

EVENING PROGRAM CERTIFICATE IN CONTROL SYSTEMS TECHNOLOGY - ST. LOUIS

This certificate program focuses on the measurement and control of automated processes and technical systems in industrial plants. Emphasis is placed on level, temperature, pressure, flow and the more analytical variables such as pH, viscosity, density and humidity.

Control Systems Technology offers opportunities in the fast-growing petrochemical (refineries), chemical, pharmaceutical, food processing, distilleries and power plant industries.

Because the highly sophisticated equipment encompasses the areas of pneumatics, electricity, analog electronics,

programmable controllers and computers, students in the certificate program will leave as control systems technicians with proficiencies in each of those areas. These classes meet on Monday and Wednesday or Tuesday and Thursday evenings. For students interested in furthering their education, these courses can be credited toward the Bachelor of Science in Applied Management (BSAM) degree.

Upon completion of the program, students will be able to:

- Interpret drawings used in automated control systems.
- Install, calibrate, and program equipment used to measure and control; temperature, level, pressure and flow rate used in food and beverage, chemical, pharmaceutical, utilities and other manufacturing facilities.

| EVENING PROGRAM COURSES | | | HOURS | PREREQUISITES |
|--|---------|--|-------|---------------|
| First Semester | EEL0110 | DC and AC Theory and Lab | 6 | |
| Second Semester | EEL0115 | Basic Control Circuits and Commercial Wiring Practices | 6 | EEL0110 |
| Third Semester | ELA0240 | Programmable Logic Controllers (PLC) and Human Machine Interface (HMI) Control | 6 | EEL0115 |
| Fourth Semester | CST0240 | Principles of Control, Batch Processing and Communications | 6 | ELA0240 |
| <i>Total Technical Credit Hours for Certificate Completion</i> | | | 24 | |

COURSE DESCRIPTIONS

EEL0110 DC and AC Theory and Lab

Emphasizes the fundamentals of electricity and the proper use of electrical tools. During the direct current (DC) portion of study, students are introduced to basic electrical terms and DC circuit concepts and calculations. Study includes hands-on laboratory experiments illustrating principles studied in theory. Students will also acquire competence in using analog and digital measuring and test equipment. During the alternating current (AC) portion of study, students will work with electrical components such as capacitors, inductors and transformers that are employed in circuit analysis. Transformer principles, resistor-inductor (RL) and resistor-capacitor (RC) circuits and impedance, resonance and power factor subjects are studied in theory and constructed in the lab. Students use test equipment such as oscilloscopes and signal amplifiers.

Six credit hours

EEL0115 Basic Control Circuits and Commercial Wiring Practices

Offers fundamentals of relay logic control circuits, basic Programmable Logic Controllers (PLCs), ladder logic, and component wiring design and operation. Students will also practice basic Variable Frequency Drives (VFDs). Students will then explore various methods used to distribute electrical power common in both residential and commercial applications. An overview of electronic control components such as diodes, transistors and integrated circuit chips are explored. The course will also review electrical safety, types of electrical equipment and devices. Students will construct various branch circuit lighting and receptacle wiring systems utilizing different cabling and conduit methods. The National Electrical Code (NEC) will be utilized throughout the course.

Six credit hours

ELA0240 Programmable Logic Controllers (PLC) and Human Machine Interface (HMI) Control

Basic PLC instructions and HMI applications are explored in real-world applications. To reinforce class lectures, students perform related lab exercises. Students will learn how field sensors and control components interact with PLC. The Allen-Bradley SLC 5/04 controller with Rockwell RSLogix™ 500 software and RSView32™ are used in a Windows environment. Online and offline programming is covered, along with wiring methods and various troubleshooting techniques. *Six credit hours*

CST0240 Principles of Control, Batch Processing and Communications

Includes principles of temperature fluid properties, conversion factors, piping and instrumentation diagrams as well as the theory and operation of devices used to measure and control variables (including sensors, transducers, transmitters, controllers, pumps and valves). Focus is placed on the calibration and configuration of various electronic digital transmitters and controllers, pressure, level and flow and basic control concepts effects of process dynamics. Students also learn basic principles for cascade, ration and dead time control. In addition, this course covers feed forward and multivariable control theory and tuning parameters for control systems. Emphasizes basic principles and operation of variable speed drives and introduces distributed control systems. The course covers hierarchy and communications of computers and introduction to computer networks, data highways and field buses. Batch processing is taught under the guidelines of the International Society of Automation, ISA-88. *Six credit hours*

EVENING PROGRAM CERTIFICATE IN ELECTRICAL AUTOMATION TECHNOLOGY - ST. LOUIS

This certificate program offers training in power electricity, the industrial applications of electronics, industrial logic and programmable controllers. The course emphasizes the maintenance, troubleshooting and installation of electrical circuitry and equipment controls.

Graduates will be prepared to enter the work force as apprentices or entry level industrial electricians. Others may gain employment in diverse areas such as research and development laboratories, utilities and manufacturers, electrical equipment distributors (as service and field technicians), electrical sales and estimating.

These classes meet on Monday and Wednesday or Tuesday and Thursday evenings.

For students interested in furthering their education, these courses can be credited toward the Bachelor of Science in Applied Management (BSAM) degree.

Upon completion of the program, students will be able to:

- Install and maintain industrial, commercial, and residential electrical systems.
- Program and configure equipment controlling various types of electrical motors and automated processes.

| EVENING PROGRAM COURSES | | | HOURS | PREREQUISITES |
|--|---------|--|-------|---------------|
| First Semester | EEL0110 | DC and AC Theory and Lab | 6 | |
| Second Semester | EEL0115 | Basic Control Circuits and Commercial Wiring Practices | 6 | EEL0110 |
| Third or Fourth Semester | ELA0230 | Motor Controls, Drives and Power Distribution | 6 | EEL0115 |
| Third or Fourth Semester | ELA0240 | Programmable Logic Controllers (PLC) and Human Machine Interface (HMI) Control | 6 | EEL0115 |
| <i>Total Technical Credit Hours for Certificate Completion</i> | | | 24 | |

COURSE DESCRIPTIONS

EEL0110 DC and AC Theory and Lab

Emphasizes the fundamentals of electricity and the proper use of electrical tools. During the direct current (DC) portion of study, students are introduced to basic electrical terms and DC circuit concepts and calculations. Study includes hands-on laboratory experiments illustrating principles studied in theory. Students will also acquire competence in using analog and digital measuring and test equipment. During the alternating current (AC) portion of study, students will work with electrical components such as capacitors, inductors and transformers that are employed in circuit analysis. Transformer principles, resistor-inductor (RL) and resistor-capacitor (RC) circuits and impedance, resonance and power factor subjects are studied in theory and constructed in the lab. Students use test equipment such as oscilloscopes and signal amplifiers.

Six credit hours

EEL0115 Basic Control Circuits and Commercial Wiring Practices

Offers fundamentals of relay logic control circuits, basic Programmable Logic Controllers (PLCs), ladder logic, and component wiring design and operation. Students will also practice basic Variable Frequency Drives (VFDs). Students will then explore various methods used to distribute electrical power common in both residential and commercial applications. An overview of electronic control components such as diodes, transistors and integrated circuit chips are explored. The course will also review electrical safety, types of electrical equipment and devices. Students will construct various branch circuit lighting and receptacle wiring systems utilizing different cabling and conduit methods. The National Electrical Code (NEC) will be utilized throughout the course. *Six credit hours*

ELA0230 Motor Control, Drives and Power Distribution

Covers the theory of both alternating current (AC) and direct current (DC) machines and drives. Students will also learn how to set up, maintain and troubleshoot AC and DC motor drive systems. Hands-on activities involve the installation, programming and troubleshooting of AC and DC motor drive systems. Students study and construct power distribution for single-phase and three-phase operations. Students will also understand instrument, auto and potential transformers.

Six credit hours

ELA0240 Programmable Logic Controllers (PLC) and Human Machine Interface (HMI) Control

Basic PLC instructions and HMI applications are explored in real-world applications. To reinforce class lectures, students perform related lab exercises. Students will learn how field sensors and control components interact with the PLC. The Allen-Bradley SLC 5/04 controller with Rockwell RSLogix™ 500 software and RSView32 are used in a Windows environment. On-line and off-line programming is covered, along with wiring methods and various troubleshooting techniques.

Six credit hours

EVENING PROGRAM CERTIFICATE IN ELECTRICAL CONSTRUCTION DESIGN AND MANAGEMENT

In response to industry demand and feedback from the Electrical Systems Design Technology advisory board, Ranken offers an evening program certificate in Electrical Construction Design and Management. Electrical construction designers and project managers work in multiple phases of electrical construction.

Designers create electrical systems for residential, commercial and industrial buildings using computers and Computer Aided Drafting (CAD) software. The designs are then assembled, installed and maintained by electricians and electrical construction workers. Cost estimation, project scheduling and management of the fabrication and installation phase are also key to this career.

Jobs in Electrical Construction Design and Management are professional positions, requiring critical thinking skills and the

perseverance to follow up with a project until it is complete. Most work is done in an office setting, but some positions may require travel, on-site supervision and project follow-up. Electrical designers and managers are employed by architectural firms, consulting engineering firms, electrical contractors and product sales and support offices. Graduates of this program will find entry-level jobs as project designers, project managers, estimators, product specialists and sales representatives.

For students interested in furthering their education, these courses can be credited toward the Bachelor of Science in Applied Management (BSAM) degree.

Upon completion of the program, students will be able to:

- Design lighting and electrical systems.
- Estimate electrical costs for construction projects.
- Create and assemble construction design documents for customer.

| EVENING PROGRAM COURSES | | | HOURS | PREREQUISITES |
|--|---------|--|-------|----------------------------|
| First Semester | EEL0110 | DC and AC Theory and Lab | 6 | |
| Second Semester | EEL0115 | Basic Control Circuits and Commercial Wiring Practices | 6 | EEL0110 |
| Third Semester | ESD0230 | Residential and Commercial Lighting Design with AutoCAD® | 6 | EEL0115Co. Req.) |
| Fourth Semester | ESD0240 | Construction Management and Estimating | 6 | EEL0115 (Co. Req.) ESD0230 |
| <i>Total Technical Credit Hours for Certificate Completion</i> | | | 24 | |

COURSE DESCRIPTIONS

EEL0110 DC and AC Theory and Lab

Emphasizes the fundamentals of electricity and the proper use of electrical tools. During the direct current (DC) portion of a study, students are introduced to basic electrical terms and DC circuit concepts and calculations. Study includes hands-on laboratory experiments illustrating principles studied in theory. Students will also acquire competence in using analog and digital measuring and test equipment. During the alternating current (AC) portion of study, students will work with electrical components such as capacitors, inductors and transformers that are employed in circuit analysis. Transformer principles, resistor-inductor (RL) and resistor-capacitor (RC) circuits and impedance, resonance and power factor subjects are studied in theory and constructed in the lab. Students use test equipment such as oscilloscopes and signal amplifiers.

Six credit hours

EEL0115 Basic Control Circuits and Commercial Wiring Practices

Offers fundamentals of relay logic control circuits, basic Programmable Logic Controllers (PLCs), ladder logic, and component wiring design and operation. Students will also practice basic Variable Frequency Drives (VFDs). Students will then explore various methods used to distribute electrical power common in both residential and commercial applications. An overview of electronic control components such as diodes, transistors and integrated circuit chips are explored. The course will also review electrical safety, types of electrical equipment and devices. Students will construct various branch circuit lighting and receptacle wiring systems utilizing different cabling and conduit methods. The National Electrical Code (NEC) will be utilized throughout the course. *Six credit hours*

ESD0230 Residential and Commercial Lighting Design with AutoCAD®

This course covers residential and commercial electrical design requirements while also teaching students to use AutoCAD LT® to draw electrical diagrams and blueprints. Light characteristics and measurements, distribution curves, light sources, calculations, lighting techniques and computerized lighting layout are also covered. *Six credit hours*

ESD0240 Construction Management and Estimating

Covers construction project delivery systems, project team members, construction documents, construction blueprint reading, job site layout and control and subcontracting. Electrical estimating by hand, Excel spread sheets and computerized estimating software are also covered.

Six credit hours

EVENING PROGRAM CERTIFICATE IN INDUSTRIAL TECHNOLOGY

ALL LOCATIONS

Students can earn a certificate in Industrial Technology by pursuing a generalist program customized to suit individual needs and interests. These courses combine classroom and shop projects to provide overall instruction, hands-on training and experience in the practices and skills needed by area-wide manufacturing and industrial firms. These classes meet on Monday and Wednesday or Tuesday and Thursday evenings.

Upon completion of this program, students will be able to:

- Construct and install various facility, electrical, mechanical, and fluid systems to standard industry codes and job specifications.
- Identify and interpret trade related prints, schematics, and work orders to diagnose and repair facility structures, building systems electrical and mechanical equipment, and fluid power devices used in industrial and manufacturing facilities and commercial buildings.

| EVENING PROGRAM COURSES | | | HOURS | PREREQUISITES |
|--|---------|--|-------|--------------------|
| Blueprint Reading | BPR0100 | Blueprint Reading | 6 | |
| Electrical Maintenance | EEL0110 | DC and AC Theory and Lab | 6 | |
| | EEL0115 | Basic Control Circuits and Commercial Wiring Practices | 6 | EEL0110 |
| Fabrication and Welding | FWL0110 | Welding I | 6 | |
| | FWL0120 | Welding II | 6 | FWL0110 (Co. Req.) |
| Industrial Maintenance | INT0100 | Hydraulics, Millwright and Rigging | 6 | |
| | INT0110 | Industrial Maintenance Mechanics | 6 | |
| Precision Machining | PMT0111 | Engine Lathe Fundamentals | 6 | |
| | PMT0113 | Milling Machine Fundamentals | 6 | |
| Plumbing | PPT0100 | Plumbing Foundations | 6 | |
| | PLT0110 | Pipefitting Theory and Practice | 6 | |
| Stationary Engineering | STE0110 | Stationary Engineering I | 6 | |
| | STE0120 | Stationary Engineering II | 6 | |
| <i>Total Technical Credit Hours for Certificate Completion</i> | | | 24 | (minimum) |

Important Note: Students must apply four courses from the list above for a total of 24 credits necessary to qualify for an Industrial Technology certificate. Electrical Maintenance, and Stationary Engineering may be taken as standalone two-semester certificate programs or as embedded certificates within the Industrial Technology program. Standalone two-semester certificate programs are not Title IV eligible. Students seeking to receive an embedded certificate along with the Industrial Technology certificate must make this request prior to starting the Industrial Technology program. Students must complete the requirements for the Industrial Technology certificate before any embedded certificates will be awarded. The minimum age to take the Stationary Engineer Exam is 21 years old.

COURSE DESCRIPTIONS

BLUEPRINT READING

BPR0100 Blueprint Reading

Presents the fundamentals of general blueprint reading, projection drawings, common terms and symbols. Students will learn to interpret blueprints and symbols in the machine trades, the building trades and welding. *Six credit hours*

ELECTRICAL MAINTENANCE

EEL0110 DC and AC Theory and Lab

Emphasizes the fundamentals of electricity and the proper use of electrical tools. During the direct current (DC) portion of a study, students are introduced to basic electrical terms and DC circuit concepts and calculations. Study includes hands-on laboratory experiments illustrating principles studied in theory. Students will also acquire competence in using analog and digital measuring and test equipment. During the alternating current (AC) portion of study, students will work with electrical components such as capacitors, inductors and transformers that are employed in circuit analysis. Transformer principles, resistor-inductor (RL) and resistor-capacitor (RC) circuits and impedance, resonance and power factor subjects are studied in theory and constructed in the lab. Students use test equipment such as oscilloscopes and signal amplifiers. *Six credit hours*

EEL0115 Basic Control Circuits and Commercial Wiring Practices

Offers fundamentals of relay logic control circuits, basic Programmable Logic Controllers (PLCs), ladder logic, and component wiring design and operation. Students will also practice basic Variable Frequency Drives (VFDs). Students will then explore various methods used to distribute electrical power common in both residential and commercial applications. An overview of electronic control components such as diodes, transistors and integrated circuit chips are explored. The course will also review electrical safety, types of electrical equipment and devices. Students will construct various branch circuit lighting and receptacle wiring systems utilizing different cabling and conduit methods. The National Electrical Code (NEC) will be utilized throughout the course. *Six credit hours*

FABRICATION AND WELDING

FWL0110 Welding I

Students will learn the necessary skills for welding and cutting processes used in the welding and fabrication industry. Processes covered in this program include Shield Metal Arc Welding (SMAW/ Stick), GMAW (MiG) and GTAW (TiG) in the flat, horizontal and vertical positions. Lay-out, Oxy-Fuel cutting are also included in the curriculum. *Six credit hours*

FWL0120 Welding II

Focuses on the skills required to perform welds in various positions. Students will be prepared for the AWS certification test in vertical Shield Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW) on steel plate. *Six credit hours*

INDUSTRIAL MAINTENANCE

INT0100 Hydraulics, Millwright and Rigging

Includes instruction in the hydraulic transmission of force and energy, the operation of hydraulic pumps, hydraulic actuators, control of hydraulic energy through the use of pressure control valves, cylinders, directional control valves and flow control valves. The course also covers the millwright and rigging fundamentals of layout and leveling, ropes, knots, splices, wire rope, chins, weight calculations, CG cranes, hoists and ladders. *Six credit hours*

INT0110 Industrial Maintenance Mechanics

Includes instruction in math, basic terms, bearings, seals, industrial pumps, power transmission, power transmission components, brakes, clutches, use of V-belts and fasteners. Also covers basic pneumatics, compressors and compressed gas systems. *Six credit hours*

PRECISION MACHINING

PMT0111 Engine Lathe Fundamentals

Students will concentrate on the manual lathe. They will learn turning, threading, taper turning and drilling operations. Students will learn setups such as, between centers, three jaw chucks and four jaw chucks. They will also have lessons on basic right angle trigonometry, print reading, drill presses, saws and lay-out. *Six credit hours*

PMT0113 Milling Machine Fundamentals

The student will concentrate on the vertical milling machine. They will learn the set-up and operations of a mill. Students will also have lessons on basic right angle trigonometry, print reading, drill presses, saws and lay-out. *Six credit hours*

PLUMBING

PPT0100 Plumbing Foundations

Plumbing Foundations will begin with an OSHA approved 30-hour class in construction safety. Successful students receive their 30-Hour OSHA card which is the gold standard in the industry. An introduction to the basics of plumbing math, including fractions, decimals, subtraction, multiplication, and division, as well as measurement conversion will also be covered. Students will use various plumbing and pipefitting hand and power tools as they complete various projects in a simulated work environment. *Six credit hours*

PLT0110 Pipefitting Theory and Practice

Covers the use of basic hand and power tools for cutting and threading steel pipe and cutting and joining copper pipe, using both hard and soft soldering methods. The course includes practical mathematics and layout methods as it applies to the piping trade. Also, the course covers drain waste vent piping systems, the use of copper and cast iron and plastic pipe, along with related fittings. *Six credit hours*

STATIONARY ENGINEERING

STE0110 Stationary Engineering I

Covers boilers, including the construction of different styles, pressure capabilities, different ways of firing, safety devices and water level controls, including efficiencies, pollution, boiler auxiliaries such as feedwater heaters, softeners and feedwater treatment. Students tour an industrial boiler room and learn about pumps, both piston and centrifugal, methods of sizing, pressures and prime movers. *Six credit hours*

STE0120 Stationary Engineering II

Provides a history of steam engines over the last century with tours of steam engines still used today. Course covers the replacement of steam engines by turbines, how steam engines operate air compressors and how to maintain good compressed air as well as the basics of electricity and how to start and synchronize generators safely. The course will then focus on power generation, efficiency and how to obtain the most productivity from electrical equipment. Students will finish up the semester learning the basics of all industrial refrigeration with an emphasis on ammonia, efficiencies and safety. *Six credit hours*

EVENING PROGRAM CERTIFICATE IN FACILITIES TECHNOLOGY

Ranken evening program students can earn a certificate in Facilities Technology by pursuing a generalist program customized to suit individual needs and interests. These courses combine classroom and shop projects to provide overall instruction, hands-on training and experience in the maintenance practices and skills needed by area facilities, including universities, hospitals, hotels and industrial businesses.

These classes meet on Monday and Wednesday or Tuesday and Thursday evenings.

For students interested in furthering their education, these courses can be credited toward the Bachelor of Science in Applied Management (BSAM) degree.

Dependent upon course combination chose for this program, student will be able to do some or all of the following:

- Install and service electrical, HVAC, and plumbing components.
- Demonstrate an understanding of the fundamentals of inspecting structures, interpreting blueprints and symbols, and the functions of steam engines, air compressors, and generators.

| EVENING PROGRAM COURSES (CHOOSE FOUR) | | | HOURS | PREREQUISITES |
|--|---------|---|-------|------------------|
| Blueprint Reading | BPR0100 | Blueprint Reading | 6 | |
| Carpentry Maintenance | CRP0110 | Exterior/Interior Frame Construction | 6 | |
| | CRP0120 | Interior Finish | 6 | |
| Disaster Restoration | DFR0110 | Foundations In Disaster Restoration | 6 | |
| Electrical Maintenance | EEL0110 | DC and AC Theory and Lab | 6 | |
| | EEL0115 | Basic Control Circuits and Commercial Wiring Practices | 6 | EEL0110 |
| Heating, Ventilation, Air Conditioning and Refrigeration | HVA0100 | Fundamentals of Heat Transfer and Domestic Applications | 6 | |
| | HVA0101 | Electrical for HVACR | 6 | |
| Plumbing | PPT0100 | Plumbing Foundations | 6 | |
| | PLT0110 | Pipefitting Theory and Practice | 6 | |
| Stationary Engineering | STE0110 | Stationary Engineering | 6 | |
| | STE0120 | Stationary Engineering | 6 | |
| Additional Stand-Alone Courses | INT101C | Home Inspection Training | 6 | |
| <i>Total Technical Credit Hours for Certificate Completion</i> | | | 24 | <i>(minimum)</i> |

Important Note: Students must apply four courses from the list above for a total of 24 credits necessary to qualify for an Facilities Technology certificate. Electrical Maintenance, and Stationary Engineering may be taken as standalone two-semester certificate programs or as embedded certificates within the Facilities Technology program. Standalone two-semester certificate programs are not Title IV eligible. Students seeking to receive an embedded certificate along with the Facilities Technology certificate must make this request prior to starting the Facilities Technology program. Students must complete the requirements for the Facilities Technology certificate before any embedded certificates will be awarded. The minimum age to take the Stationary Engineer Exam is 21 years old.

COURSE DESCRIPTIONS

BLUEPRINT READING

BPR0100 Blueprint Reading

Presents the fundamentals of general blueprint reading, projection drawings, common terms and symbols. Students will learn to interpret blueprints and symbols in the machine trades, the building trades and welding. *Six credit hours*

CARPENTRY MAINTENANCE

CRP0110 Exterior/Interior Frame Construction

This course covers basic carpentry math calculations of fractions and decimals as well as right-angle geometry. Students will learn how to identify and safely operate different hand and portable/stationary power tools. The course also covers how to set up and operate leveling instruments. Concrete formwork, floor and wall framing and gable roof construction are covered in this course. Upon completion of the basic framework of the small-scale module of the residential structure, students will hang an exterior door and install vinyl siding, soffit and fascia on the exterior of the building. Students will install roof shingles and learn proper flashing and water prevention techniques. *Six credit hours.*

CRP0120 Interior Finish

This course covers the different aspects of interior finish work to be completed on the module constructed during CRP0110. Mathematical stair calculations and layout, as well as basic stair construction, is covered in this course. Residential drywall installation/ patchwork and drywall finishing is covered. In this course, students will learn how to install different floor systems such as carpet, sheet vinyl, ceramic tile and laminate. They will also learn how to install a suspended ceiling. Upon completion of the ceiling and flooring, students will install an interior pre-hung door unit and finish the rest of the structure with base trim and window casing. The basic woodworking portion of this course will cover the fabrication of small woodworking projects, such as a bookcase or coat rack. *Six credit hours*

DISASTER RECOVERY*

FDR0110 Foundations In Disaster Recovery

Students will acquire skills specialized to the disaster recovery industry and gain technical knowledge to assess damage such as water, fire and smoke, process work orders and take Institute of Inspection, Cleaning and Restoration Certification (IICRC) tests. *Six credit hours*

**It is suggested students pursuing a career as a Disaster Restoration Technician take the following courses:*

CRP 0110 Exterior/Interior Frame Construction

CRP 0120 Interior Finish

EEL 0110 DC and AC Theory and Lab

FDR 0110 Foundations In Disaster Restoration

HEATING, VENTILATION, AIR CONDITIONING & REFRIGERATION

HVA0100 Fundamentals of Heat Transfer and Domestic Applications

This course introduces the basics of refrigeration, including a description of what is taking place inside each component and the lines connecting them. Students learn to read a temperature/pressure chart and apply it to various refrigerants which are used in the trade. Common service procedures such as gauge installation, evacuation and recovery of refrigeration are also covered in the course. Students are exposed to trade measurements and are given theory behind what it takes to make a good solder and braze connection on copper tubing. This course introduces students to pressures, temperatures and running times for refrigerators and room air conditioners and continues with charging, service and operation of domestic refrigerators and room air conditioners. *Six credit hours*

HVA0101 Electrical for HVACR

Study includes capacitors, current relays, potential relays and solid-state relays. Students practice methods used to recognize each relay and wire each relay circuit with its hermetic compressors. The course incorporates the wiring of basic fan relays, contactors and sequencers. Additionally, this course provides an overview of the different means of wiring, charging and problem diagnosis of domestic refrigerators and window air-conditioners. Troubleshooting through an electrical schematic is a staple of this course. Emphasis is placed on problem analysis of system operation. *Six credit hours*

PLUMBING

PPT0100 Plumbing Foundations

Plumbing Foundations will begin with an OSHA approved 30-hour class in construction safety. Successful students receive their 30-Hour OSHA card which is the gold standard in the industry. An introduction to the basics of plumbing math, including fractions, decimals, subtraction, multiplication, and division, as well as measurement conversion will also be covered. Students will use various plumbing and pipefitting hand and power tools as they complete various projects in a simulated work environment. *Six credit hours*

PLT0110 Pipefitting Theory and Practice

Covers the use of basic hand and power tools for cutting and threading steel pipe and cutting and joining copper pipe, using both hard and soft soldering methods. The course includes practical mathematics and layout methods as it applies to the piping trade. Also, the course covers drain waste vent piping systems, the use of copper and cast iron and plastic pipe, along with related fittings. *Six credit hours*

ELECTRICAL MAINTENANCE

EEL0110 DC and AC Theory and Lab

Emphasizes the fundamentals of electricity and the proper use of electrical tools. During the direct current (DC) portion of a study, students are introduced to basic electrical terms and DC circuit concepts and calculations. Study includes hands-on laboratory experiments illustrating principles studied in theory. Students will also acquire competence in using analog and digital measuring and test equipment. During the alternating current (AC) portion of study, students will work with electrical components such as capacitors, inductors and transformers that are employed in circuit analysis. Transformer principles, resistor-inductor (RL) and resistor-capacitor (RC) circuits and impedance, resonance and power factor subjects are studied in theory and constructed in the lab. Students use test equipment such as oscilloscopes and signal amplifiers.

Six credit hours

EEL0115 Basic Control Circuits and Commercial Wiring Practices

Offers fundamentals of relay logic control circuits, basic Programmable Logic Controllers (PLCs), ladder logic, and component wiring design and operation. Students will also practice basic Variable Frequency Drives (VFDs). Students will then explore various methods used to distribute electrical power common in both residential and commercial applications. An overview of electronic control components such as diodes, transistors and integrated circuit chips are explored. The course will also review electrical safety, types of electrical equipment and devices. Students will construct various branch circuit lighting and receptacle wiring systems utilizing different cabling and conduit methods. The National Electrical Code (NEC) will be utilized throughout the course.

Six credit hours

STATIONARY ENGINEERING

STE0110 Stationary Engineering I

Covers boilers, including the construction of different styles, pressure capabilities, different ways of firing, safety devices and water level controls, including efficiencies, pollution, boiler auxiliaries such as feedwater heaters, softeners and feedwater treatment. Students tour an industrial boiler room and learn about pumps, both piston and centrifugal, methods of sizing, pressures and prime movers. *Six credit hours*

STE0120 Stationary Engineering II

Provides a history of steam engines over the last century with tours of steam engines still used today. Course covers the replacement of steam engines by turbines, how steam engines operate air compressors and how to maintain good compressed air as well as the basics of electricity and how to start and synchronize generators safely. The course will then focus on power generation, efficiency and how to obtain the most productivity from electrical equipment. Students will finish up the semester learning the basics of all industrial refrigeration with an emphasis on ammonia, efficiencies and safety.

Six credit hours

INT101C Home Inspection Training

This course will teach students the fundamentals of inspecting structure, exteriors, roofing, electrical, plumbing, heating/ cooling systems, insulation/ventilation systems, report writing and business development and marketing strategies. After completion of this course, students will be able to identify and properly document defects of a residential property within the standards of the industry. They will be able to properly document their findings on an inspection report. They will also learn essential skills in working with realtors, mortgage brokers, attorneys and financial institutions that play a key role in real estate transactions. *Six credit hours*