

KENNEBEC VALLEY COMMUNITY COLLEGE

ENERGY SERVICES AND TECHNOLOGY PROGRAM

ASSOCIATE OF APPLIED SCIENCE DEGREE

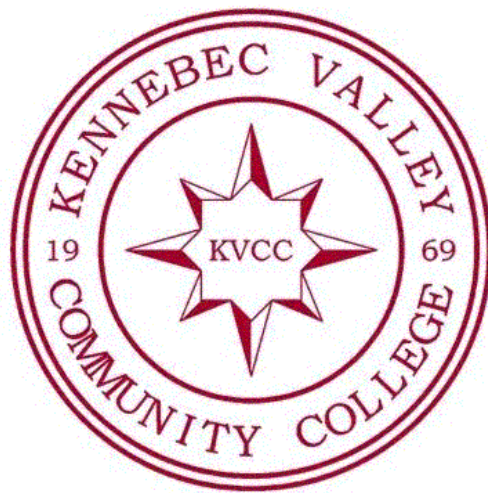


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Program Description

The Energy Services and Technology (EST) program offers a two-year Associate of Applied Science (AAS) degree. The program is designed to prepare students for technician level positions in the rapidly growing field of installing, maintaining, and troubleshooting high efficiency plumbing, heating, ventilating, and cooling systems in buildings. Graduates will work on systems that control water, temperature, humidity, and air quality of enclosed spaces within building structures. They will install various types of equipment used to control human comfort in residential, commercial, industrial, and institutional environments. This program will give the technician a working knowledge of plumbing and HVAC system building concepts and energy efficient design principles. Incorporated within the curriculum is the International Association of Plumbing and Mechanical Officials (IAPMO) “Accredited Green Plumbers Training” curriculum. Students can earn the Green Plumber’s accreditation from IAPMO upon completion of EST degree requirements. Additionally, program graduates are eligible for State of Maine licensing in plumbing, oil burner, solid fuel, and propane and natural gas. Students can also pursue the EPA refrigeration certification. Combined with the appropriate additional coursework, graduates will also have the necessary educational background and licenses needed for advancing into a career in renewable and sustainable energy systems.

Admission Requirements

1. Successful completion of two years of high school algebra or the equivalent.
2. Successful completion of a high school science course (physics recommended).

AAS Degree Curriculum

Program of Study

Educational Core	Credit Hours
ENG108	Technical Writing ----- 3
MAT114	Technical Math----- 3
MAT117	College Algebra ----- 3
PHY111	Elements of Physics ----- 4
COM104	Introduction to Communication, or
COM105	Interpersonal Communication----- 3
	Humanities Elective ----- 3
	Social Science Elective----- 3
	Educational Sub Total -----22

Technical Core **Credit Hours**

BPT125	Drafting / Print Reading-----	3
ETL107	Electrical Principles for HVAC-----	3
ETL108	HVAC Electronics and Controls-----	3
HAC201	Heating System Fundamentals-----	5
HAC202	Advanced Heating Applications-----	5
HAC204	Biomass Solid Fuel Applications-----	3
HAC106	Heat Pumps and Air Conditioning-----	3
HAC206	Solar and Geothermal Renewable Energy Systems-----	3
HAC205	Propane and Natural Gas-----	3
HAC210	HVAC and Plumbing Codes-----	3
PLB101	Plumbing Fundamentals-----	5
PLB201	Advanced Plumbing Applications-----	5
PMT217	Metal Fabrication-----	1

Technical Sub Total -----45

AAS Degree Program Total-----67

Suggested Curriculum Sequence

<u>First Semester</u>		<u>Credit Hours</u>	<u>Classroom</u>	<u>Lab</u>	<u>Contact Hours</u>
BPT125	Drafting/Print Reading*	3	3	0	45
ETL107	Electrical Principles for HVAC*	3	2	2	60
PLB101	Plumbing Fundamentals*	5	2	9	165
PMT217	Metal Fabrication*	1	0	3	45
MAT114	Technical Math	3	3	0	45
		15	10	14	360
<u>Second Semester</u>					
ETL108	HVAC Electronics and Controls*	3	2	2	60
HAC106	Heat Pumps and Air Conditioning*	3	2	2	60
PLB201	Advanced Plumbing Applications*	5	2	9	165
MAT117	College Algebra	3	3	0	45
ENG108	Technical Writing	3	3	0	45
		17	12	13	375
<u>Third Semester</u>					
HAC201	Heating System Fundamentals*	5	2	9	165
HAC204	Biomass Solid Fuel Applications*	3	2	2	60
COM104	Introduction to Communication, or				
COM105	Interpersonal Communication	3	3	0	45
PHY111	Elements of Physics	4	3	2	75
	Social Science Elective	3	3	0	45
		18	13	13	390

Fourth Semester

HAC206	Solar and Geothermal Renewable Energy Systems*	3		2	2
60					
HAC210	HVAC and Plumbing Codes*	3	3	0	45
HAC202	Advanced Heating Applications*	5	2	9	165
HAC205	Propane and Natural Gas *	3	2	2	60
	Humanities Elective	3	3	0	45
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		17	12	13	375
	Program Totals	67	47	53	1500

*Denotes a core technical course

Criteria for Graduation

Students must complete 67 credits in the Energy Services and Technology program and achieve a minimum grade of "C" in designated common and program core courses (*). Students must maintain a final GPA of 2.0 or higher.

Career Opportunities

Graduates of the EST program will find employment as entry level plumbing, heating, ventilation, and air conditioning technicians. They may also find employment as technicians for gas and propane systems. Solid fuel technician positions may also be an option. Graduates are encouraged to take additional coursework to qualify them as renewable energy system installers in such areas as solar thermal, geothermal, and biomass solid fuel systems.

Course Descriptions

BPT125 Drafting / Print Reading Credits 3

This course will provide the student with the technical knowledge necessary to interpret residential construction blueprints. Emphasis will be placed on basic drawing practices, use of instruments, orthographic projection, reading scales, architectural & electrical symbols, floor plans, sections, dimensions, pictorial views and blueprint reading.

ETL107 Electrical Principles for HVAC Credits 3

This course is designed to provide a foundation in the field of electricity and electronics for HVAC technicians. Topics such as engineering notation, components, voltage, current, resistance, power, Ohm's Law, circuit theorems, magnetic theory, AC theory, and transformers will be covered in detail. The lab component of this course is designed to reinforce topical theories and provide applications by means of "hands on" lab procedures and computer based lab experiments. Test and measure equipment such as the digital multi-meters (DMM), variable DC power supplies, and bread boards will be used throughout the course.

Pre or Co-requisite: MAT114

ETL108 HVAC Electronics and Controls Credits 3

This course will provide students with the theory and practice of the electrical skills needed as an HVAC technician. Theoretical studies will be backed up with hands on laboratory exercises. Students will practice installing and troubleshooting electronic controls that are commonly used in HVAC systems.

Prerequisite: ETL107

HAC201 Heating System Fundamentals Credits 5

This is an introductory course that introduces students to career possibilities as a heating technician. The basics of how to supply heat to residential buildings will be covered. Major topics covered include trade safety practices, tools of the trade, heating fundamentals, fuel types, combustion theory, system types, and system sizing. High efficient heating systems and renewable energy heating systems will be introduced.

HAC202 Advanced Heating Applications Credits 5

This course is a continuation of HAC101. It will cover system design, installation methods for residential and commercial heating systems, testing for combustion efficiency, heating control wiring, and customer interaction. Advanced instruction in alternative energy and high efficient heating systems will be covered. There is a large amount of 'hands-on' lab time in this course so that the student will have the necessary manual skills needed to install heating systems.

Prerequisite: HAC201

HAC204 Biomass Solid Fuel Applications Credits 3

This course will introduce biomass solid fuel heating systems. It will address the economic and environmental advantages of biomass heating, and describe the distribution process. Then it will move toward practical technical skills needed to correctly size, design, install, and service complete biomass heating systems.

Pre or Co-requisite: HAC201

PMT217 Metal Fabrication Credits 1

This course is designed to introduce students to the fundamentals of metal fabrication. The principles of shielded metal arc welding and the oxy-fuel process of cutting, welding, and brazing will be covered in detail. Students will also be introduced to gas metal arc welding. Classification of metals, their properties, designations, and identification will also be covered.

HAC106 Heat Pumps and Air Conditioning Credits 3

This class will describe the general theory behind the refrigerant cycle, and how it is used to create heat, or air conditioning. Students will learn how to service, and check the efficiency of heat pumps and air conditioning units. Students will be presented with the regulatory requirements of handling refrigerants, and prepare for the EPA certification test.

Pre or Co-requisite: ETL108

**HAC206 Solar and Geothermal Renewable Energy Systems
Credits 3**

This course will introduce students to the full spectrum of renewable and alternative energy heating and cooling systems. Focus will be on understanding the source of clean and sustainable energy, and implementing the best technologies to match the existing natural resources. Content will focus on geothermal heating/cooling and solar thermal heating/cooling.

Pre or Co-requisite: HAC202

HAC205 Propane and Natural Gas Credits 3

This course will introduce students to the fundamental principles and practices of propane and natural gas technologies, and is specifically designed toward the knowledge and skills required to become a licensed appliance connection and service technician. Course content matches the materials used in three National Propane Gas Association (NPGA) Certified Employee Training Program (CETP) certification areas.

Prerequisite: HAC201

HAC210 HVAC and Plumbing Codes Credits 3

This course is designed to cover the IAPMO Uniform Plumbing and Mechanical Code in detail. Other applicable codes such as the Maine oil and solid fuel code will be covered as they apply to HVAC systems. Appropriate sections of the national Electrical Code will also be covered.

Prerequisite: HAC201, PLB201. Co-requisite: HAC202

PLB101 Plumbing Fundamentals Credits 5

This course will introduce students to the fundamental principles of plumbing technology. Topics covered include trade safety practices, tools of the trade, plumbing materials, drainage and venting, climate care, potable water supply, water pump basics including submersible and jet-pump systems, and the basics of plumbing installations. Students will also begin their review of IAPMO's Green Plumbers training program. The entire Green Plumbers accreditation course, totaling thirty-two hours of core courses, will be delivered throughout the EST program. Hands-on labs will provide training in pipefitting, water pumps, and basic plumbing skills. The initial labs will cover the proper ways to assemble copper, IPS, PEX and PVC piping systems. The next set of labs focus on the installation, service, and repair of water pumps. The final set of labs introduces the student to the basics of plumbing system installations.

PLB201 Advanced Plumbing Applications Credits 5

This course is a continuation of PLB201 and covers more advanced plumbing applications. Hands-on labs will concentrate on developing the student's skills in the assembling and testing various plumbing systems. The proper installation of a variety of plumbing fixtures for both residential and commercial applications is also covered. Students will complete their review and exposure to IAPMO's Accredited Green Plumbers Training program and will be eligible to pursue this certification.

Prerequisite: PLB101