. Theme Unit</b>	<b>II. Pollution Sources</b>
<b>2. Practical Hours</b>	12
<b>3. Theoretical Hours</b>	8
<b>4. Total Hours</b>	20
<b>5. Objective</b>	The student will determine the sources of physical, chemical and biological contamination, to contribute to the safety of aquaculture by-products, products and supplies.

Themes	Learning to know	Learning to do	Learning to be
Main sources of physical contamination	Identify the main sources of physical contamination of aquaculture by-products, products and supplies before being processed, during processing and distribution: wood, plastic, dust.	Determine the presence of physical contaminants and their sources in aquaculture by-products, products and supplies.	Synthesis and analysis ability Systematic Observer Ethical Methodical
Main sources of chemical contamination	Identify the main sources of chemical contamination of aquaculture by-products, products, and supplies before being processed, during their processing and distribution: Heavy metals, pesticides and drugs.	Determine the presence of physical contaminants and their sources in aquaculture by-products, products, and supplies.	Synthesis and analysis ability Systematic Observer Ethical Methodical

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Themes	Learning to know	Learning to do	Learning to be
Main sources of biological contamination	Identify the main sources of microbiological contamination of aquaculture by-products, products, and supplies before being processed, during processing and distribution: Bacteria, fungi, viruses and parasites.	Determine the presence of biological contaminants and their sources in aquaculture by-products, products, and supplies.	Synthesis and analysis ability Systematic Observer Ethical Methodical
Preservation methods	Describe the main methods about the preservation of aquaculture by-products, products and supplies regarding safety: Freezing, smoked, salted, packed, chilled, alive.	Select the preservation method according to the aquaculture product.  Preserve aquaculture by-products, products, and supplies.	Synthesis and analysis ability Systematic Observer Ethical Methodical

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# SAFETY IN AQUACULTURE

Evaluation Process		
Learning outcomes	Learning sequence	Instruments and type of reagents
<p>From a study case about the aquaculture value chain, the student will prepare a report including:</p> <ul style="list-style-type: none"> <li>- Contamination sources</li> <li>- Identified contaminants</li> <li>- Methods of preservation by-products, products, and supplies.</li> </ul>	<ol style="list-style-type: none"> <li>1. Distinguish sources of physical, chemical and biological contamination in the aquaculture value chain.</li> <li>2. Relate sources of contamination with each stage of the aquaculture value chain.</li> <li>3. Understand methods of preservation of aquaculture products and their relationship regarding safety.</li> </ol>	<p>Case study Checklist</p>

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# SAFETY IN AQUACULTURE

Teaching learning process	
Methods and teaching techniques	Media and didactic materials
Research tasks In situ practice Case analysis	Computer Projector Whiteboard Internet Printed: Registration forms Logs

Learning Space		
Classroom	Laboratory / Workshop	Company
X		X

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# SAFETY IN AQUACULTURE

## THEMATIC UNITS

<b>1. Thematic Unit</b>	<b>III. Risk Analysis and Good Practices</b>
<b>2. Practical Hours</b>	35
<b>3. Theoretical Hours</b>	15
<b>4. Total Hours</b>	50
<b>5. Objective</b>	The student will propose corrective actions and toward improvement to contribute to the safety of aquaculture by-products, products and supplies.

Themes	Learning to know	Learning to do	Learning to be
Risk analysis	Identify the structure and application of the Hazard Analysis and Critical Control Points (HACCP) methodology: <ul style="list-style-type: none"> <li>- Risk Analysis</li> <li>- Determine the critical control points (CCP)</li> <li>- Establish critical limits of CCP</li> <li>- Establish monitoring systems for the control of CCP</li> <li>- Establish corrective actions</li> <li>- Establish HACCP verification procedures</li> <li>- Systems of documentation</li> </ul>	Determine critical control points of an aquaculture production process	Careful Patient Tolerant Punctual Proactive Observer Systematic Synthesis and analysis ability

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Themes	Learning to know	Learning to do	Learning to be
Traceability	Describe the concept of traceability and its importance  Explain the procedure and controls of traceability:  Transparency of the product marketing chain, Documentary controls	Propose traceability controls for aquaculture by-products, products, and supplies.  Schematize the traceability of aquaculture by-product, product and supplies.	Careful Patient Punctual Observer Systematic Synthesis and analysis ability Organized
GPAP (BPPA) (Good Practices in Aquaculture Products)	Identify good aquaculture production practices for food safety:  - Production - Processing - Marketing  Explain the structure of the manuals and the verification instruments of the GPAP (BPPA)	Verify the compliance of the GPAP (BPPA)  Determine the corrective actions and toward improvement of the aquaculture production in pursuant of the GPAP (BPPA).	Careful Patient Punctual Observer Systematic Synthesis and analysis ability Organized Ethical

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Evaluation Process		
Learning outcomes	Learning sequence	Instruments and type of reagents
<p>From a study case of the aquaculture value chain, the student will prepare a report including:</p> <ul style="list-style-type: none"> <li>- Critical control points</li> <li>- Flow diagram of the traceability's process</li> <li>- Proposal of traceability's formats for every stage of the process that it may require it</li> <li>- Required GPAP (BPPA) verification formats</li> <li>- Non-conformities identified</li> <li>- Corrective action program</li> </ul>	<ol style="list-style-type: none"> <li>1. Understand the Analysis and Critical Control Points (HACCP) methodology</li> <li>2. Understand the concept of traceability and its importance</li> <li>3. Understand the GPAP (BPPA) and the importance of its implementation.</li> <li>4. Propose corrective actions and toward improvement.</li> </ol>	<p>Study case Checklist</p>

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		X

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# SAFETY IN AQUACULTURE

## CAPACITIES DERIVED FROM THE PROFESSIONAL COMPETENCES TO WHICH THE COURSE CONTRIBUTES

Capacity	Performance Criteria
<p>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.</p>	<p>To prepare a report about the conditions under which an aquaculture system is found, that includes:</p> <ul style="list-style-type: none"> <li>- The steps for obtaining and processing the samples and their justification.</li> <li>- The analysis and interpretation of information (logs, histories, results analysis, laboratory reports).</li> </ul> <p>Conclusions and recommendations.</p>
<p>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.</p>	<p>Prepare an evaluation file according to the guidelines of the good practices manual for the respective species or species that includes:</p> <ul style="list-style-type: none"> <li>- The internal verification forms of good production practices duly completed</li> <li>- Formats of corrective recommendations for non-conformities detected</li> <li>- Schedule of corrections.</li> </ul>
<p>To schedule aquaculture system conditioning activities, the product demand and climatic conditions, to optimize resources and meet production goals.</p>	<p>To elaborate a program of the productive cycle based on the manual of good practices that includes:</p> <ul style="list-style-type: none"> <li>- water quality monitoring</li> <li>- water refills</li> <li>- disinfection activities of the infrastructure and the system</li> <li>- acquisition of supplies</li> </ul>

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Capacity	Performance Criteria
<p>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</p>	<p>To write a production log with the following data:</p> <ul style="list-style-type: none"> <li>- species</li> <li>- density of organisms</li> <li>- physicochemical parameters of production systems</li> <li>- data for statistical control (date, time, number of pond, percentage of survival)</li> <li>- harvesting techniques</li> <li>- indicators of compliance with goals and interpretation               <ul style="list-style-type: none"> <li>- Conclusions and recommendations</li> </ul> </li> </ul>
<p>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</p>	<p>To elaborate a program of the productive cycle based on the manual of good practices for the respective species or species and that includes:</p> <ul style="list-style-type: none"> <li>- planting period (climatic and biology of the species)</li> <li>- morphometric measurements of the organisms</li> <li>- homogenization of sizes of the organisms</li> <li>- harvest period</li> <li>- feeding schedules</li> <li>- water quality monitoring</li> <li>- water refills</li> <li>- disinfection activities of the infrastructure and the system</li> <li>- acquisition of supplies</li> </ul>

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Capacity	Performance Criteria
<p>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.</p>	<p>To write a reproduction log according to the manual of good practices and reproduced species where it reports the following data:</p> <ul style="list-style-type: none"> <li>- selection of reproductive species</li> <li>- number of reproductive species (males and females)</li> <li>- reproductive density in systems, degree of gonadal maturation</li> <li>- physicochemical parameters of reproduction systems</li> <li>- data for statistical control (date, time, number of the pond, number of eggs, biometrics, percentage of survival).</li> </ul>
<p>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.</p>	<p>To prepare a report on the transportation, arrival and sowing process based on the good practices manual, that includes:</p> <ul style="list-style-type: none"> <li>- Transportation: conditions of reception of organisms, number of organisms, size, weight, temperature, oxygen, legal documentation, preventive treatments, method and time of transport.</li> <li>- Arrival at the farm: tempering methodology, number of organisms, weight, sizes, planting densities, preventive treatments</li> <li>- Planting method.</li> </ul>

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Capacity	Performance Criteria
<p>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.</p>	<p>To write a log of the fattening process of aquaculture organisms, based on the good practices, that includes:</p> <ul style="list-style-type: none"> <li>- Morphometric records.</li> <li>- Records of physicochemical parameters of water quality.</li> <li>- Observations of the signs of internal or external injuries, diseases and behavior alterations.</li> <li>- Record of feeding (percentages of protein, food ration, feed conversion and pellet size).</li> <li>- Mortality records</li> <li>- Preventive, and corrective treatments and adjustments.</li> </ul>

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## Bibliography

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

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