

# **New Haven Public Schools**

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### **Aquaculture Technology Course**

Ocean Engineering  
Vessel Operations  
Marine Construction  
Marine Propulsion

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## **Background Information**

In the “traditional” Agriculture Center, land was often set aside for production agriculture. These activities included the production of meat, eggs, vegetables, ornamental plants and greenhouse horticulture. The vocational agriculture curriculum had major divisions in which teachers often had a primary assignment. All teachers involved in the science and technology of agriculture had a piece of the production “farm”. The operation of the farm was the scientific study of agriculture production. Today, agriculture production provides opportunities for students to study science and industry applications.

With the new Aquaculture Centers, the “farm” had to be completely enclosed but all aquaculture teachers would still have a role. A large difference between agriculture and aquaculture “farms” is the time for a crop to mature. The only indoor agriculture production facility was the greenhouse, which used plant stock for finishing or for the production of immature plant stock for outside planting. Aquaculture “farms” parallel agriculture greenhouses with the development of fish hatcheries in the late 1800’s. Only recently has aquaculture sought to produce harvestable crops totally inside. Greenhouse hydroponics is a modern day “indoor” agriculture equivalent.

The aquaculture “farm” is a combination of technical, experimental and research aqua cultural operations. They are integrated within the unit concept vocational agriculture education. Vocational Agriculture Curriculum units of varying lengths (3 to 12 weeks) provided opportunities to experience different agricultural production applications. This is the same model which requires flexibility in laboratory / production facility design. The Vocational Agriculture Curricula and Performance Standards were initially developed in 1987. The educational initiatives of the 1990’s relate to the integration of problem solving, critical thinking skills and descriptive application (writing) of science to the principles of modern day life. National science standards formulated by the National Academy of Science, the American Association for the Advancement of Science and the National Science Foundation ATE (Advanced Technology Education) program has been incorporated into the Connecticut Science Standards, endorsed by the Connecticut State Department of Education documents focusing on application of Science rather than the theory of science. In this regard, the Vocational Agriculture System has been a leader in “application based” science curricula. Comprehensive high schools have addressed the theory of science instruction/content in a four-year sequence. The Vocational Agriculture System has addressed the “active learner” format based on measurable outcomes (plant growth, number of bushels, acreage, yields, etc). Science instruction at the high school level typically lacked definable real world outcomes until institution of the science C.A.P.T. test, Vocational Agricultural curricula were practical in function with science theory the domain of the comprehensive high schools. With the increase of high school graduation requirements, less and less schedule space existed for students to take Vocational Agriculture electives. Vocational Agriculture Centers started to “cross credit in science” in order to keep students enrolled in the program. At the same time, Vocational Agriculture programs were looking at comprehensive high school curricula to align theory “content”, while comprehensive high schools looked at Vocational Agriculture Science for guidance in practical applications.

The science scope and sequence for our program here in New Haven cross credits for the Science courses. Science teachers attend in service and CIA meetings conducted by Richard Therrien, New Haven Public Schools Supervisor of Science. Technology teachers attend Unified Arts staff meetings

conducted by Alicia Caraballo, Supervisor Unified Arts. We obtain much support from Unified Arts in the way of Perkins funds for course expansion, new equipment and professional development.

## Curriculum

Like all curricula, the content of the vocational agriculture curriculum is subject to Section 10-16b (C) of the Connecticut General Statutes, which mandates that a planned, on-going, systematic program of studies be offered. Credit for vocational agriculture may be offered to meet the mandate of cross credit instruction that contain content comparable to that offered in mainstream math and science courses.

The Connecticut Vocational Agriculture education curriculum was developed by vocational agriculture teachers under the direction of Dr. Alfred Mannebach, University of Connecticut teacher-trainer and with the guidance from the staff of the Bureau of Vocational Services of the Connecticut State Department of Education. There are currently six volumes, each with over 100 pages of curriculum guides in the areas of plant science, animal science, agricultural mechanics, natural resources/aquaculture, agribusiness management and career development/FFA/Supervised Agriculture Education. Each center has received a copy of the 6 volume set, which was intended to serve as a model curriculum for individual programs to use in organizing the instructional material that will be used for high school students.

The curriculum is developed based on a unit concept with varying lengths of time from three to twelve weeks for each unit. The amount of time allotted depends upon the amount of information to be recovered and the depth of understanding that is to be imparted to the students. (Using multiples of three weeks in setting lengths of units allows for multiple teacher departments to develop a coordinated schedule for start-up and completion of units so that students may have crossover of areas of study and of teacher assignments).

The vocational agriculture education curriculum is divided into areas of plant science, animal science, natural resources, aquaculture marine trades, agriculture mechanics, agribusiness and food science. Students entering a four-year program are usually involved for the first year or year and one-half in an exploratory program covering all of the areas of agriculture. For the final two and one-half to three years, the students elect units from one area or a combination of areas to coincide with his/her goals.

In 1989, a new curricular initiative created the equivalent of two new vocational taxonomy areas-marine technology and aquaculture. Marine technology reflected marine trades and the related associated industries similar to agriculture. Aquaculture science was further defined to include not only production strategies, but foundation topics in genetics, pathology, disease prevention, nutrition, hatchery systems and environmental science. The Bridgeport Aquaculture Center, dedicated in 1993, reflects these two new taxonomy areas as “departments” each with assigned cross credits.

The New Haven Vocational Agriculture Center, established in 1994, has an aquaculture focus but also provides a traditional agriculture program for New Haven students. The theme of the departments is that each teacher has a role in the four-year sequence of the high school program. The focus of the freshmen educators and students is to develop an understanding of the earth sciences and natural resource management. The application of these concepts is the control of inputs (food resources) to sustain natural resources within specific ecosystems. Sophomores have a biological role with nursery and hatchery systems. Juniors maintain production systems (either Aquaculture or Agriculture) while studying nutrition, chemistry and environmental water quality. As seniors,

students focus on advances in genetics, biotechnology, disease control, toxicology and veterinary sciences. Laboratories designed to industry standards are located adjacent to classroom areas to facilitate practical application of research and scientific principles. Manuals of operations, protocols and procedural guidelines used in classroom/laboratory instructional settings complement assigned and supervised occupational experiences that students must participate in outside of the normal school hours.

## Curriculum Integration at the Sound School

### Vocational Agriculture Science (Cross Credit Equivalents)

Exploratory-	<i>Aquaculture Science and Natural Resources</i>	(Earth Science or General Science)
Intermediate-	<i>Aquaculture Biology/Hatchery Systems</i>	(Biology)
Advanced-	<i>Aquaculture Chemistry /Finfish Nutrition/Water Quality</i>	(Chemistry)
Intensive-	<i>Special Topics- or life Science</i>	(Genetics or Production Scenes)
Research-	<i>Internship- (Special Projects or ISSP)</i>	Advanced Placement
Exploratory-	<i>Aquaculture Tech I Nautical Science /Seamanship</i>	(Mathematics)
Intermediate-	<i>Aquaculture Tech II</i>	(Algebra)
Advanced-	<i>Aquaculture Tech III Computer Assisted Design</i>	(Geometry)
Intensive-	<i>Aquaculture Engineering</i>	(Trigonometry)
Research-	<i>Aquaculture Tech IV Vessel Design/Stability</i>	Physics)
	<i>Aquaculture Tech V Computer Science (ISSP)</i>	Advanced Placement
	<i>Internship</i>	

## Scope and Sequence

The scope and sequence of the course offerings at the Sound School is organized in accordance with the guidelines set forth in the Carl D. Perkins Act and the Connecticut State Department of Education's guide, "The Connecticut Vocational and Technical Education Performance Standards and Competencies". The specific program area is Agriculture Science Technology Education. The content areas of concentration are Aquaculture and Marine Related Technology, Animal Science Technology, Agriculture Mechanics Technology, Plant Science Technology and Natural Resources and Environmental Technology and Agriculture Business (elements of this area are embedded in other areas). The performance standards and competencies listed in the publication have been used as the framework for the development of all of the courses offered at the school. A great deal of additional information has been gathered from the many individuals who serve as members of the Vocational Agriculture Center's Advisory/Consulting committee and other program committee partnerships. The information has been incorporated into the courses that are being offered at our school. These ongoing and long-term relationships between the industry people, regional employers and the teachers at the school are essential for the continuous revision and updating of the curriculum. The course work in the classrooms and labs must provide the students with the most up-to-date training experiences, which will prepare them for the job site internships they will work in during their senior years.

As mentioned earlier, the freshmen level courses have been designed as exploratory courses to provide students with an overview of aquaculture, marine trades or agriculture. For half the year, the student takes the Aquaculture Science course and then, at mid-year begins the Aquaculture Technology I course. In the sophomore year, the courses are still half-year courses in Aquaculture Science and Aquaculture Technology but the content becomes more specific. At the end of the sophomore year, the student must select the area of "concentration" that he/she wishes to focus on as their career track for the remaining years at the Sound School. During the junior year, the students will again take half-year advanced level courses in Aquaculture Science and Aquaculture Technology but the specific courses that they have to choose are geared towards development of the knowledge and skills that they must have for entering certain occupational clusters or continuing on to higher education in that field. It is as seniors that the students receive the most intensive job related training and experience. For the first half of the year, the students will receive even more detailed and comprehensive instruction in two of the subject areas within the occupational field that they have selected. The remainder of the senior year will be spent working on Special Topics that are a part of the student's planned program. Instruction in Special Topics is achieved through placement of students at sites where they can receive real occupational experience. These placements are of two types. There is the **Cooperative Placement** (Internship), which involves the student being released during the school day to allow education, during that time, in an aquaculture, (student obtains a grade) marine trade or agriculture related business. Additionally, the student may attend a co-op class taught by an outside instructor who also supervises the student on the job site if required. The other placement is the **Directed Laboratory Experience** in which the student works with a teacher and/or mentor at one of the school's labs or at an off-site laboratory on a planned research project beyond the regular school day and the student obtains SOE hours.

The third type of placement includes **Employer Agreements** the traditional work site agriculture work experience placement. They require periodic site visits by vocational agriculture teaching staff and state of Connecticut Department of labor approvals.

## The Sound School's Vision, Mission, and Goals:

Key words: Authenticity, Power, Fluency, Engagement, Motivation, Achievement.

At the Sound School, we strive for **authentic** learning through **powerful** experiences and **powerful** teaching. At our command is a learning environment as small as a ruler, or as wide as the ocean.

Given this, our beliefs are:

- That our focus on the marine environment, our unique location, and our vocational aquaculture and agriculture curricula are **powerful** tools to capture student interest and **motivation**, ensuring student **fluency**, and therefore, student **achievement**.
- That **Fluency** in the core content areas is paramount.
- That students who are **fluent** can use mathematics to solve real-life problems, analyze scientific data, think critically about what they read, command a working knowledge of the world's history, cultures, and languages, and express their ideas coherently in writing.
- That **fluency** is not only the greatest factor influencing student success on high-level, high stakes assessments such as the CAPT—it is an essential prerequisite for a successful life.

Our vision for the Sound School is that it will be a learning community where:

- Students and Faculty feel safe and respected.
- Faculty members fearlessly use methods “outside the norm,” which lead to **authentic** student learning.
- Students recognize the **power** of academic pursuits.
- Teachers are part of a professional learning community that leads and directs the educational program.
- Teachers capture student interest and **motivation** through **engaging** learning activities.
- Administrators support teachers in their efforts, and make school a positive experience for students.
- Students reach beyond their grasp, and teachers consistently challenge them to do better.
- The physical plant supports the educational program.
- The knowledge and values inherent in a love for the marine environment, America's agricultural heritage, and New Haven's maritime tradition are transmitted to students consistently.
- Students take care of one another and feel that they are partners in all school endeavors.
- Students exhibit the qualities of good character.

The mission of the Sound School is that, given our beliefs and vision, we will produce citizens of the United States and the World who can think critically; solve problems, question, and act with facility and **fluency**.

In an effort to realize this mission, we commit to the following goals—that all students will graduate from the Sound School with the ability to demonstrate:

- The use of critical thinking.
- Proficiency in solving multi-step, interdisciplinary problems.
- Proficiency in mathematics, reading, writing, and science.
- Facility with at least one foreign language.
- Appropriate public speaking skills.

- Job readiness skills.
- A working knowledge of the tools of maritime and/or agricultural commerce.
- A working knowledge of marine and/or terrestrial ecology.
- An understanding of the history, geography, and cultures of the United States and the world.
- The ability to function as part of a team.
- A healthy respect for the diversity of individuals found at school, in academia, in the workplace, and in the world at large.
- Knowledge of their role as stewards of the earth.

# **Freshman Exploratory Courses**

## Aquaculture Science Curriculum

**Course Title:**

### Aquaculture Science and Natural Resources

**Scope and Sequence:**

### Exploratory - Year I

**Course Description:**

**1st Year Students / Double Period / Alternating Cycle / One (1) credit**

This course serves as an introduction to Aquaculture as it relates to the laboratory and worldwide marine and fresh water environments. The course includes studies of the scientific method, classification, microscopy, the water cycle, earth science, the periodic table and science experiments designed to improve CAPT readiness. Laboratory and field experiments reinforce student understanding in the scientific method while facilitating mastery of basic scientific concepts. The information and skills taught in this course are integrated in laboratory and field experiences in and around New Haven harbor aboard research vessels, and on local marshes and streams. There is a strong emphasis on the scientific method, natural resource management/earth science and ecosystem dynamics.

### Units (Theme or major Chapter/Sections)

Measurement/Metric system  
Scientific Method  
Classification  
Project Search  
Mapping  
New Haven Harbor Study  
CAPT Preparation

### Industry Applications or Performance Standards CTE

State Department of Education or  
other Industry recognized  
standards

State science standards:

Chemistry/polymers; D10, D11,  
D12, D15, D16, D17

Environment; D18, D20, D25,  
D26

NOCTI standards:

G5/C3, C5, C7  
I1, 4, E1, E3 A4/A9/E1

### Significant Job Tasks/ Job Titles

- **Water Quality Specialist**  
Be able to use a dissecting binocular microscope  
Be able to identify common macro invertebrate species  
Be able to perform water chemistry and use parameters to assess water quality
- **Town Sanitarian**  
Be able to interpret topographic, Waste Water/Leachate, Water Drainage Basin and wetland inventory maps for land use determination  
Conduct soil tests to determine land suitability
- **Field Biologist**  
Be able to identify native and invasive trees, mammals, insects, reptiles and amphibians  
Be able to use a dissecting binocular microscope  
Be able to identify common macro invertebrate species  
Conduct experiments and analyze data to determine cause and effect of different variables

### FFA Awards or competency Certificates

- Natural Resource CDE

## Aquaculture Technology Curriculum

### Course Title: Aquaculture Technology I

#### Scope and Sequence:

#### Exploratory and Exposure Curriculum

#### Course Description:

##### 1<sup>ST</sup> Year Students / Double Period / Alternating Cycle / One (1) credit

Aquaculture Technology I introduces freshmen students to several marine technology and aquaculture technology areas. As so much of the emerging Aquaculture industry is dependent upon traditional nautical, sail training and seamanship skill and the ability evaluate and problem solve. Students are therefore provided exposure to and experiences in a variety of marine related areas. Units of instruction cover in depth, small boat safety, teamwork, rowing, sailing and basic seamanship. All students are required to complete the Connecticut DEP Safe Boating Certification course. Special instruction areas include emergency procedures, nautical science, an introduction to piloting, basic weather, boat maintenance, boat repair and small vessel construction techniques. On the water instruction is coordinated with laboratory technicians and other aquaculture teachers. Students obtain a ½ credit in physical education.

#### Units (Theme or major Chapter/Sections)

- Seamanship
- Small Boat Handling
- Job Safety (Shop, Boat)
- Safe Boating Certification
- Leadership and Success
- Maintenance of small boats
- Introduction to use of hand tools
- Measurement
- Preparation and use of paints and solvents
- Teamwork
- Leadership Training
- Weather as a planning tool

#### Significant Job Tasks/ Job Titles

- Demonstrate the ability to think and problem solve in a dynamic environment
- Demonstrate seamanship skills
- Demonstrate proper methods of maintaining small wooden boats
- Demonstrate ability to operate small boats in variety of situations and conditions
- Demonstrate ability to manage a crew on board a boat and as a project leader
- Identify qualities of success and demonstrate effective leadership skills
- Create long and short term personal goals
- Demonstrate effective communication skill and teamwork skills
- Demonstrate knowledge and understanding of safety procedures in and around the marine environment
- Identify hand tools, and have the ability to work with them safely
- Demonstrate ability to perform calculations involving fractions, decimals
- Demonstrate ability to read and understand charts, drawings, and their symbols
- Obtain Physical Education credit through exposure to life long activity experiences
- Demonstrate the ability to interact with business and industry professionals.

#### Job Titles

- Marina operator
- Boat repair
- Carpentry
- Deck hand
- Sales position in Marine Sales
- Able seaman
- Coastal scientist

#### Industry Applications or Performance Standards CTE

State Department of Education or other Industry recognized standards

- CTE-NOCTI; Aqua = Marine Related Technology
- A – 2, 3
- B- 1, 2, 4
- C- 1, 2, 3,
- D- 1, 2, 5, 11
- E- 2, 3, 5
- F-1, 2, 3, 4,
- H- 3, 4, 5, 6, 7
- I- 1, 2, 4

ABYC Standards

- Boating Safety
- Seamanship & Small Boat Handling

#### FFA Awards or Competency Certificates

- Tech I Leadership Award
- CT. Safe Boating Certificate
- ABYC Certification
- Boating Safety
- Seamanship & Small Boat Handling

**Agriculture Science Curriculum**

**Course Title: Agriculture Science**

**Scope and Sequence: Exploratory – Year I**

**Course Description:**  
**1st Year Students / Double Period / Alternating Cycle / One (1) credit**

Agricultural Science and Natural Resources is a general course designed to reinforce and extend students' understanding of science by associating scientific principles and concepts with relevant application in Agriculture. Students will examine major phases of Environmental, Plant and Animal science along with specific biological concepts that govern management decisions in the Agriculture industry. Laboratory work will enable students to investigate the biological processes that occur in major agricultural plant crops including tissue culture. Important agricultural fields of study will be introduced to the students such as forestry, wildlife management and natural resource conservation. Students will also establish a SOE Program with the Connecticut Agricultural Experiment Station and The New Haven Department of Parks, Recreation and Trees as well as participate in Agricultural Science activities of the FFA. The Agricultural Biology section is designed to reinforce and extend students' understanding of biological science by associating scientific principles and concepts with relevant application in Agriculture. Students will utilize the Scientific Method while examining major areas of Plant and Animal science along with specific biological concepts that govern the growth and reproduction of living organisms as they pertain to the Agricultural industry. This one semester course strongly promotes a hands-on approach to teaching and learning in Agriculture. Laboratory activities emphasize how and why producers raise animals and grow crops and plants. This course will enhance student achievement in the basic learning area of applied science. Students will utilize their knowledge to implement management decisions and practices in Agriculture.

**Units  
 (Theme or major  
 Chapter/Sections)**

Matter and Heat  
 Atoms and Bonding  
 Chemical Bonding and Polymers  
 Chemical Cycles  
 Earth Materials and  
 Environmental Impact  
 Energy and Electricity Sources  
 and Impacts  
 Energy and Electricity Sources  
 and Impacts

**Industry Applications or  
 Performance Standards  
 CTE**

State Department of Education or  
 other Industry recognized  
 standards

Agricultural Mechanics Technology  
 A-9  
 A-10  
 A-16

Plant Science Technology  
 A-3  
 A-4  
 A-6  
 A-9  
 A-12  
 A-13

Natural Resources & Environmental  
 Management  
 A-2  
 A-5  
 A-6  
 A-8  
 A-10  
 A-12

**Significant Job Tasks/ Job Titles**

Implements greenhouse protocol  
 Uses hydroponics system  
 Understands impacts of fossil fuels on environment  
 Uses microscopes  
 Understands how chemical and physical processes cycle  
 Performs soil testing.

**Job Titles**

Greenhouse Mgt.  
 Conservation Biologist  
 Cytologist  
 Ecologist  
 Botanist  
 Science Teacher

**FFA Awards or  
 competency Certificates**

## Agricultural Technology Curriculum

### Course Title:

### Agricultural Power, Structures and Technology I

### Scope and Sequence:

#### Exploratory- Year I

### Course Description:

**1st Year Students / Double Period / One Semester / One {1} Credit**

This “Hands-on” fundamentals and applications course is designed for students who would like to develop basic/exploratory mechanical skills and technological applications in a modern agricultural facility. This course addresses the specific needs of students enrolled in an agricultural power, structures and technology course within a vocational program. It starts with instruction in career opportunities, safety, FFA, SAE, and computers. Competency-based instruction in basic agriculture power, structures and technological skills and applications are provided.

Specialized and emerging technologies in agriculture will engage students at our satellite campus at the Pardee Greenhouse Educational Complex in Hamden. Laboratory practices will utilize many of the “Agricultural Industry” resources available within the greater New Haven area.

### Units

#### (Theme or major Chapter/Sections)

- Agricultural Power, Structures, and Technology
- Employability and Safety
- FFA
- SAE
- Computers
- Hand Wood Working Tools
- Hand Metal Working Tools
- Power Tools
- Tractor Driving/Power Technology
- Design an Agricultural Shop
- Plant Anatomy and Function
- Vegetable Production

### Significant Job Tasks/ Job Titles

- Explain the importance of power, structures and technology in modern agriculture
- Identify career opportunities, employer expectations, resources and information in agriculture
- Explain and practice personal and mechanical safety
- Define and list benefits of SAE and planned supervised experiences
- Explain the benefits of participation in the FFA, listing the purposes, organization structure and major programs within
- Demonstrate a working knowledge of computers and specialized software
- Identify and properly use and care for common wood working hand tools
- Identify and properly use and care for common metal working hand tools
- List the protocol in the safe and efficient use of stationary and portable power tools
- Demonstrate the safe use and maintenance of a farm tractor/landscape maintenance equipment
- Identify tools, supplies and equipment needed in the design of an agriculture shop
- Explain plant classification, function and structure with emphasis on life cycles, photosynthesis, respiration and transpiration, including both vegetative and reproductive structure of plants
- Produce a crop of vegetables

#### Job Titles

- Agriculture Teacher
- Farm mechanic
- Vegetable grower
- Landscape equipment operator
- Greenhouse worker
- Laboratory technician

### Industry Applications or Performance Standards

#### CTE

State Department of Education  
or other Industry recognized standards

- CTE-NOCTI  
Agricultural  
Mechanics  
Technology
- A-1, 2, 6, 7, 9, 11, 12, 16
- B-1, 2, 3, 4, 5
- C-1, 2, 3, 4, 5, 6, 7, 8,
- D-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
- H-1, 2, 3, 4, 5, 6, 7,
- I-1, 2, 4
- CTE-NOCTI  
Plant Science  
Technology
- A-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

#### FFA Awards or Competency Certificates

- FFA Membership Card
- Greenhand Degree
- Tractor Driving Certificate
- SAE Certificate of Outstanding Achievement

# **Sophomore Intermediate Courses**

## Aquaculture Science Curriculum

**Course Title:** **Aquaculture Biology**

**Scope and Sequence:**  
**Intermediate – Year II**

**Course Description:**

**2nd Year Students / Double Period / Alternating Cycle / One (1) credit**

The primary purpose of this course is to provide a broad overview of key concepts of Biology with an emphasis on major Aquaculture species. It is designed to offer content and skills necessary for advanced aquaculture study, college preparation, and good citizenship. Aquaculture Biology investigates the world's waters as they relate to marine biology, marine life, habitats and aquaculture production. Student skills are developed and guided in working cooperatively and individually to solve problems utilizing the Scientific Method.

Laboratory work will explore the foundational knowledge and advanced skills for applying technology to developing hatchery techniques for aquatic species and expanding the understanding of biological systems. Specific emphasis is on laboratory practica and field activities.

Field trips on Long Island Sound extensively study this estuary aboard our research vessels. Marsh, stream, lake studies and coastal processes are essential to fulfill the program objectives.

This course is also a prerequisite for the courses offered during third and fourth year of the aquaculture program.

**Units**  
**(Theme or major Chapter/Sections)**

1. Introduction and Characteristics of Life
2. Chemistry and Nutrition
3. Cell Biology: Plant and Animal
4. Cell Reproduction
5. Aquatic Plants and Animals
6. Management Practices for Finfish, Crustaceans, Mollusks, Plants, Frogs, and Alligators

**Industry Applications or Performance Standards**  
**CTE**

State Department of Education or other Industry recognized standards

CCTE A.1, 2,3,4,5, 6, 7  
CCTE B.13, 14  
CCTE C 16, 17, 20  
CCTE D 31  
CCTE E. 32, 33, 34, 37, 38  
CCTE F 40, 41,  
CCTE G 45  
CCTE H 55, 57, 58

**Significant Job Tasks/ Job Titles**

1. Students demonstrate collection, identification, and sampling of microscopic and macro invertebrates from ponds, rivers and lakes. ***Fisheries and Wildlife Manager, Commercial Fisherman, Shellfish/Finfish/Algal Aquaculturist Microbiologist***
2. Students can explain the structure and functions of cells, particularly differences between plants and animals. ***Biologist***
3. Students can describe the differences between bacteria and viruses, particularly pathogens., ***Pathobiologist***
4. Students will complete Aquarium Fish Project and Scientific Report that utilizes the Scientific Method which includes filters, water quality and analysis, nutrition, breeding, Taxonomic nomenclature, science abstract, works cited, Microsoft word, Microsoft excel tables and graphing, and presentation. (City 10.1 all, State Aquaculture Standards All.) ***Aquaculture Technician, Research Scientist***
5. Students test the structure and Function of Biochemical reactions, especially enzymes. ***Biochemist***
6. Student will demonstrate good lab technique dissecting aquatic organisms: Dissection of Mollusks, Crustaceans, and Finfish. ***Aquaculture Technician, Marine Biologist***

**FFA Awards or competency Certificates**

Aquaculture CDE Directed Lab and Competition  
Science CAPT preparation and achievement of Goal

## Aquaculture Technology Curriculum

**Course Title:**           **Aquaculture Technology II**

**Scope and Sequence:**  
                                  **Intermediate –Year II**

**Course Description:**  
                                  **2nd Year Students / Double Period / Alternating Cycle / One (1) credit**

Aquaculture Technology II follows the freshman introductory course and has been designed as an exploratory course exposing students to four major areas; Vessel Operations, Ocean Engineering; Marine Mechanics; Marine Construction. This course is also a prerequisite for the courses offered during third and fourth year of the aquaculture program. Students in sophomore classes will alternate between science and technology each marking period.

### Units (Theme or major Chapter/Sections)

- Seamanship
- Small Boat Handling
- Job Safety (Shop, Boat)
- Rules of the Road
- Leadership and Success
- Maintenance and Rigging
- Introduction to Ocean Engineering and Marine Mechanics
- Chart Work and Navigation
- Small Boat Construction

### Significant Job Tasks/ Job Titles

- Demonstrate seamanship skills in maintenance of boats, gear and rigging
- Demonstrate ability to operate small boat in variety of situations and conditions
- Demonstrate ability to manage a crew on board a boat and as a project leader
- Identify personal ‘Categories of Life’, apply to ‘Wheel of Life’ and evaluate categories on wheel
- Create long and short term personal goals, using 4-step model
- Describe the parts of the ‘Triad’, how it relates to leadership and success in the workplace and in life
- Demonstrate effective communication skill and teamwork skills
- Demonstrate knowledge and understanding of waterfront safety rules, USCG rules and regulations and “Work Mode” while on the water
- Identify tools used and uses
- Demonstrate effective time management skills
- Demonstrate ability to perform calculations involving fractions, decimals and percents
- Demonstrate ability to read and understand charts, drawings, and their symbols
- Demonstrate ability to convert scale and to measure using different scales

### Job Titles

- Marina operator
- Boat repair
- Carpentry
- Deck hand
- Sales position in Marine Sales
- Able seaman
- Coastal scientist

### Industry Applications or Performance Standards CTE

State Department of Education or  
other Industry recognized  
standards

- CTE-NOCTI;  
Aqua - Marine Related  
Technology
  - A – 2, 3
  - B- 1, 2
  - C- 1, 2, 3, 6, 8
  - D- 1, 2, 5, 11
  - E- 3, 5
  - F-1, 2, 4, 5
  - H- 3, 4, 5, 6, 7
  - I-1, 4
- ABYC Standards
- Boating Safety
  - Seamanship & Small Boat Handling

### FFA Awards or competency Certificates

1. Tech 2 Leadership Award
2. ABYC Certifications for
  - Boating Safety
  - Seamanship & Small Boat Handling

## Agriculture Science Curriculum

**Course Title:**           **Agriculture Biology**

**Scope and Sequence:**  
                                  **Intermediate – Year II**

**Course Description:**

**2nd Year Students / Double Period / Alternating Cycle / One (1) credit**

The primary purpose of this course is to provide a broad overview of key concepts of Biology with an emphasis on major Agriculture species. It is designed to offer content and skills necessary for advanced agriculture study, college preparation, and good citizenship. Agriculture Biology investigates the world's flora and fauna, habitats and agriculture production. Student skills are developed and guided in working cooperatively and individually to solve problems utilizing the Scientific Method. Specific emphasis is on laboratory practical and field activities.

Laboratory work will explore the foundational knowledge and advanced skills for applying technology to developing and improving bioremediation, bioprocessing, and expanding the understanding of biological systems. Curriculum units include: introduction to biology, microscopy, introduction to agriculture, greenhouse projects, cell biology and reproduction, organisms that inhabit land and water environments, management practices for domestic animals, fundamentals of nutrition, and Agriculture Business.

**Units**  
**(Theme or major**  
**Chapter/Sections)**

Chemistry of Living Things  
Cells, Bacteria & Viruses  
Cell Division  
Heredity/Genetics  
Evolution

**Industry Applications**  
**or Performance**  
**Standards CTE**

State Department of Education or  
other Industry recognized  
standards

Animal Science

A-1

A-3

Plant Science

A-3

A-8

A-9

Natural Resources &

Environmental Management

A-2

A-5

A-8

A-12

**Significant Job Tasks/ Job Titles**

Implements greenhouse protocol  
Uses hydroponics system  
Identifies differences between prokaryotic and eukaryotic organisms  
Uses microscopes  
Understands characteristics of living things  
Identifies plant and animal species

**Job Titles**

Agricultural Scientist  
Conservation Biologist  
Cytologist  
Ecologist  
Wildlife Biologist  
Science Teacher

**FFA Awards or competency**  
**Certificates**

## Agricultural Technology Curriculum

**Course Title:**

### Agricultural Power, Structures and Technology II

**Scope and Sequence:**

**Intermediate - Year II**

**Course Description:**

**2<sup>nd</sup> Year Students / Double Period / One Semester / One {1} Credit,  
Requires Previous Course Sequence / Permission of Instructor**

This course will continue to sharpen the students' skills and abilities within the agricultural power, structures and technology world in modern agriculture. Greater emphasis will be placed on individual success and increased responsibility.

Specialized and emerging technologies in agriculture will engage students at our satellite campus at the Pardee Greenhouse Educational Complex in Hamden. Laboratory practices will utilize many of the "Agricultural Industry" resources available within the greater New Haven area.

**Units**
**(Theme or major Chapter/Sections)**

- Agricultural Power, Structures, and Technology
- Employability and Safety
- FFA
- SAE
- Computers
- Repairing/Sharpening Tools
- Concrete Technology
- Painting/Glazing
  - Using Electricity
  - Plant Propagation
  - Media, Nutrients and Fertilizers
  - Using/Care of Grounds Maintenance Equipment

**Industry Applications or Performance Standards CTE**  
 State Department of Education or other Industry recognized standards

- CTE-NOCTI Agricultural Mechanics Technology
- A-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16
- B-1, 2, 3, 4, 5
- C-1, 2, 3, 4, 5, 6, 7, 8,
- D-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
- H-1, 2, 3, 4, 5, 6, 7,
- I-1, 2, 4
- CTE-NOCTI Plant Science Technology
- A-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

**Significant Job Tasks/ Job Titles**

- Explain the importance of power, structures and technology in modern agriculture
- Identify career opportunities, employer expectations, resources and information in agriculture
- Explain and practice personal and mechanical safety
- Define and list benefits of SAE and planned supervised experiences
- Explain the benefits of participation in the FFA, listing the purposes, organization structure and major programs within
- Demonstrate a working knowledge of computers and specialized software
- List the protocol in the safe and efficient repair and sharpening of tools
- Demonstrate the use and mixing of concrete
- Demonstrate preparation of material for painting/glazing
- Understanding and using electricity safely
- Planning and making simple electrical circuits
- Demonstrate sexual and asexual propagation of plants
- Understanding plant growing media and soil content/structure
- Identify nutrients necessary for plant growth
- Fertilizer applications
- List the protocol in the safe and efficient use, care and operation of grounds maintenance equipment

**Job Titles**

- Agriculture Teacher
- Landscape construction
- Greenhouse grower
- Equipment operator
- Laboratory assistant
- Parks employee

**FFA Awards or Competency Certificates**

- FFA Membership Card
- Chapter FFA Degree
- SAE Outstanding Achievement
- FFA Officer Team Certificate

# **Junior Advanced Courses**

## Aquaculture Science Curriculum

### Course Title: **Aquaculture Chemistry Water Quality**

#### Scope and Sequence:

#### **Advanced – Year III**

#### Course Description:

**3rd Year Students / Double Period / One Semester /One (1) credit**

This class will cover the use of the periodic table, including atomic mass, atomic number and the structure of the atom. At the completion of this course, the student will have had exposure to the role of Chemical Reactions and Principles that are involved in Aquatic Sciences and Biology. Basic Atomic structure, Chemical Bonding, Acid Base Reactions and Solutions will be covered. Stoichiometry, Reaction Kinetics, Equilibria and Thermochemistry will also be examined. Computer generation of lab reports is seen as an essential component of this class as well as designing, implementing and monitoring experiments.

Students will carry out research on topics related to Chemistry. Water Quality Monitoring of Long Island Sound and controlled tank systems will be performed. Relevant learning will include: experimental and control setups, independent and dependent variables, writing hypotheses, designing and writing experimental procedures, observation and data collection, data analysis and conclusion and assessing validity of conclusions.

Course work will consist of field and laboratory studies, conventional lab experiments, lectures, presentations and periodical literature research.

#### **Significant Job Tasks / Job Titles**

Performs titrimetric water quality tests  
 Performs colorimetric water quality tests  
 Performs calibration of meters as needed  
 Performs electronic water quality tests  
 Understands water quality concerns as part of culturing  
 Identifies water quality problems when present  
 Identifies limiting water quality factors for aquaculture production  
 Performs work on boats and around water safely  
 Uses YSI 85 Dissolved Oxygen/Salinity meter correctly  
 Uses Refractometer for salinity readings

#### **Job Titles**

- 1.Environmental Intern- CT DEP
- 2.Environmental Protection Field Inspector I (water, air, waste)
- 3.Hazardous Material Response Technician I and II
- 4.Fish Culturist I and II
- 5.Environmental Planner
- 6.Town Sanitarian
- 7.Waste Water Treatment Plant Chemist
- 8.Water Authority Lab Chemist

#### **Units**

**(Theme or major Chapter/Sections)**

1. Introduction: Measurements, Mathematics, Problem solving, Metric System, Safety
2. Matter: States, Changes, Energy, Temperature, History
3. Atomic Structure: Subatomic Particles, Periodic Table, Electron Arrangement
4. Chemical Bonding: Ionic, Covalent, Hydrogen, Electron Affinity
5. Chemical Reactions: Formulae, Moles, Rates, Stoichiometry
6. Chemical Reactions 2: Thermochemistry, Kinetics, Oxidation/Reduction
7. Aquatic Chemistry: Acids, Bases, Solutions, Water Testing Parameters

#### **Industry Applications or Performance Standards CTE**

State Department of Education  
or other Industry recognized standards

- A-2, A-6, A-9, A-10  
 B-1, B-2, B-3  
 C-1, C-2, C-3, C-7, C,8  
 D-1, D-8  
 E-1, E-2, E-3, E-5  
 H-3, H-7  
 I-1, I-3

#### **State SDE Chem Std's**

- 1.2  
 2.1, 2.2, 2.3, 2.5  
 6.5  
 7.3

#### **FFA Awards or competency Certificates**

FFA Greenhand Award  
 FFA Membership Card  
 FFA Chapter Proficiency Award

## Aquaculture Science Curriculum

### Course Title: Aqua- Life Science Finfish/Shellfish III

#### Scope and Sequence:

#### Advanced – Year III

#### Course Description:

**3rd Year Students / Double Period / One Semester /One (1) credit**

Aquaculture Production is a junior level applied aquaculture technique course. The intent of the course is to prepare students for advanced senior special topics courses centered upon individual projects run by the student, through work on existing algae, rotifer, finfish and shellfish culture initiatives. Students will be responsible to construct and maintain new and existing culture systems as well as work with laboratory personnel and the senior special topics class to support their projects and the fish production lab. The class is a half-year, double-period single credit aquaculture class.

As directed by the Vo-Ag standards, the curriculum of this course is determined by driven investigation and application of current industry practice. Students have chosen this course and are expected to participate fully in all lecture, laboratory and field aspects of the course. Research into appropriate topics will be an integral part of the course and detailed lab reports and papers will be expected and required. Group discussion and support of classmates will be encouraged to widen experience and knowledge. Final evaluation for this class will involve student presentations of team projects/experiments that each student has participate in throughout the course.

#### Units (Theme or major Chapter/Sections)

- Introduction to applied aquaculture production principles
- Application of research to culture methods
- Develop appropriate communication skills for discourse in science and industry
- Provide culture system design and implementation experience
- Establishment of familiarity with monitoring technology and techniques useful to the aquaculture industry
- Provide marketing and processing experience to each student

### Significant Job Tasks / Job Titles

Performs/prepare feeds for a variety of organisms  
 Performs wet chemistry tests as a part of fish culture  
 Monitors growth of aquatic organisms  
 Maintenance of recirculating aquaculture systems  
 Maintenance of shellfish aquaculture open systems  
 Performs work on boats and around water safely  
 Uses YSI 85 Dissolved Oxygen/Salinity meter correctly  
 Uses Refractometer for salinity readings

#### Job Titles

1. Environmental Intern- CT DEP
2. Environmental Protection Field Inspector I (water, air, waste)
3. Professional Aquarist
4. Fish Culturist I and II
5. Research Assistant
6. Water Authority Lab Chemist
7. Aquaculture Production Technician

### Industry Applications or Performance Standards CTE

State Department of Education  
or other Industry recognized  
standards

A- 4,5,7,9

B-1,2,3

E-1,2,5

G-1,2,3,4

### FFA Awards or competency Certificates

Aquaculture CDE

## Aquaculture Science Curriculum

**Course Title:            Biotechnology III**

**Scope and Sequence:  
                                  Advanced- Year III**

**Course Description:**

**3rd Year Students / Double Period / One Semester / One (1) credit**

In this course, students will gain cutting-edge knowledge and laboratory experience in the fast-growing field of biotechnology. Course topics include DNA: the Code for Life, Protein Synthesis, Mendelian Genetics, Genetic Manipulation through Recombinant DNA Technology, Microbiology, and Biotech Careers. The class content is supported by high-tech laboratory investigations where students perform actual procedures used in the biotechnology industry, NOT merely simulations. Lab activities include DNA extraction, electrophoretic analysis of DNA and proteins, transferring genes coding for fluorescent proteins into bacteria using recombinant DNA, ELISA immunoassays, and DNA fingerprinting. Instruction methods include PowerPoint presentations, research papers, visiting scientists, and field trips. This course provides the knowledge and skills that will prepare students for a future in genetics, microbiology, biotechnology, and many areas of medical science. Each year, two biotechnology students participate in Discovery to Cure summer internships at Yale University Medical Laboratories.

**Units  
(Theme or major  
Chapter/Sections)**

- DNA Structure
- Modifications to Proteins
- Evolutionary Mechanisms
- Recombinant Technology
- Prokaryotes and Viruses
- Reading a Scientific Paper
- Mendelian Genetics
- History of Biotechnology
- Cloning
- Ethics of Biotechnology
- Measurements and Equipment in the Laboratory

**Industry Applications or  
Performance Standards  
CTE**

State Department of Education  
or other Industry recognized  
standards

### Significant Job Tasks/ Job Titles

- Demonstrate ability to measure and prepare simple solutions for use in a laboratory
- Demonstrate ability to use basic biotechnology instruments and equipment including sterile technique, recombinant techniques, micropipettes, graduate cylinders, balances, and electrophoresis
- Demonstrate ability to review a basic scientific paper
- Demonstrate ability to locate and select relevant scientific papers as they pertain to an area of research
- Demonstrate knowledge of key vocabulary in biotechnology
- Demonstrate & be able to discuss various issues in the ethics of biotechnology
- Demonstrate ability to convert standards units of measure used in the laboratory (uL – mL, g – mg – ug)
- Be able to make connections between research objectives and benefits to society

#### Job Titles

- Aquaculture Diagnostic Technician
- Lab Technician (human health laboratory)
- Research Technician (pre-college or post BS)
- Research Assistants (BS)
- Research Scientist (BS, MS, PhD)
- Fisheries Biologist
- Aquaculture Research Analyst (BS)
- Aquaculture Technician
- Fisheries Research Analyst (BS) Any laboratory internship at their universities in marine science/biology

**Industry Applications  
CTE Standards**

Aquaculture & Marine

- C-16,17,19,20
- D-21,25
- E-32 thru 38
- H- 53-55
- I- 59,60,62

Co-op Skills Section

- A-1,2,5,7
- B-11
- C-17

**FFA Awards or  
Competency Certificates**

State & Nat'l Agri-science  
Student Recognition Award  
Agri-science Education Award  
Env. Science & Natural Resource  
Mgt.  
Emerging Agri-science  
Technologies

**Vocational Agriculture Program of Studies**

## Aquaculture Technology Curriculum

**Course Title:** **Ocean Engineering III**

**Scope and Sequence:**

**Advanced- Year III**

**Course Description:**

**3rd Year Students / Double Period / One Semester / One (1) credit.**

**Prerequisites: Algebra I & II, Geometry**

This course introduces students to various areas of physics through application to marine technology and the engineering process. The curriculum includes units on Drafting, Computer-Assisted Drafting/Design (CAD), Analog Electronics, Mechanisms, Pneumatics, Hydraulics and Sub-Sea Physics. These disciplines are brought together in a semester-ending project wherein students design, construct and test a Remotely-Operated Vehicle (ROV) which must perform a variety of underwater tasks. Emphasis is placed on the completion of short-term projects, daily in-class work, and the group project to end the semester. Mathematics and algebraic expressions are utilized frequently. Geometry, Algebra I and Algebra II should have been completed successfully prior to taking this course. The course requires students to document their daily and weekly progress and include reflective writing about their experiences and projects. Students who are highly self-motivated and willing to challenge themselves will succeed in this course. This course is the first in the Ocean Engineering concentration sequence.

**Units  
(Theme or major  
Chapter/Sections)**

- Computer-Aided Drafting (CAD) using SolidWorks
- Electronics
- Soldering
- Kinetics
- Pneumatics
- Hydraulics
- Underwater Technology
- Subsea Physics
- Special Project – ROV Design & Construction
- Marine Technology Careers

### Industry Applications or Performance Standards CTE

State Department of Education or  
other Industry recognized  
standards

#### INDUSTRY APPLICATIONS

- CTE-NOCTI:  
Aquaculture & Marine  
Related Technology
- B - 12, 13, 14, 15
- C - 17, 18, 19, 20, 21, 22
- D - 28, 31, 32, 34
- I - 67, 68, 70
- CTE-NOCTI: Computer-  
Aided Drafting&Design
- B - 9, 10, 11, 12, 13, 14

### Significant Job Tasks/ Job Titles

- Demonstrate ability to visualize perspective views of 3D objects in 2D
- Create a computer image of an object in a 3D format
- Properly describe the function of simple analog circuit elements
- Describe the relationship between current, resistance & voltage in an electronic circuit
- Identify and use proper symbols for electronic components
- Demonstrate ability to create analog electrical systems using schematic diagrams
- Demonstrate ability to make solder connections to electronic components
- Demonstrate use of simple machines to perform tasks
- Describe the relationship between force, pressure & area in a closed pneumatic/hydraulic system
- Demonstrate knowledge and understanding of the parts of a Remotely-Operated Vehicle and their functions
- Demonstrate ability to document work performed
- Demonstrate use of appropriate technology for presentation
- Demonstrate effective interpersonal skills in group work
- Demonstrate effective group speaking skills

### Job Titles

Mechanical Engineer  
Electrical Engineer  
Electronics Technician  
Remotely Operated Vehicle (ROV) Technician  
Marine Technician Aboard Survey Vessels  
Hydrographic Survey Technician

### FFA Awards or Competency Certificates

Solid Works Certificate  
Soldering Certificate  
Analog Electronics Certificate  
Mechanics Certificate  
Pneumatics Certificate  
Flotation/Buoyancy Certificate

## Aquaculture Technology Curriculum

**Course Title:** **Vessel Operations III**

**Scope and Sequence:**  
**Advanced – Year III**

**Course Description:**

**3rd Year Students / Double Period / One Semester / One (1) credit**

Participation in this course is designed to train the student as a large vessel crew member and to eventually become captain of a motor launch, charter boat, ferry, fishing vessel, or to develop the knowledge and skills that could lead to a career in the Merchant Marine, the Navy or the Coast Guard. Students taking this course will be introduced to the coast Guard Regulations applicable to the construction, maintenance and operation of vessels and to obtaining various Coast Guard licenses. They will be introduced to what is involved in the operation of large vessels and how to navigate by various methods. Advanced seamanship skills will be learned such as light cargo handling and towing. They will become familiar with all of the systems that are present aboard a vessel and how each functions to support the operation of the vessel. The use of various communication systems and radar will be practiced. There will also be instruction in watch standing procedures, emergency procedures, heavy weather procedures, and the Coast Guard Auxiliary Coast Watch Program. This is the first course in the Vessel Operations concentration sequence.

**Units**  
**(Theme or major Chapter/Sections)**

- Large Vessel Safety
- Large vessel seamanship
- Navigation/Piloting
- USCG Inspection/Licensing
- Vessel Maintenance
- Navigation/ Piloting
- CPR/ First aid training
- Introduction to Mechanical & Electrical systems
- Understanding basic weather patterns
- Career opportunities within marine transportation

**Significant Job Tasks/ Job Titles**

- Students will be exposed to safety practices and procedures aboard larger vessels.
- Students will review marine vocabulary.
- Students will identify their skills and interests as it relates to a specific career path for post-graduation.
- Students will be introduced to all pertinent Navigation rules.
- Students will be exposed to the piloting of Island Rover.
- Students will successfully complete a marine safety, seamanship, and piloting course.
- Students will be exposed to basic employability skills.
- Students will review proper knot tying.
- Students will successfully complete an American Red Cross approved course.
- Students will gather all necessary information to appropriately select their senior level aquaculture course.

**Job titles**

- 1) Safety/ First aid (Safety Officer)
- 2) Crew duties and responsibilities (Crew)
- 3) Understanding weather (Meteorologist)
- 4) Boat characteristics (Fleet Manager, Retail)
- 5) Maintenance/ Troubleshooting (Systems Engineer)
- 6) Helmsman (Crew)
- 7) Navigation (Crew)
- 8) Regulations (Fleet Manager)

**Industry Applications or Performance Standards**  
**CTE**

State Department of Education or other Industry recognized standards

- CTE-NOCTI; Aqua = Marine Related Technology
- A: 1,2,3
- B: 1, 2,3,4,5
- C: 1,2,3,4,5
- D: 1 - 11
- E: 1,3,5,6
- F: 1,3,4,5
- I: 1 – 14

**FFA Awards or competency Certificates**

- American Red Cross First Aid/CPR
- USCG Launch Operators License Certificate Course
- ABYC Certification

## Aquaculture Technology Curriculum

**Course Title: Marine Construction III**

**Scope and Sequence: Advanced – Year III**

**Course Description:**  
**3<sup>rd</sup> Year Students / Double Period / Alternating Cycle / One (1) credit**

Aquaculture Technology III begins the course and has been designed as Marine Construction. This course is the prerequisite for the Marine Construction 2 offered during senior year of the aquaculture program. Students in Marine Construction 1 will alternate between science and technology at the half-year point.

Students will build and/or repair boats for the school fleet. Blueprint reading, boat design, CAD and CNC operation will expand the scope of this course to include student who aspire to continue on to college in engineering and manufacturing.

### Units (Theme or major Chapter/Sections)

- Shop safety
- Tools
- Materials
- Job sequence/plan
- Woodworking
- Tool maintenance
- Small Boat Construction
- Boat design
- Solid Works (CAD)
- Introduction to CNC Routing

### Industry Applications or Performance Standards CTE State

Department of Education or  
other Industry recognized  
standards

#### INDUSTRY APPLICATIONS

- CTE-NOCTI;  
Agriculture Mechanics
- A – 2, 3, 7, 10, 11, 12, 16
- B- 19, 20, 21, 22, 23
- C- 24, 25, 26, 27, 28, 29, 20, 31, 32, 33
- D- 34, 35, 38, 39, 40, 41, 42, 43
- I- 74, 75, 76, 77

#### ABYC Standards

- Composites
- Wood Joinery
- Finishes

### Significant Job Tasks/ Job Titles

- Demonstrate understanding of and apply shop safety,
- Identify tools their proper care and use
- Read architectural drawings
- Measure, estimate and prepare job time, sequence and cost analysis
- Perform calculations involving fractions, decimals and percents
- Demonstrate safe, accurate procedures for laying-up petrochemical resins, core materials and fibers
- Construct and repair FRP and composite boat hulls
- Utilize effective communication and teamwork
- Apply effective time management skills

#### Job Titles

- Marina, boatyard technician - paint, fiberglass hull repair, rigger, store and move boats
- Yacht design firm – draftsperson, apprentice designer
- Boatbuilding firm – fiberglass lay-up, mold preparation, gelcoat application, CNC programmer and operator
- Marine machinist – CNC operator
- Fiberglass Technician – restoration
- CAD Technician

### FFA Awards or competency Certificates

1. Career Dev. Events (CDE)
2. ABYC Certifications for
  - Composites
  - Wood Joinery
  - Finishes

## Aquaculture Technology Curriculum

**Course Title: Marine Propulsion III**

**Scope and Sequence:  
Advanced – Year III**

**Course Description:**  
3rd Year Students / Double Period / One Semester / One (1) credit

Participation in this course will provide students with a working knowledge and experience in mechanics and the workings of small gasoline engines, with the focus on outboard engines. Emphasis will be placed on engine systems and how they are integrated to allow the engine to function, with special attention given to common problems and repairs. Knowledge of the fundamental and specialized tools used, safe working practices, and what constitutes a safe working environment will be achieved through hands on experience with engines. Outboard engines will be disassembled, the parts cleaned or replaced as needed, the engines rebuilt and then brought to the test tank to test and monitor operation. Outboard manufacturers' maintenance and repair videos will be used to enable students to work independently at workstations. The topics/units that students will receive instruction in will include ignition systems; engine cooling systems/ water pumps/ propellers/ lower units, fuel systems (fuel injection and carburetion), lubrication systems, 2-stroke and 4- stroke cycles, winterization and maintenance. This is the first course in the Marine Propulsion concentration sequence.

### Units

(Theme or major  
Chapter/Sections)

Shop Safety  
Tool Identification  
Single cylinder gas engines  
Outboard Systems: Ignition  
Cooling  
Power Transmission (lower unit)  
Fuel Delivery (carburetion/fuel injection)  
Lubrication  
2 Stroke Engines  
4 Stroke Engines  
Winterization  
Maintenance

### Industry Applications or Performance Standards CTE State

Department of Education or  
other Industry recognized  
standards

Standards and Competencies,  
Aquaculture and Marine  
Related Technologies:

A1 ,A3

Standards and Competencies,  
Agriculture Mechanics:

A1,A6,A10,A11,A16

B19,B21

C26,C33

D41

I 74,I 77

### Significant Job Tasks/ Job Titles

**Learning Outcomes- Upon completion of this course, students will be able to:**

Work safely in the marine mechanics environment  
Explain the fundamental principles of 2-stroke and 4-stroke engines  
List in sequence the 4 strokes of an internal combustion engine  
List the major components of 4-stroke engines and their functions  
List and explain the differences between 2-stroke and 4-stroke engines  
Identify correct tools for specific tasks and utilize them properly  
Perform routine maintenance on outboard engines

### FFA Awards or competency Certificates:

ABYC ( American Boat &  
Yacht Council) National  
Marine Trades Curriculum

## Agriculture Science Curriculum

**Course Title:** **Veterinary Science III**

**Scope and Sequence:**  
**Advanced – Year III**

**Course Description:**  
**3rd Year Students / One (1) credit**

This course is designed to expose students to the wide array of opportunities with the animal care field. As developing animal advocates, students in this class will explore issues in the use of animals in our society as well as their own talents and skills and how they apply to the potential of employment in this field. They will learn how to work safely with animals in the laboratory through an understanding of animal behavior. The animals in the lab are housed in cages typically found in retail and research laboratory settings which the students are responsible for maintaining. Additional topics include parasitology, microscopy, grooming techniques, breed identification, feed identification and veterinary tool identification.

Laboratory experiments include dissections, nutritional and gestation studies and experiments as well as practicum activities where students learn how to assess animal health. Field trips to local animal shelters, farms and other related businesses are included in the course.

**Units**  
**(Theme or major**  
**Chapter/Sections)**

Safety Working with Animals,  
Animal Welfare, Introduction to  
Anatomy and Physiology,  
Digestive systems and Nutrition,  
Small Animal housing systems,  
Animal Behavior and Large  
Animal Production

**Industry Applications or**  
**Performance Standards CTE**  
**State**

Department of Education or  
other Industry recognized  
standards

CTE Animal Science Technology  
Vocational Standards: A2, A3,  
A4; B1-5, C3,4,5,7,8; D2,5,11;  
E5; I 1,2 and 4

### Significant Job Tasks/ Job Titles

- **Veterinary Technician**  
Be able to identify common parasites in larval and adult form  
Be able to identify common breeds of dogs, cats and other small animals  
Be able to perform laboratory techniques such as microscopy  
Assess animal housing requirements and maintenance  
Understand basic anatomy and physiology
- **Retail Sales in a Pet Supply Business**  
Effectively communicate with both customers and fellow employees  
Be able to identify common breeds of dogs, cats and other small animals  
Assess animal housing requirements and maintenance  
Manage small animal reproduction  
Be able to identify and advise appropriate use of various feedstuffs
- **Animal Groomer**  
Be able to identify common parasites in larval and adult form  
Be able to identify common breeds of dogs, cats and other small animals  
Understand basic anatomy and physiology  
Be able to perform animal restraints appropriate to different situations with an understanding of animal behavior

**FFA Awards or**  
**competency Certificates**

FFA CDE Veterinary  
Science

**Vocational Agriculture Program of Studies**

**Agricultural Power, Structures and Technology Curriculum**

**Course Title:**  
**Agricultural Power, Structures and Technology III**

**Scope and Sequence:**  
**Advanced - Year III**

**Course Description:**  
**3<sup>rd</sup> Year Students / Double Period / One Semester / One {1} Credit,**  
**Requires Previous Course Sequence / Permission of Instructor**

This course will take it to the third level, continuing to sharpen the students skills and abilities as well as team work within the agricultural power, structures and technology world in modern agriculture. Greater emphasis will be placed on individual success, team work and increased responsibility. Specialized and emerging technologies in agriculture will engage students at our satellite campus at the Pardee Greenhouse Educational Complex in Hamden. Laboratory practices will utilize many of the “Agricultural Industry” resources available within the greater New Haven area.

**Units**  
**(Theme or major Chapter/Sections)**

- Agricultural Power, Structures, and Technology
- Employability and Safety
- FFA
- SAE
- Computers
- Plumbing
- Selection/Using Wood Materials
- Using Plans
- Constructing Small Buildings
- Electrical Controls
- Irrigation Systems
- Business Management
- Greenhouse Structures

**Significant Job Tasks/ Job Titles**

- Explain the importance of power, structures and technology in modern agriculture
- Identify career opportunities, employer expectations, resources and information in agriculture
- Explain and practice personal and mechanical safety
- Define and list benefits of SAE and planned supervised experiences
- Explain the benefits of participation in the FFA, listing the purposes, organization structure and major programs within
- Demonstrate a working knowledge of computers and specialized software
- Design, installation and maintenance of plumbing systems to include plastic, iron, steel and copper
- Selection and uses of wood materials, including bill of materials
- Making and using plans
- Construction of a small building to include preparation of a foundation, framing, roofing, cutting rafters, insulation, repair and maintenance
- Operation and maintenance of greenhouse controls, irrigation system controls and low voltage landscape lighting
- Design, install and operate irrigation systems within the greenhouse and the outdoor landscape
- Develop and manage a business to include a plan, marketing and work place safety
- Design and construct a greenhouse to include structure type, costs considerations, location and environmental controls of the greenhouse environment

**Job Titles**

- Agriculture Teacher
- Computer programmer
- Plumber apprenticeship
- Electrician apprenticeship
- Building/greenhouse contractor
- Small business operator

**Industry Applications or Performance Standards CTE State**

Department of Education or other Industry recognized standards

CTE-NOCTI  
 Agricultural  
 Mechanics  
 Technology

- A-1, 2, 6, 7, 9, 11, 12,14,15, 16
  - B-1, 2, 3, 4, 5
  - C-1, 2, 3, 4, 5, 6, 7, 8,
  - D-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
  - F-1,2,3,4,5
  - G-1,2,3,4,5,6,7,8,9,10
  - H-1, 2, 3, 4, 5, 6, 7,
  - I-1, 2, 4
- CTE-NOCTI Plant  
 Science Technology
- A-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16
  - G-1,2,3,4,5,6,7,8,9,10

**FFA Awards or Competency Certificates**

- FFA Membership Card
- FFA Chapter Proficiency Award
- State FFA Degree
- SAE Outstanding Achievement
- FFA Officer Team Certificate

# **Senior Intensive Courses**

## Aquaculture Science Curriculum

**Course Title:**                 **Aquaculture Life Sciences  
Finfish/Shellfish IV**

**Scope and Sequence:**  
  **Intensive- Year IV**

**Course Description:**  
  **4th Year Students / Double Period / Full Year / Two (2) credits.**

FinFish/Shellfish Production is an advanced course in Aquaculture Science for seniors. It is designed to expand upon and enhance the investigations begun in the Aquaculture Production courses offered in the student's junior year and establish a foundation for more advanced studies in aquaculture, fish husbandry or marine sciences in post-secondary education. It provides the learner with hands-on career experiences in a wide spectrum of scientific techniques employed in aquatic studies. Hands-on work is a requirement. Student abilities to apply both quantitative and qualitative reasoning, problem solving and higher order thought processes will be facilitated by the instructor in many curricular areas including, but not limited to: tank systems, culture methods, feed and habitats, live feed husbandry, water quality, sampling techniques, data collection, and HACCP certification.

Students will be graded on their class participation, field work in a variety of settings, materials and information acquired on field trips, class notes, portfolio, PowerPoint presentations, quizzes, tests and laboratory practicals.

Each student will select an area of interest, create a specialized plan of study, and pursue their chosen aspect of aquaculture through in-depth research for their entire senior year. Students will be required to submit a research project that follows a specific format provided by the instructor. Failure to complete the research project will result in loss of credit, regardless of prior class standing.

### Units (Theme or major Chapter/Sections)

- Safety
- Career Goals
- Carbon Budget
- Journal Reading
- Recirculating Systems
- Live Feeds
  - Algae
  - Zooplankton
- Husbandry Techniques
  - Finfish
  - Shellfish
  - Crustacean
- Genetics
- Spawning Practices
- Hatchery Techniques
- Harvest & Handling
- Scientific Methods
- Data Entry- Excel Program
- Applied Field Work

### Significant Job Tasks/ Job Titles

- Complies with the labor and safety regulations on the job.
- Exposed to "All aspects of the industry".
- GPS Usage.
- Perform calculations involving fractions, decimals and percents.
- Demonstrate accurate record keeping and accounting procedures required for successful agribusiness management.
- Acquire, evaluate, and interpret mathematical data or information in terms of an agricultural application.
- Develop a visual presentation of mathematical data.
- Utilize necessary tools to determine measurements and record results.
- Develop career interests in agriculture science and technology careers through a supervised work experience.
- Demonstrate employee traits desirable in the workplace.
- Demonstrate personal occupational safety and health measures and security measures as they relate to agricultural science and technology applications.
- Utilize computer technology and specialized software for specific work application
- Effectively choose tools or equipment for task completion.
- Demonstrate safe and secure setup and operation of equipment.

#### Job Titles:

Biochemist, Marine Biologist, Nurse/Medical Field Technician, Accountant Teacher, Medical Researcher, Commercial Aquarist, Fisheries Biologist Archaeologist, Commercial Aquaculturalist.  
All report having received useful training in the aforementioned class.

### Industry Applications or Performance Standards CTE State

Department of Education or  
other Industry recognized  
standards

STC/CBIA LEGAL  
AWARNNESS- F52,G54,  
G55, G56, G57  
STF/ C1/ P5  
STF/ C1/ P6  
STF/C7/P7

### FFA Awards or competency Certificates

FDA Hazard Analysis &  
Critical Control Point  
(HACCP) Certification

## Aquaculture Science Curriculum

**Course Title:            Biotechnology IV**

**Scope and Sequence:**  
**Intensive- Year IV**

**Course Description:**

**4th Year Students / Double Period / Full Year Two (2) credits.**  
**Requires Previous Course Sequence or Permission of Instructor and Advisor**

This is the second class in the Aquaculture Biotechnology sequence. This course is designed to provide students with an interest in biotechnology the opportunity to design and implement applications concerning the marine environment. The course begins with various standard procedures in microbiology & biotechnology and progresses through several short and long term projects including the "Microbes for Hire" curriculum, designed by the Center of Marine Biotechnology and the Maryland Sea Grant Extension Program. Laboratory experiments include: using bacterial signals to measure chemical impacts, osmosis and Halo bacteria, DNA extraction, recombinant techniques and PCR. Each student will also be responsible for a long-term study of his or her choice, with teacher approval, which will culminate in a research paper to be submitted in the last marking period.

**Units**  
**(Theme or major Chapter/Sections)**

- Genomics
- Regulation of DNA & Proteins
- Control of Gene Expression
- Proteomics
- PCR
- Critiquing a Scientific Paper
- Key methods in biotechnology
  - PCR
  - Northern Blot
  - ELISA
  - Gene transfer
  - Sequencing
- Independent research topic
  - experimental design
  - reporting

**Industry Applications or Performance Standards CTE State**

Department of Education or other Industry recognized standards

**INDUSTRY APPLICATIONS CTE Standards:**

Aquaculture & Marine

- C-16,17,19,20
  - D-21,25
  - E-32 thru 38
  - H- 53-55
  - I- 59,60,62
- Co-op Skills Section**
- A-1,2,5,7
  - B-11
  - C-17

**Significant Job Tasks/ Job Titles**

- Demonstrate competence in individual preparation of laboratory solutions, reagents, and media
- Demonstrate ability to prepare, set-up and perform basic biotechnology experiments related to PCR, microbiology, and gene transfer
- Demonstrate excellence in the use of pipettes, graduated cylinders, scales, and sterile technique
- Explain the theory behind a Polymerase Chain Reaction experiment (PCR), list all of the necessary reagents, and demonstrate ability to perform the same.
- Demonstrate ability to review, summarize and critique a scientific paper
- Demonstrate competency and facility with biotechnology vocabulary and processes
- Discuss and substantiate various ethical positions related to biotechnology
- Demonstrate knowledge of key biotechnology databases (i.e. NCBI, Pubmed, Fishbase, Wormbase)
- Demonstrate ability to apply evolutionary theories to relevant research topics in marine science (including potential for health care)

**Job Titles**

- Aquaculture Diagnostic Technician
- Lab Technician (human health laboratory)
- Research Technician (pre-college or post BS)
- Research Assistants (BS)
- Research Scientist (BS, MS, PhD)
- Fisheries Biologist
- Aquaculture Research Analyst (BS)
- Aquaculture Technician
- Fisheries Research Analyst (BS) Any laboratory internship at their universities in marine science/biology

**FFA Awards or competency Certificates**

State & Nat'l Agri-science Student Recognition Award  
 Agri-science Education Award  
 Env. Science & Natural Resource Mgt.  
 Emerging Agri-science Technologies

## Aquaculture Technology Curriculum

**Course Title: Ocean Engineering IV**

**Scope and Sequence:  
Intensive –Year IV**

**4th Year Students / Double Period / Full Year / Two (2) credits.  
Requires Previous Course Sequence or Permission of Instructor and Advisor**

This is the second course in the Ocean Engineering sequence. This course explores in greater depth those topics begun in the junior year course, and expands into further areas of current marine technology. Students continue to develop their skills by completing advanced units in CAD, Digital Electronics, Mechanical Engineering, Programming, Robotics, and Underwater Technology/Systems. Emphasis is once again placed on the completion of both short- and long-term projects, as well as daily class work. Class projects include the use of side scan sonar to map a portion of Long Island Sound and the construction, testing and use of a hydrophone, a Conductivity/Temperature/Depth sensor, a fresh water Remotely-Operated Vehicle (ROV) for intra-class competition, and an Autonomous Underwater Vehicle (AUV). The final project involves the construction of an ROV for entry in the National ROV Competition, wherein all phases of project management are studied and incorporated into daily class work. Mathematics and algebraic expressions are utilized a great deal. Completion of (or concurrent enrollment in) Pre-Calculus is preferred, as trigonometric concepts will be used. This course requires students to document the steps of the engineering process and to include reflective writing on their experiences. A high degree of self-discipline and academic motivation is understood to be a prerequisite for successful completion of this course.

### Units (Theme or major Chapter/Sections)

- Advanced Solid Modelin; in CAD using SolidWorks
- Digital Electronics
- Computer Programming/ BASIC Stamp
- Mechanical Engineering/ Subassemblies
- Underwater Technology/ Remote Sensing
- Sonar Imaging Technology
- Special Project – ROV Design & Construction
- Marine Technology Careers

### Industry Applications or Performance Standards CTE State

Department of Education or  
other Industry recognized  
standards

#### INDUSTRY APPLICATIONS

- CTE-NOCTI:  
Aquaculture & Marine  
Related Technology
- B - 12, 13, 14, 15
- C - 17, 18, 19, 20, 21, 22
- D - 28, 31, 32, 34
- I - 67, 68, 70
- CTE-NOCTI: Computer-  
Aided Drafting&Design
- B - 9, 10, 11, 12, 13, 14

### Significant Job Tasks/ Job Titles

- Create advanced solid models of an object in a 3D format
- Properly describe the function of simple digital circuit elements
- Describe the relationship between current, resistance & voltage in an electronic circuit
- Identify and use proper symbols for electronic components
- Demonstrate ability to create digital electrical systems using schematic diagrams
- Properly diagnose, troubleshoot and repair electrical systems
- Design and construct complex machines to perform tasks
- Demonstrate knowledge and understanding of the parts of a Sidescan Sonar Towfish and their functions
- Demonstrate ability to document work performed
- Demonstrate use of appropriate technology for presentation
- Demonstrate effective interpersonal skills in group work
- Demonstrate effective group speaking skills
- Demonstrate ability to create a technical report

#### Job Titles:

- Mechanical Engineer
- Electrical Engineer
- Electronics Technician
- Remotely Operated Vehicle (ROV) Technician
- Marine Technician Aboard Survey Vessels
- Hydrographic Survey Technician

### FFA Awards or competency Certificates

- Advanced SolidWorks Certificate
- Digital Electronics Certificate
- Mechanical Engineering Certificate
- Programming Certificate
- Sidescan Sonar Certificate

## Aquaculture Technology Curriculum

**Course Title: Vessel Operations**

**Scope and Sequence:**

**Intensive – Year IV**

**Course Description:**

4th Year Students / Double Period / Full Year / Two (2) credits.

**Requires Previous Course Sequence or Permission of Instructor and Advisor**

This is the second course in the Vessel Operations sequence. Participation in this course is designed to train the student as a large vessel crew member and to eventually become captain of a motor launch, charter boat, ferry, fishing vessel, or to develop the knowledge and skills that could lead to a career in the Merchant Marine, the Navy or the Coast Guard. Students taking this course will be introduced to the coast Guard Regulations applicable to the construction, maintenance and operation of vessels and to obtaining various Coast Guard licenses. They will be introduced to what is involved in the operation of large vessels and how to navigate by various methods. Advanced seamanship skills will be learned such as light cargo handling and towing. They will become familiar with all of the systems that are present aboard a vessel and how each functions to support the operation of the vessel. The use of various communication systems and radar will be practiced. There will also be instruction in watch standing procedures, emergency procedures, heavy weather procedures, and the Coast Guard Auxiliary Coast Watch Program.

### Units (Theme or major Chapter/Sections)

- Large Vessel Safety
- Large vessel seamanship
- Navigation/Piloting
- USCG Inspection/  
Licensing
- Vessel Maintenance
- CPR/ First aid training
- Mechanical & Electrical  
systems
- Weather
- Career opportunities  
within marine  
transportation

### Industry Applications or Performance Standards CTE State

Department of Education or  
other Industry recognized  
standards

- CTE-NOCTI; Aqua =  
Marine Related  
Technology
- A: 1,2,3
- B: 1, 2,3,4,5
- C: 1,2,3,4,5
- D: 1 - 11
- E: 1,3,5,6
- F: 1,3,4,5
- I: 1 – 14
- ABYC Standards

### Significant Job Tasks/ Job Titles

- Prepare students for positions of responsibility in the operation and management of a variety of private and commercial vessels
- Students will comprehend and implement safety aboard larger vessels.
- Students will be proficient in the use and understanding of marine vocabulary.
- Students will develop a specific career path for post-graduation.
- Students will understand all pertinent Navigation rules.
- Students will be proficient at piloting Island Rover.
- Students will successfully complete a USCG approved marine licensing course.
- Students will exercise basic employability skills.
- Students will be proficient in tying knots.
- Students will successfully complete an American Red Cross approved course.

The following job titles are related to this course: (Job titles are in parentheses)

- 1) Safety/ First aid (Safety Officer)
- 2) Crew duties and responsibilities (Crew)
- 3) Understanding weather (Meteorologist)
- 4) Boat characteristics (Fleet Manager, Retail)
- 5) Maintenance/ Troubleshooting (Systems Engineer)
- 6) Helmsman (Crew)
- 7) Navigation (Crew)
- 8) Regulations (Fleet Manager)

### FFA Awards or competency Certificates

- American Red Cross  
First Aid/CPR
- USCG Master  
License Certificate  
Course
- ABYC Certification

## Aquaculture Technology Curriculum

**Course Title:**           **Marine Construction**

**Scope and Sequence:**  
**Intensive – Year IV**

**Course Description:**  
**4<sup>th</sup> Year Students / Double Period / Full Year / Two (2) credits**

Aquaculture Technology IV, Marine Construction 2, continues with the same overall content as Marine Construction 1 with the addition of project management. Seniors are expected to initiate and complete projects that will benefit their learning goals as well as other programs within the school. Students will continue to build and/or repair boats for the school fleet. Boat design using Multisurf (a CAD program) will lead to operating the CNC router to cut out parts for models and/or full size boats. This course includes both hands-on and theoretical learning to prepare the seniors for college in engineering and manufacturing or entry level employment in the marine industry.

### Units (Theme or major Chapter/Sections)

- Shop safety
- Tools
- Materials
- Job sequence/plan
- Woodworking
- Tool maintenance
- Small Boat Construction
- Boat design
- Solid Works (CAD)
- Multisurf (CAD)
- CNC Routing

### Industry Applications or Performance Standards CTE State

Department of Education or  
other Industry recognized  
standards

#### INDUSTRY APPLICATIONS

- CTE-NOCTI;  
Agriculture Mechanics
- A – 2, 3, 7, 10, 11, 12,  
16
- B- 19, 20, 21, 22, 23
- C- 24, 25, 26, 27, 28, 29,  
20, 31, 32, 33
- D- 34, 35, 38, 39, 40, 41,  
42, 43
- I- 74, 75, 76, 77

#### ABYC Standards

- Composites
- Wood Joinery
- Finishes

### Significant Job Tasks/ Job Titles

- Demonstrate understanding of and apply shop safety,
- Identify tools their proper care and use
- Read architectural drawings
- Measure, estimate and prepare job time, sequence and cost analysis
- Perform calculations involving fractions, decimals and percents
- Demonstrate safe, accurate procedures for laying-up petrochemical resins, core materials and fibers
- Construct and repair FRP and composite boat hulls
- Utilize effective communication and teamwork
- Apply effective time management skills

### Job Titles

- Marina, boatyard technician - paint, fiberglass hull repair, rigger, store and move boats
- Yacht design firm – draftsperson, apprentice designer
- Boatbuilding firm – fiberglass lay-up, mold preparation, gelcoat application, CNC programmer and operator
- Marine hardware manufacturer – CNC programmer and operator
- Marine machinist – CNC operator

### FFA Awards or competency Certificates

1. Career Dev. Events (CDE)
2. ABYC Certifications for
  - Composites
  - Wood Joinery
  - Finishes

## Aquaculture Technology Curriculum

**Course Title: Marine Propulsion**

**Scope and Sequence:  
Intensive –Year IV**

**Course Description:**

**4th Year Students / Double Period / Full Year / Two (2) credits.  
Requires Previous Course Sequence or Permission of Instructor and Advisor**

This is the second course in the Marine Propulsion sequence. Participation in this course will provide students with a working knowledge and experience in mechanics and the workings of outboard engines. Knowledge of the fundamental and specialized tools used, safe working practices, and what constitutes a good working environment will be achieved through hands on experience with engines both in the shop and on the water. Outboard manufacturers maintenance and repair videos will be used to enable students to work independently at workstations. The topics/units that students will receive advanced training and instruction in will include ignition systems, engine cooling systems/ water pumps/ propellers/ lower units, fuel systems (fuel injection and carburetion), lubrication systems, 2-stroke and 4- stroke cycles marine diesel engine principles and operation ,new engine rigging, winterization and maintenance ,diagnosing repairs and trouble-shooting. Time permitting, MP IV students may also experience units dealing with Metal Fabrication (cutting and welding).

**Units  
(Theme or major  
Chapter/Sections)**

Shop Safety  
Tool ID  
Outboard Systems:  
Ignition  
Cooling  
Power Transmission (lower unit)  
Propellers  
Fuel Delivery (carburetion/fuel injection)  
Lubrication  
2 Stroke Engines  
4 Stroke Engines  
Winterization  
Maintenance  
Diesel Principles of Operation  
Metal Fabrication

### Significant Job Tasks/ Job Titles

**Upon completion of this course, students will be able to:**

Work safely in the marine mechanics environment  
Explain the fundamental principles of 2-stroke and 4-stroke engines  
List in sequence the 4 strokes of an internal combustion engine  
List the major components of 4-stroke engines and their functions  
List and explain the differences between 2-stroke and 4-stroke engines  
Identify correct tools for specific tasks and utilize them properly  
Perform routine maintenance on outboard and marine diesel engines  
Describe the operating principles of a simple carburetor  
Differentiate between a magneto ignition system and a D.C.battery system  
Explain the basic principles of both air cooled and water cooled engines  
Explain the principles of diesel engine operation

#### Job Titles

- 1.Outboard Engine Technician
- 2.Outboard Engine and Systems Rigger
- 3.Marine Diesel Engine Technician
- 3.Small Gas Engine Repairman
- 4.Parts Department Clerk/ Manager
- 5.Marina Equipment Operator
- 6.Marine Electrician
- 7.Marine Metal Fabricator and Repairman

### Industry Applications or Performance Standards CTE State

Department of Education  
or other Industry  
recognized standards

Standards and Competencies,  
Aquaculture and Marine Related Technologies:  
A1, A3  
Standards and Competencies,  
Agriculture Mechanics:  
A1, A4, A6-8,A10,A11,A16  
B19, B21  
C26, C33  
D41

### Competency Certificates:

ABYC ( American Boat & Yacht Council) National Marine Trades Curriculum

## Agriculture Power, Structures and Technology Curriculum

<p><b>Course Title:</b> <b>Agricultural Power, Structures and Technology IV</b></p> <p><b>Scope and Sequence:</b> <b>Intensive - Year IV</b></p> <p><b>Course Description:</b> <b>4th Year Students / Double Period / Full Year / Two {2} Credits</b> <b>Requires Previous Course Sequence / Permission of Instructor</b></p> <p>Course Sequence or Permission of Instructor and Advisor. This course will culminate 4 years of student knowledge, skills and abilities to develop, conduct and conclude research of special topics/projects within the laboratory facility. Intensive projects will also be taking place. Specialized and emerging technologies in agriculture will engage students at our satellite campus at the Pardee Greenhouse Educational Complex in Hamden. Laboratory practices will utilize many of the “Agricultural Industry” resources available in the greater New Haven area. Instruction will be provided on FFA, SOE, employability/careers, and safety within the agricultural technology field. This is an advanced independent study, involving research in an area of agriculture power, structures and technology agreed to by instructor and student. Emerging fields of and current issues in agriculture are encouraged to enhance student learning and self-directed study. Students will be required to plan, conduct, document and conclude with a Power Point presentation, regarding the progress and outcomes of their independent study.</p>	<p style="text-align: center;"><b>Units</b> (Theme or major Chapter/Sections)</p> <ul style="list-style-type: none"> <li>• Agricultural Power, Structures and Technology</li> <li>• Employability and Safety</li> <li>• FFA</li> <li>• SAE</li> <li>• Computers</li> <li>• Greenhouse Crop Production</li> <li>• Pesticides</li> <li>• Tissue Culture</li> <li>• Floral Design</li> <li>• Interiorscapes</li> <li>• Hydroponics/Aquaponics</li> </ul>
<p style="text-align: center;"><b>Significant Job Tasks/ Job Titles</b></p> <ul style="list-style-type: none"> <li>• Explain the importance of Power, Structure and Technology in modern agriculture</li> <li>• Identify career opportunities, employer expectations, resources and information in agriculture</li> <li>• Explain and practice personal and mechanical safety</li> <li>• Define and list benefits of SAE and planned supervised experiences</li> <li>• Explain the benefits of participation in the FFA, listing the purposes, organization structure, and major programs within</li> <li>• Demonstrate a working knowledge of computers and specialized software</li> <li>• List the protocol in the safe and efficient use of equipment used in the horticulture industry</li> <li>• Describe the complete and incomplete metamorphosis of insects</li> <li>• Demonstrate safe practices in selecting, applying, storing and disposal of chemicals</li> <li>• Produce a greenhouse crop of Poinsettias for market</li> <li>• Identify the art principles used in floral design</li> <li>• Design and maintain an interiorscape</li> <li>• Produce a crop of hydroponic salad greens and herbs</li> <li>• Design and install and aquaponics growing system for third world countries</li> </ul>	<p style="text-align: center;"><b>Industry Applications or Performance Standards CTE State</b></p> <p>Department of Education or other Industry recognized standards</p> <p>CTE-NOCTI Agricultural Mechanics Technology</p> <ul style="list-style-type: none"> <li>• A-1, 2, 6, 7, 9, 11, 12, 16</li> <li>• B-1, 2, 3, 4, 5</li> <li>• C-1, 2, 3, 4, 5, 6, 7, 8,</li> <li>• D-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11</li> <li>• H-1, 2, 3, 4, 5, 6, 7,</li> <li>• I-1, 2, 4</li> </ul> <p>CTE-NOCTI Plant Science Technology</p> <ul style="list-style-type: none"> <li>• A-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16</li> <li>• E-1, 2, 3, 4, 5, 6</li> </ul>
<p style="text-align: center;"><b>Job Titles</b></p> <ul style="list-style-type: none"> <li>• Agriculture Teacher</li> <li>• Greenhouse grower</li> <li>• Computer technician</li> <li>• Interior landscaper</li> <li>• Floral Designer</li> <li>• Community leader</li> </ul>	<p style="text-align: center;"><b>FFA Awards or Competency Certificates</b></p> <ul style="list-style-type: none"> <li>• FFA Membership Card</li> <li>• State FFA Degree</li> <li>• State Proficiency Award</li> <li>• SAE Certificate of Outstanding Achievement</li> <li>• FFA Officer Team Certificate</li> </ul>

