

ENERGY OPERATIONS

2009 – 2010

20 Months

Credits Required for Graduation:

Process Plant Operations: 72

Power Plant Operations: 72

Associate of Applied Science (A.A.S.) Degree

The Energy Operations program is a new program beginning Fall of 2009. All course content is subject to change.

Energy Industry Outlook

Producing economical energy has become a global business with a demand is so large that it has created opportunities for newly developed careers in the energy industry and adding additional numbers to the current industry employee base. The Energy Operations program is designed to meet the ever-increasing need in the particular area of power and process plant operations technicians for energy producing industries.

Monitoring and Controlling the Energy Industry

Power plants (coal-fired, hydro, and nuclear) and process plants (ethanol, oil refineries, bio-diesel, and other renewable fuels) are rapidly expanding in this region. The ethanol industry's production capabilities are exploding across the Midwest and two new coal-fired power plants and a refinery are on the horizon for Eastern South Dakota. All of these facilities are facing an acute need for technicians who can monitor, control, and operate the production equipment for the energy industry.

Understanding the Energy System

The Energy Operations program will have two major components: technical theoretical training and practical experience gained in the labs and during the internship. The Energy Operations program provides a baseline understanding of mechanics and systems, then students specialize in either process plant or power plant – going in depth on monitoring, controlling, and troubleshooting plant systems. Students will learn electrical systems, turbines, boiler systems, and other core theory and skills. They will also learn metallurgy, pneumatics, hydraulics, thermodynamics, combustion, vibration analysis, and dynamic balancing. Environmental and safety concerns will also be taught throughout the program.

The Future

The growth of the energy industry in this area of the country is substantial. The need for Plant Operations Technicians in the energy field is solid both locally and nationally. A skilled energy technician can earn high wages in ethanol plants, power plants, wind turbine farms, pipelines, dairy and cheese processing plants, and any industry that requires an employee to understand processes and perform industrial maintenance.

Recommended Background Courses

Although not required, the following courses would be beneficial to this course of study prior to attending Lake Area Technical Institute: Math, Algebra, Physics, Computer, communication skills, industrial technology courses.

Energy Operations Courses

AED 100 – Automated External Defibrillator (.5 credit)

To prepare individuals in the workplace to provide care for breathing emergencies, perform cardiopulmonary resuscitation (CPR), and use an automated external defibrillator (AED) for victims of sudden cardiac arrest.

CIS 102 – Windows Applications for Technicians Applications (3 credits)

Introductory course in using a Windows-based microcomputer and related software, you will gain an understanding and basic operational knowledge about the Windows XP operating system.

ET 100 – Fundamentals of Energy Production and Distribution (2 credits)

This course will help the student gain a strong knowledge of various energy sources and technologies through study and discussions on conventional, alternative, and emerging sources of energy.

ET 105 – OSHA/Safety (.5 credit) This course will cover OSHA laws, rules, and regulations for the industrial construction and possible hazards in the workplace. Preventative measures that can be taken to insure your safety and the safety of those around you will also be covered.

EO 110 – Introduction to Process Technology (3 Credits) This course provides an introduction to process plant operations including ethanol plants, chemical and refinery plants, natural gas facilities, gasification operations, combined cycle and food processing operations.

EO 115 – Introduction to the Electric Industry (3 Credits)

Provides an overview of the electrical power industry, including its history, development and regulatory environment. Students learn about the transmission of electricity and the development of regional and national energy grids, including changes in the regulation of the power industry.

EO 120 – DC Fundamentals (3 Credits) Covers basic direct current theories and applies those theories to the electrical system and related equipment. Students will study methods of producing a voltage, such as batteries, magnetic fields, basic series and parallel circuits.

EO 125 – AC Fundamentals (3 Credits) Covers basic alternating current theories and applies those theories to electrical systems and related equipment. Students also study basic generator and motor design, construction and operating principles.

EO 130 – Basic Blueprint Reading (1.5 Credits) Covers schematics, prints, piping and instrument diagrams used in the energy industry. Students will learn how to interpret simple block and single-line diagrams, which will prepare them for the logic and electrical schematics included in this course.

EO 135 – Instrumentation and Controls (3 Credits) Provides a comprehensive look and study of instrumentation components, control theory, control systems and typical controllers associated with the operation of energy facilities.

EO 140 – Thermodynamics (3 Credits) This course will study heat transfer, fluid flow and the conservation of energy. Specific equipment design considerations based on thermodynamic principles covered.

EO 145 – Water Purification and Treatment (3 Credits)

Covers industrial water treatment processes. Students will study boiler water treatment, raw water treatment, and the design and operation of ion exchangers. The course also covers cooling water treatment equipment and waste water treatment equipment and systems.

HAZ 100 – Hazardous Materials Safety (.5 credit) Identifying types of hazardous material, demonstrating personal protective equipment, and identifying blood borne pathogens.

MATH 117 – Applied Trigonometry (1 credit) The practical application of trigonometry as it applies to the shop setting.

Additional Courses Required for the Process Plant Option

EO 200 – Process Boilers (3 Credits) Provides a comprehensive study of industrial manufacturing plant boilers and furnaces, and supporting auxiliary systems. Students will study typical process plant boiler, oxidizer and furnace types, their operation, safe firing theory, troubleshooting techniques, and typical maintenance.

EO 202 – Hydrocarbon Chemistry (3 Credits) Provides a fundamental study of the organic chemistry of hydrocarbons associated with crude oil. Also focuses on process chemistry, chemistry fundamentals, typical process reactions and process solubility theory.

EO 204 – Distillation and Refinery Operations (3 Credits) A comprehensive study of processes associated with refining, and petrochemical distillation. This course will also focus on equipment designs, operation requirements and technician responsibilities associated with the operation of typical distillation facilities.

EO 206 – Gas Processing (3 Credits) A comprehensive study of the processing technologies associated with the production of natural gas and other gases found within natural gas fields. Students will study gas laws, molecular structure, process theory, terminology, equipment and the auxiliary systems which support the production and processing of gases.

EO 208 – Ethanol and Biofuels Production (4 Credits) Students enrolled in this course will study the design, operation, equipment and process flows of ethanol plants and biofuels facilities including biodiesel plants. The student will have the ability to interpret basic flow diagrams, understand related terminology, focus on safety considerations, typical maintenance, and startup/shutdown procedures.

EO 210 – Auxiliary Systems and Refrigeration (3 Credits) Provides a comprehensive study of industrial manufacturing plant auxiliary systems, including fluid power, piping and piping systems, pumps and pump drive systems, compressors and fan systems, refrigeration, and hydraulic systems, but not restricted to these components.

EO 212 – Process Operations and Troubleshooting (3 Credits) This course is designed to provide instruction in the different types of troubleshooting techniques, procedures, and methods used to solve process problems. Students will use existing knowledge of equipment, systems, and instrumentation to understand the operation of an entire unit in a facility.

EO 214 – Internship (5 Credits) Students will participate in an on-site internship placement in an energy production facility.

WLD 230 – Structural Material Welding (3 credits) Introduction to shielded metal arc welding on structural steel.

Additional Courses Required for the Power Plant Option

EO 201 – Power Plant Equipment (3 Credits) This course covers the various types of equipment used in the production of electricity, including pumps, valves, air compressors, coal pulverizers, fans, cooling towers, condensers and heat exchangers.

EO 203 – Energy Sources and Conversion (2 Credits) This course will study the various forms of energy and the processes used to convert chemical and potential energy into thermal, mechanical, and in some instances electrical energy. Energy sources that will be studied include fossil fuels (coal, oil and natural gas), hydro, wind, fuel cells, solar, derived fuel, geothermal and nuclear.

EO 205 – Boilers (4 Credits) In this course the various types of boilers, systems, components and auxiliary systems associated with steam generators are covered. Including low/high pressure, fire tube/water tube, negative/positive draft, drum type, supercritical and fluidized bed boilers. Boiler operation, combustion, safety and emission control equipment will be covered along with efficiency measures.

EO 207 – Gas Turbines and Combined Cycle Operations (4 Credits) Students will study all the elements that make up a gas turbine and a combined cycle unit. This course also covers the safe and efficient operation of gas turbines and heat recovery steam generators and different applications for combine cycle and cogeneration configurations.

EO 209 – Steam Turbines and Auxiliaries (3 Credits) This course covers basic steam turbine construction and design and associated auxiliary systems. Students will learn how thermal energy is converted to mechanical energy as the steam passes through a typical industry steam turbine. Students will also study the auxiliary systems associated with steam turbine operation, including extraction steam systems, gland steam sealing systems, turbine lube oil systems, seal oil systems, instrumentation and control devices and protective schemes used during abnormal operating conditions.

EO 211 – Power Generation (2 Credits) Students will study the design and construction of large industrial generators used in the electricity production. Also covered are the various exciter designs and operation and the various auxiliary equipment that supports generator operation.

EO 213 – Electrical System Components and Protection (4 Credits) Students enrolled in this course will study the electrical systems from the main generator through the switchyard including the various relay and protection schemes and zones. Safety aspects and operational checks when placing electrical systems and components in and out of service will be covered.

EO 215 – Plant Operations and Troubleshooting (3 Credits) Students will gain the knowledge necessary to comprehend overall power plant operations and respond to abnormal operating conditions. Students will also participate in root cause analysis exercises while troubleshooting different operating scenarios.

EO 217 – Internship (5 Credits) Students will participate in an on-site internship placement in an energy production facility.

To fulfill graduation requirements, students must select one course in each of the areas listed. Courses marked with an asterisk can be transferred directly to the university system under the terms of articulation agreements.

Behavioral Science Course

PSYC 100 – Psychology of Human Relations
PSYC 101 – General Psychology *

Communications Course

COMM 101 – Contemporary Communication
ENGL 101 – Composition *
SPCM 101 – Fundamentals of Speech *

Mathematics Course

MATH 100 – Applied General Math
MATH 101 – Intermediate Algebra
MATH 102 – College Algebra *

Social Science Course

ECON 105 – Leadership in the Global Workplace
ECON 201 – Principles of Microeconomics I *
ECON 202 – Principles of Macroeconomics II *
SOC 100 – Introduction to Sociology *