



Republic of the Philippines

Department of Education

DepEd Complex, Meralco Avenue, Pasig City

STRENGTHENED SENIOR HIGH SCHOOL CURRICULUM

AQUACULTURE

Grade 11/12

Course Description:

This course equips learners with essential skills in Aquaculture, focusing on aquatic farming operations in accordance with the industry standards. The course includes fish grow-out operation, hatchery operation, fish health management practices, harvest and post-harvest activities, and marketing of aquaculture products. After completing the course, learners are eligible to take assessments to earn the National Certificate Level II in Aquaculture (Tilapia Culture), Aquaculture (Grow-Out Operation), and Aquaculture (Hatchery Operation). They may also pursue higher education or careers in the aquaculture industry.

Elective: Technical Professional

Prerequisite: None

Time Allotment: In Grade 11, 320 hours for two semesters, 8 hours per week. In Grade 12, 320 hours for one semester, 16 hours per week

Schedule: First/Second Semester

QUARTER I

CONTENT STANDARD:	The learners demonstrate an understanding of the principles of aquaculture, use and maintenance of tools and equipment, and factors in site selection and pond preparation.
PERFORMANCE STANDARD:	The learners perform maintaining tools, materials and equipment, site selection and pond preparation appropriate to local industry.
LEARNING COMPETENCIES	CONTENTS
1. Discuss the overview of aquaculture	Overview of Aquaculture <ul style="list-style-type: none"> • Principles of aquaculture • Legal Basis (R.A 8550 as amended by R.A 10654 Article III) • Local and global trends of aquaculture • Aquaculture commodities <ul style="list-style-type: none"> ○ finfish ○ crustacean ○ mollusk • Challenges in aquaculture industry • Good Aquaculture Practices (GAqP) <ul style="list-style-type: none"> ○ food safety and sanitation

	<ul style="list-style-type: none"> ○ animal health and wealth care ○ environmental Integrity ○ socio-economic
2. Perform utilization and maintenance of aquaculture tools, materials, and equipment	<p>Aquaculture Tools, Materials, and Equipment</p> <ul style="list-style-type: none"> • Digging tools and equipment • Leveling tools • Repair tools • Electrical tools • Masonry tools • Basic carpentry tools • Cutting and cleaning tools • Water quality monitoring tools and equipment • Laboratory tools and equipment • Personal Protective Equipment (PPE) • Life support system equipment • Harvest and post-harvest tools and equipment
3. Perform farm layout and site selection	<p>Farm Layout</p> <ul style="list-style-type: none"> • Conventional • Modular <p>Factors to Consider in Site selection</p> <ul style="list-style-type: none"> • Water supply and quality • Topography • Climate • Land • Soil characteristics • System of culture

	<ul style="list-style-type: none"> • Operational method • Accessibility
4. Perform pond preparation	<p>Pond Preparation</p> <ul style="list-style-type: none"> • Earthen pond <ul style="list-style-type: none"> ○ draining ○ elimination of pond predators ○ harrowing and plowing ○ drying ○ dikes, water inlets, outlets and canal/ pipes ○ liming ○ filling of water ○ fertilization • High density polyethylene-lined pond <ul style="list-style-type: none"> ○ digging ○ leveling and compacting ○ installation of Polyethylene Liner ○ washing and flushing ○ repairing of holes

QUARTER II

CONTENT STANDARD:	The learners demonstrate an understanding of the principles in designing aquaculture facilities, record keeping, hatchery operations, and broodstock and spawning management.
PERFORMANCE STANDARD:	The learners perform management of hatchery, and broodstock and spawning in aquaculture following industry practices.

LEARNING COMPETENCIES	CONTENTS
1. Design aquaculture facilities appropriate to local industry	<p>Aquaculture Facilities</p> <ul style="list-style-type: none"> • Types of ponds • Types of tanks • Pens <ul style="list-style-type: none"> ○ types of pens ○ specifications of net and its installation ○ suitable site for pen culture • Cages <ul style="list-style-type: none"> ○ types of cages ○ specifications of nget and its installation ○ Suitable site for cage culture • Factors to consider in installing of perimeter security • Biosecurity measures • Other facilities
2. Discuss the importance of record keeping in managing aquaculture activities	<p>Different Records in Aquaculture</p> <ul style="list-style-type: none"> • Production record <ul style="list-style-type: none"> ○ hatchery ○ counting fry/fingerlings ○ stocking ○ feeding ○ stock sampling ○ monitoring ○ health ○ harvest ○ marketing
3. Perform hatchery operations	<p>Hatchery Operations</p> <ul style="list-style-type: none"> • Preparation of hatchery ponds and tanks • Facilities and equipment • Natural food production • Aeration system • Water quality monitoring • Water filtration and treatment

4. Perform broodstock and spawning management	<p>Broodstock Management</p> <ul style="list-style-type: none"> • Selection of breeders • Sex determination technique • Reproductive maturity of breeders • Proper handling of breeders <p>Spawning</p> <ul style="list-style-type: none"> • Natural spawning • Induced spawning based on species requirement • Fecundity • Collection of spawners for hatchery <ul style="list-style-type: none"> ○ collection of eggs/ larvae/ fry/ fingerlings ○ hatching rate
---	--

QUARTER III

CONTENT STANDARD:	The learners demonstrate an understanding of the process of stocking aquaculture species, feeding management and stock sampling computations.	
PERFORMANCE STANDARD:	The learners perform stocking of aquaculture species, feeding management and stock sampling computations.	
LEARNING COMPETENCIES		CONTENTS
1. Apply the process of stocking aquaculture species	<p>Process of Stocking Aquaculture Species</p> <ul style="list-style-type: none"> • Fry/ fingerlings Selection <ul style="list-style-type: none"> ○ fry/ fingerlings behavior and condition ○ sample counting ○ mortality rate • Transport of fry and fingerlings <ul style="list-style-type: none"> ○ handling of transported fry and fingerlings ○ packaging procedures ○ acclimatization ○ water quality parameters monitoring 	

	<ul style="list-style-type: none"> • Stocking <ul style="list-style-type: none"> ○ stocking of fry/ fingerlings ○ stocking density ○ stocking ratio ○ survival rate
2. Perform feeding management in accordance with industry practices	<p>Natural Food</p> <ul style="list-style-type: none"> • phytoplankton and zooplankton • production of natural food <p>Feeds</p> <ul style="list-style-type: none"> • Types of feeds • Feeding method • Feed requirement based on species • Feed formulation • Feed ingredients for formulation • Nutrient content of feeds • Proper storage of feeds <p>Feeding Management</p> <ul style="list-style-type: none"> • Feeding frequency • DFR (Daily Feed Ration)
3. Perform stock sampling computations in feeding stocks	<p>Stock Sampling</p> <ul style="list-style-type: none"> • ABW (Average Body Weight) • ADG (Average Daily Gain) • TFC (Total Feeds Consume) • Biomass • FCR (Feed Conversion Ratio) • Stock sampling schedule • Feeding adjustment

QUARTER IV

CONTENT STANDARD:	The learners demonstrate an understanding of the principles of water quality management, health management, harvest and post- harvest activities, and marketing of aquaculture products.
PERFORMANCE STANDARD:	The learners perform monitoring of water quality parameters, health management practices, harvest and post-harvest activities, and marketing of aquaculture products.
LEARNING COMPETENCIES	CONTENTS
1. Perform water quality management in accordance with the industry practices	<p>Water Quality Management</p> <ul style="list-style-type: none"> • Salinity, dissolved oxygen, pH, ammonia, nitrite and nitrate, temperature, turbidity, and transparency • Optimum range of parameters of specific species • Schedule of water monitoring based on the industry requirement • Relationship of each water parameter to environmental conditions • Water exchange
2. Apply health management to prevent or treat aquaculture species	<p>Health Management in Aquaculture</p> <ul style="list-style-type: none"> • Diseases based on cultured species • Signs and symptoms • Prevention and treatment
3. Perform harvest and post-harvest activities	<p>Harvest and Post- harvest Activities</p> <ul style="list-style-type: none"> • Types of harvest and post-harvest based on aquaculture facilities • Harvest and post-harvest operations
4. Perform selling of aquaculture products using different marketing strategies	<p>Methods of Selling Aquaculture Products</p> <ul style="list-style-type: none"> • Marketing strategies • Sales and Return of Investment (ROI)

GLOSSARY

aquaculture - a fishery operation involving all forms of raising and culturing fish, and other fishery species in fresh, brackish and marine water areas

biomass - the total weight of fish in a specific area of water, and it's a crucial factor in the success of aquaculture operations

broodstock - mature fish that are kept separate and used to produce fry. Broodstock can be kept in captivity in ponds or tanks, or sourced from wild populations

dikes - an embankment of earth and rock built to prevent floods or to hold irrigation water in for agricultural purposes

fecundity - a key biological metric that refers to the number of eggs a female can lay during a reproductive season

fish cage - an enclosure which is stationary or floating made up of nets or screens sewn or fastened together and installed in the water with opening at the surface or covered and held in a place by wooden/bamboo posts or various types of anchors and floats

fish fingerlings - a stage in the life cycle of the fish measuring to about 6-13 cm depending on the species

fish fry - a stage at which a fish has just been hatched, usually with sizes from 1-2.5 cm

fish pond - a land-based facility enclosed with earthen or stone material to impound water for growing fish

fish pen - an artificial enclosure constructed within a body of water for culturing fish and fishery/aquatic resources made up of poles closely arranged in an enclosure with wooden materials, screen or nylon netting to prevent escape of fish

freshwater - naturally occurring water on the Earth's surface in ice sheets, ice caps, glaciers, icebergs, bogs, ponds, lakes, rivers and streams, and underground as groundwater in aquifer sand underground streams. Fresh water is generally characterized by having low concentrations of dissolved salts and other total dissolved solids

harvest - the process of removing fish and shellfish from their production unit, such as a pond or cage, before they are sold as food

hatchery - a place for artificial breeding, egg hatching, and rearing across the early life stages of aquatic animals (e.g., finfish and crustaceans)

life support system - any natural or human-engineered (constructed or made) system that furthers the life of the biosphere in a sustainable fashion. An artificial or natural system that provides all or some of the items (as oxygen, food, water, control of temperature and pressure, disposition of carbon dioxide and body wastes) necessary for maintaining life or health

mortality - an organism that lives by preying on other organisms; an animal that hunts and seizes other animals for food

natural food - the term is assumed to imply foods that are minimally processed and do not contain manufactured ingredients, mostly available in the environment

polyethylene liner - a common material used in aquaculture to line ponds, tanks, and other water facilities

sampling - is the process of weighing fish to determine the growth rate and performance. Fish sampling involves taking weights and measurements such as body length, and the weight of the fish population

spawning - the process of inducing fish to reproduce, which can increase production and profits for fisherfolk

species - one of the basic units of biological classification and a taxonomic rank

stocking - the practice of releasing fish or shrimp into a pond, tank, cage, or raceway for cultivation

REFERENCES

Technical Education and Skills Development Authority-Qualification Standards Office. Training Regulations for Grow- out Operation NC-II. Taguig City, Philippines: TESDA, 2020

Technical Education and Skills Development Authority-Qualification Standards Office. Training Regulations for Hatchery Operation NC-II. Taguig City, Philippines: TESDA, 2020

Technical Education and Skills Development Authority-Qualification Standards Office. Training Regulations for Tilapia Culture NC-II. Taguig City, Philippines: TESDA, 2020

Republic Act 8550, SEC. 4. Definition of Terms

TOOLS, MATERIALS, AND EQUIPMENT

TOOLS	MATERIALS	EQUIPMENT
digging tools	pH meter kit	lawn mower
carpentry tools	ammonia test kit	electric microscope
masonry tools	alkalinity test kit	aerator
electrical tools	water sample bottles	weighing scale (60kg)
cutting tools	laboratory gown	filled oxygen tank
bolo	scissors	feed pellet mill machine
refractometer	face mask	small grain grinder
dissolved oxygen meter	eye goggles	
thermometer	hand gloves	
secchi disc	chilling tank	
beaker	styrofoam box	

hemacytometer	chlorine	
pencil	tea seed cake	
dissecting tools	common nails	
dissecting board	lime	
farm boots	nets	
buri hat	tying rope	
aquarium hose	bamboo poles	
air stones	monofilament nylon	
T- connectors	netting needles	
soil tester	detergent	
tally counter	aquariums	
plankton counter	pail/ basin	
mixing spatulas	brush	
graduated cylinder	scope net	
	soft towels	
	fry bag	
	cast net	
	fish trays	
	log book	
	rubber bands	
	calculator	
	salt	
	formaldehyde	
	magnifying glass	
	blue round plastic tanks	