HIGHER UNIVERSITY TECHNICIAN IN AQUACULTURE
PROJECTS SPECIALIST

COURSE SYLLABUS WITH BREAKDOWN OF THEMATIC UNITS

1. Course Name	**Mathematics**
2. Competencies	Direct the production of auxiliary crops, 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	38
5. Theoretical Hours	22
6. Total Hours	60
7. Week Total Hours Four Month Period	4
8. Course Objective	The student will solve problems of the aquaculture area, using methods and mathematical reasoning, to contribute to the decision making process.

Theme Units	Hours		
	Practical	**Theoretical**	**Totals**
I. Set Theory	7	3	1
II. Trigonometry	7	3	1
III. Algebra	12	8	2
IV. Basic Functions and their Graphs	12	8	2
Totals	**38**	**22**	**60**

MATHEMATICS

THEMATIC UNITS

1. Theme Unit	**I. Set Theory**
2. Practice Hours	7
3. Theoretical Hours	3
4. Total Hours	10
5. Objective	The student will solve problems using operations with real numbers, intervals and percentages, based on their rules, to interpret the phenomena of aquaculture production.

Themes	Learning to know	Learning to do	Learning to be
Definition and Types of sets	Recognize the definition of sets by extension and comprehension	Categorize a group of objects of particular interest.	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest
Set Operations	Recognize the basic operations of sets (union, intersection, complement and difference) and graphic representation	Calculate the basic operations of sets Determine a simple size Represent sets graphically	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest
Real Numbers	Recognize the definition and classification of real numbers. Identify the domains and codomains by means of inequality.	Calculate domains and codomains of functions.	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest

Themes	Learning to know	Learning to do	Learning to be
Operations with Fractions	Recognize basic operations: addition, subtraction, multiplication, division, exponentiation and radical.	Solve problems using basic operations.	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest Deductive Reasoning
Ratios and Proportions	Recognizing direct variation: the rule of three and percentages	Calculate a proportional part of the direct variation Calculate proportions	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest

MATHEMATICS

Evaluation Process		
Learning outcomes	**Learning sequences**	**Instruments and type of reagents**
Solve an exercise booklet related to aquaculture production, containing 10 exercises of each topic: • Categorization of object group and operations with them. • Fundamental arithmetic operations with fractions • Operation with proportions applying the rule of three and percentages.	1. Understand the concept of set. 2. Understand the procedure to calculate fundamental operations with sets. 3. Understand the concepts of real numbers, domain and codomain. 4. Understand the procedure to calculate fundamental operations with real numbers 5. Calculate direct variations.	Practical exercises Checklist

MATHEMATICS

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic materials**
Solving Problems Teamwork Demonstrative Practice	Whiteboard, Projector, Computer equipment

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

MATHEMATICS

THEMATIC UNITS

1. Theme Unit	**II. Trigonometry**
2. Practical Hours	7
3. Theoretical Hours	3
4. Total Hours	10
5. Objective	The student will solve problems using trigonometry and operations with complex numbers, to develop projects in the aquaculture field.

Themes	Learning to know	Learning to do	Learning to be
Right Triangle	Recognize the types of triangles. Mention the characteristics of the right triangle.	Calculate the area of the right triangle. Formulate the characteristics of the right triangles.	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest Deductive Reasoning
Pythagorean Theorem	Describe the Pythagorean Theorem.	Calculate the sides of a right triangle using the Pythagorean theorem.	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest Deductive Reasoning
Trigonometric Functions	Describe the trigonometric functions in relation to their parameters.	Obtain the trigonometric ratios of a right triangle: Sine, Cosine, Tangent	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest Deductive Reasoning

MATHEMATICS

Evaluation Process		
Learning outcomes	**Learning sequence**	**Instruments and type of reagents**
Prepare a technical report that contains the formulation and solution of a practical problem relating the concepts of: • Triangle, • Pythagorean Theorem and, • Trigonometric Function.	1. Understand the properties and characteristics of the right triangle. 2. Identify the trigonometric functions. 3. Understand the concepts of complex numbers and its representation. 4. Formulate operations with complex numbers and its representation.	Implementation tasks. Checklist.

MATHEMATICS

Teaching learning process	
Methods and teaching techniques	**Media and didactic materials**
Demonstrative practice. Collaborative teams Practical Exercises	Whiteboard. Projections. Computer with software.

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

MATHEMATICS

THEMATIC UNITS

1. Theme Unit	**III. Algebra**
2. Practical Hours	12
3. Theoretical Hours	8
4. Total Hours	20
5. Objective	The student will use algebraic operations to solve basic problems in the aquaculture production.

Themes	Learning to know	Learning to do	Learning to be
Algebraic Expressions and their Operations	Identify the algebraic terms: monomial and polynomial Recognize the fundamental operations of algebra: addition, subtraction, multiplication and division.	Formulate problems with algebraic notation. Solve fundamental algebraic operations	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest Deductive Reasoning
Product Notation	Recognize the product notation that are made in a fast way without formulating the operation	Solve problems using product notation	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest Deductive Reasoning
Factorization	Recognize operations in which is possible to extract the factors to simplify the problem	Reduce problems to its most basic form	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest
First and Second Degree Equations	Identify the structure of first and second degree equations. Describe the methods of solving first and second degree equations	Solve problems with Equations of first and second degree	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest Deductive Reasoning

MATHEMATICS

Evaluation Process		
Learning outcomes	**Learning sequence**	**Instruments and types of reagents**
Solve an exercise booklet related to aquaculture production, containing 10 exercises of each topic: • Polynomial operations. • Product notation y factorization. • Solving first and second degree problems	1. Recognize the algebraic terms 2. Understand the procedure to calculate monomial and polynomial operations 4. Understand the methods of product notation and factorization. 5. Understand the procedure to solve first and second degree equations. 6. Solve problems with first and second degree equations.	Practical exercises Checklist

MATHEMATICS

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic materials**
Solving Problems Teamwork Demonstrative practice.	Whiteboard, Projector, Computer equipment

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

MATHEMATICS

THEMATIC UNITS

1. Theme Unit	**IV. Basic Functions and their Graphs**
2. Practical Hours	12
3. Theoretical Hours	8
4. Total Hours	20
5. Objective	The student will calculate linear, logarithmic and/or exponential function, based on its evaluations and graphs to solve problems estimating the behavior of an associated phenomenon.

Themes	Learning to know	Learning to do	Learning to be
Rectangular Coordinates	Recognize the coordinates in the Cartesian plane, Identify the graphical representation of data and equations.	Represent coordinates in the Cartesian plane. Represent Graph data and equations.	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest Deductive Reasoning
Functions	Explain the concept of function and graphic representation.	Calculate operations with functions. Represent graphically a function.	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest Deductive Reasoning
Logarithmic and Exponential Functions	Identify the concept, types and application of logarithms. Explain the concept of logarithmic function and graphic representation.	Represent in a graph an exponential behavior Interpret a logarithmic function	Autonomous Learner Concentration, Methodical, Analytical, Observer, Organized Honest Deductive Reasoning

MATHEMATICS

Evaluation Process		
Learning outcomes	**Learning sequence**	**Instruments and type of reagents**
Solve an exercise booklet related to aquaculture production, containing 10 exercises of each topic: • Calculate spaces • Calculate gradients (slopes) • Solve pond's problems	1. Recognize the Cartesian plane 2. Understand the straight line function and its graphic representation 3. Understand the logarithmic behavior	Practical exercises Forms Portfolio of evidence

MATHEMATICS

Teaching Learning Process	
Methods and teaching techniques	**Media and didactic materials**
Solving Problems Teamwork Demonstrative practice	Whiteboard, Projector, Computer Equipment

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

MATHEMATICS

CAPACITIES DERIVED FROM THE PROFESSIONAL COMPETENCES TO WHICH THE COURSE CONTRIBUTES

Capacity	Performance Criteria
Diagnose the conditions of aquaculture systems. Through physicochemical and biological analysis techniques and historical records, to guarantee the health, safety and profitability of production.	Write a report about the current conditions of an aquaculture system, specifying: - Obtaining and processing the samples and their justification. - Analysis and interpretation of information (logs, histories, analysis results, laboratory reports). - Conclusions and recommendations.
Evaluate 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.
Schedule 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 meet the production goals.	Prepare a program of the productive cycle based on the manual of good practices for the respective species and that should contain: - Planting period (climatic and biology of the species) - Morphometric measurements of organisms - Homogenization of sizes of organisms - Harvest period - Feeding schedules - Water quality monitoring - Water refills - Disinfection activities of the infrastructure and of the system - Acquisition of supplies
Direct the transportation, arrival and sowing process through the methodology corresponding to each species and considering good management practices, to start the production cycle and avoid economic losses.	Prepare a report on the transportation, arrival and sowing process based on the manual of good practices, including: - Transportation: conditions of reception of the 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.

Capacity	Performance Criteria
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.	Integrate logs of the fattening process of aquaculture organisms, based on good practices, including: • Morphometric records. • Registers of physicochemical parameters of water quality. • Observations of the signs of internal or external injuries, diseases and alterations to behavior • Feed record (percentages of protein, food ration, feed conversion and pellet caliber). • Mortality records • Preventive treatments, correctives and adjustments
Supervise the process of harvesting aquaculture products based on the established program, the methods and techniques corresponding to the species and good practices, to satisfy the requirements of the organization and the market.	Develop a report of the process of harvesting aquaculture products, based on good practices, specifying: • Harvesting techniques according to the species and stage of development • Indicators of compliance with the goals and objectives of the organization • Analysis and interpretation of the indicators • Conclusions and recommendations
Determine the production capacity of a sustainable aquaculture project through a technical study, to establish the species and the required aquaculture production system.	Develop a prospective report that reflects the productive potential of the sustainable aquaculture project, considering the following aspects: • Location and specific description of the project site • Infrastructure and equipment. • The species to be managed. • Processes and technologies to be employed. • Capacity of processes and production programs. • Scenarios with different process volumes. • Programs of execution, administrative, training and technical assistance. • Applicable regulatory framework. • Production costs and investment of the project. • Conclusion about the technical feasibility of the project.
Manage the required financial support before the corresponding institutions, according to the procedures and regulations established, for the implementation of the sustainable aquaculture project.	Integrate a record of financial support for a sustainable aquaculture project, including: • Institutions that provide financial support according to the characteristics of the project • Operation policies of the different departments involved • Requisition forms required

Bibliography

Author	Year	Title	City	Country	Publisher
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