ELECTRICITY (413)

413-105 - National Electrical Code for Maintenance
Introduces the National Electrical Code (NEC) to students. Proficiency in determining electrical codes and performing electrical calculations are vital as a maintenance technician. Students will navigate the National Electrical Code book and interpret why the purpose of the NEC is to safeguard persons and properties from electrical hazards.
3 Credit hours
54 Lecture hours

413-308 - Electrical Concepts for Utilities
Provides overview of the electrical industry as it relates to the utility field with an emphasis on fundamental electrical theory. The course is restricted to students enrolled in the Electrical Power Distribution program (31-413-2). (Corequisites: 413-309 Line Technician 1; 413-310 Line Technician 2)
2 Credit hours
36 Lecture hours
36 Lab hours

413-309 - Line Technician 1
Provides practical hands-on training, modeling first-year apprentice employment. Introduces pole climbing techniques. Covers safety policies/procedures and PPE. Provides hands-on experience in the design and construction of single-phase power distribution systems. Introduces operation of digger-derrick trucks and bucket trucks. Must be an Electrical Power Distribution program student. (Corequisites: 413-308 Electrical Concepts for Utilities; 413-310 Line Technician 2)
5 Credit hours
36 Lecture hours
144 Lab hours

413-310 - Line Technician 2
Provides practical hands-on training, modeling second-year apprentice employment. Provides hands-on experience in maintaining and constructing of single-phase electrical power systems, concentrating on primarily 600-volt and below utility work. Transformer settings will be constructed and designed. Grounding for personal protection will be performed. Must be an Electrical Power Distribution program student. (Prerequisites: Completion of or concurrent enrollment in 103-159 Computer Literacy – Microsoft Office; 890-101 College 101. Corequisites: 413-308 Electrical Concepts for Utilities; 413-309 Line Technician 1)
5 Credit hours
36 Lecture hours
144 Lab hours

413-311 - Line Technician 3
Provides practical hands-on training, modeling third-year apprentice employment. Provides hands-on experience in maintaining and constructing of three-phase electrical power systems, bringing together the equipment that make up a distribution system from the substation to the customer. Three-phase lines will be constructed and retired. Grounding for personal protection and rescue procedures will be performed. Must be an Electrical Power Distribution program student. (Prerequisites: 413-309 Line Technician 1; 413-310 Line Technician 2. Concurrent enrollment in 469-348 Safety Applications for Utilities 2. Corequisite: 413-312 Line Technician 4)
5 Credit hours
36 Lecture hours
144 Lab hours

413-312 - Line Technician 4
Provides practical hands-on training, modeling fourth-year apprentice employment. Provides hands-on experience in maintaining and constructing of transmission electrical systems. Three-phase banking principles and URD systems will be focused on. Students will bring together the entire electrical system from generation to the customer. Exit assessment, a college requirement, will be performed. (Prerequisites: 413-309 Line Technician 1; 413-310 Line Technician 2; Concurrent enrollment in 469-348 Safety Applications for Utilities 2; Corequisite: 413-311 Line Technician 3)
5 Credit hours
36 Lecture hours
144 Lab hours

413-318 - Directional Boring
Provides hands-on training of directional drill machines with safe operating practices. Students will gain experience in soil identification relating to drill lubrication. Introduces drill route planning and utility locating. Covers traffic control and flagger certification. The course is restricted to students enrolled in the Electrical Power Distribution program (31-413-2) or Gas Utility Construction and Service program (31-469-2).
2 Credit hours
36 Lecture hours
36 Lab hours

413-342 - Introduction to Electrical Substations
Students will learn the concepts of electrical substation operation. Explore safety in substations and learn how to read one-line diagrams. Identify key electrical components in an electrical substation and explain their theory of operation. Interpret name plate information on the substation equipment. Explore protective measures needed to operate equipment in substations. (Prerequisite: 413-308 Electrical Concepts for Utilities)
1 Credit hours
18 Lecture hours
18 Lab hours

413-350 - Beginning Electrical Concepts
Provides an overview of the electrical industry with an emphasis on fundamental electrical theory. Basic electricity is explored through concepts of DC electricity. Focuses on the electronic theory, voltage, amperage, resistance, Ohm's law and series/parallel circuits. Must be an Electricity program student. (Prerequisite: Completion of or concurrent enrollment in 804-360 Occupational Math 1)
2 Credit hours
72 Lecture hours

413-351 - Advanced Electrical Concepts
This course is a continuation of 413-350 Beginning Electrical Concepts. Provides AC theory, inductance, capacitance and series/parallel circuits, single- and three-phase motors, transformers and circuits. Must be an Electricity program student. (Prerequisites: 413-350 Beginning Electrical Concepts. Completion of or concurrent enrollment in 804-118 Intermediate Algebra with Applications)
2 Credit hours
18 Lecture hours
54 Lab hours

413-355 - Residential and Commercial Wiring Concepts
Develops the skills and concepts necessary for planning and installing electrical equipment in residential and commercial occupancies. Students explore the uses of raceways, conductors, boxes and power distribution equipment in residential and commercial work. Must be an Electricity program student. (Prerequisites: Completion of or concurrent enrollment in 413-361 Intermediate National Electrical Code; 413-363 OSHA Job Site Safety)
3 Credit hours
18 Lecture hours
90 Lab hours

413-360 - Introduction to National Electrical Code
Provides an introduction to the uses and applications of the state and national electrical codes. Students examine standard definitions, enforcement issues and the code-making cycle. Focuses on electrical installations to determine compliance with the state and national electrical codes. Must be an Electricity program student. Approximately 16 hours of instruction will be online.
2 Credit hours
36 Lecture hours
36 Lab hours

413-361 - Intermediate National Electrical Code
Examines standards and procedures used by electricians in determining requirements for electrical installations. Focuses on the process of how the code is used in making decisions and how different occupancies, such as residential, commercial or industrial, affect the electrical installation process. Must be an Electricity program student. Approximately 16 hours of instruction will be online. (Prerequisite: Completion of or concurrent enrollment in 413-360 Introduction to National Electrical Code)
2 Credit hours
36 Lecture hours
36 Lab hours

413-363 - OSHA Job Site Safety
Introduces OSHA policies, procedures and standards as well as construction safety issues. Emphasizes using the OSHA regulations as a guide to working safely on various construction sites and in recognizing potential hazards. Upon successful completion, the student will receive an OSHA 10-hour Construction Safety and Health card. Must be an Electricity program student.
1 Credit hours
36 Lecture hours

413-365 - Basic Motor Controls
Continues the investigation of industrial electricity by introducing more complex theory and techniques. Focuses on timers, control devices, motors and PLCs. Students design control circuits, program PLCs, and wire complex control circuits and Human Machine Interface (HMI) circuits. Must be an Electricity program student or Industrial Wiring Certificate student. (Prerequisite: Completion of or concurrent enrollment in 413-380 Industrial Wiring Concepts)
3 Credit hours
18 Lecture hours
90 Lab hours

413-370 - Construction Trades Blueprint Reading
Develops skills in interpreting construction blueprints by categorizing elements of plans by view, size, shape and symbol. Focuses on the essential elements of residential and commercial plans. Students integrate basic blueprint reading skills with the construction process. Must be an Electricity program student. (Prerequisite: Completion of or concurrent enrollment in 413-360 Introduction to National Electrical Code)
2 Credit hours
36 Lecture hours
36 Lab hours

413-380 - Industrial Wiring Concepts
Introduces the features and functions of electrical equipment in an industrial setting. Students build the skills required to interpret line diagrams and use them to wire control circuits. Emphasizes control circuits most commonly found in a manufacturing setting. Must be an Electricity program student or Industrial Wiring Certificate student or have dean approval. (Prerequisite: Program student or consent of instructor)
3 Credit hours
18 Lecture hours
90 Lab hours

413-385 - Electrical Fabrication
Introduces the methods and practices used to build supports for electrical equipment and apparatus. Methods for mounting electrical equipment, supports and related devices to various surfaces are examined through the use of fastening systems and hardware. Must be an Electricity program student. (Prerequisite: 413-355 Residential and Commercial Wiring Concepts)
2 Credit hours
36 Lecture hours
36 Lab hours

413-386 - Trends in Electricity
Explores current trends and recent developments in residential, commercial, and renewable energy. Trends change based on current events within the industry. Students focus on code, enforcement issues, new materials, equipment and techniques surrounding the new developments. Students apply their learning in hands-on activities. Must be an Electricity program student. (Prerequisites: 103-159 Computer Literacy – Microsoft Office; 413-361 Intermediate National Electrical Code; 890-101 College 101)
1 Credit hours
36 Lab hours

413-394 - Basic Programmable Logic Controls
Studies the theory of operation, applications, installation, programming techniques, interfacing and troubleshooting of programmable controllers for industry. Programming instructions include internal relays, timers, counters, math functions and relations.
2 Credit hours
72 Lecture hours

413-540 - ABC Construction Electrician 1
Introduces students to electrical safety with a special emphasis on OSHA requirements, National Electrical Code, blueprint reading, residential wiring, hand-bending of conduit and DC electrical theory. Must be a state-contracted apprentice to enroll in this course.
2 Credit hours
54 Lecture hours
18 Lab hours

413-541 - ABC Construction Electrician 2
Continues the studies of electrical safety with a special emphasis on OSHA requirements, National Electrical Code, blueprint reading, residential wiring, hand-bending of conduit and DC electrical theory. Must be a state-contracted apprentice to enroll in this course. (Prerequisite: 413-540 ABC Construction Electrician 1)
2 Credit hours
54 Lecture hours
18 Lab hours

413-542 - ABC Construction Electrician 3
Introduces AC voltage: how it applies to magnetism; electrical symbols; line diagrams; current design and protection of circuits, motor controls, capacitance and inductive circuits, transformers, blueprints, and RC and RL time constants. Students continue studies in Safety and National Electrical Code with emphasis on grounding, over-current protection and box fill. Must be a state-contracted apprentice to enroll in this course. (Prerequisite: 413-541 ABC Construction Electrician 2)
2 Credit hours
54 Lecture hours
18 Lab hours

413-543 - ABC Construction Electrician 4
Continues the study of AC voltage: how it applies to magnetism; electrical symbols; line diagrams; current design and protection of circuits, motor controls, capacitance and inductive circuits, transformers, blueprints, and RC and RL time constants. Students continue studies in Safety and National Electrical Code with emphasis on grounding, over-current protection and box fill. Must be a state-contracted apprentice to enroll in this course. (Prerequisite: 413-542 ABC Construction Electrician 3)
2 Credit hours
54 Lecture hours
18 Lab hours

413-544 - ABC Construction Electrician 5
Challenges students into deeper studies in the National Electrical Code, introducing load calculations, conductor selection, motor calculations and HVAC systems. Continues to stress the requirements of safety on the job site through material provided by ABC. Must be a state-contracted apprentice to enroll in this course. (Prerequisite: 413-543 ABC Construction Electrician 4)
2 Credit hours
54 Lecture hours
18 Lab hours

413-545 - ABC Construction Electrician 6
Continues investigations in the National Electrical Code, introducing load calculations, conductor selection, motor calculations and HVAC systems. Stresses the requirements of safety on the job site through material provided by ABC. Must be a state-contracted apprentice to enroll in this course. (Prerequisite: 413-544 ABC Construction Electrician 5)
2 Credit hours
54 Lecture hours
18 Lab hours

413-546 - ABC Construction Electrician 7
Examines the areas of high voltage; advanced controls; and practical applications of lighting, fire alarm systems, heat trace and freeze protection paralleling National Electrical Code requirements in these areas with practical applications of installation through text and lab. Students focus on job site safety with OSHA standards. Must be a state-contracted apprentice to enroll in this course. (Prerequisite: 413-545 ABC Construction Electrician 6)
2 Credit hours
54 Lecture hours
18 Lab hours

413-547 - ABC Construction Electrician 8
Continues examining the areas of high voltage; advanced controls; and practical applications of lighting, fire alarm systems, heat trace and freeze protection paralleling National Electrical Code requirements in these areas with practical applications of installation through text and lab. Students focus on job site safety with OSHA standards. Must be a state-contracted apprentice to enroll in this course. (Prerequisite: 413-546 ABC Construction Electrician 7)
2 Credit hours
54 Lecture hours
18 Lab hours

413-750 - DC Electricity for Industrial Electricians
This course introduces the fundamental concepts of and computations related to DC electricity. Emphasis is placed on circuit analysis and the problem solving skills necessary for the maintenance of modern industrial electric systems. Competencies related to metering and safe use of measuring devices are included.
2 Credit hours
36 Lecture hours
36 Lab hours

413-751 - AC Electricity for Industrial Electricians
This course is designed to introduce the industrial electrical apprentice to the basic concepts of alternating current. Emphasis is placed on circuit analysis and the problem solving skills necessary for the maintenance of modern industrial electric systems. (Prerequisite: 413-750 DC Electricity)
2 Credit hours
36 Lecture hours
36 Lab hours

413-752 - Codes for Industrial Electricians 1
This course introduces the apprentice to the layout and purpose of the National Electric Code. It also strives to teach the apprentice proper methodology to research a code question and correctly interpret what they are reading. Various examples in the textbook and activity sheets help guide the apprentice through this process. Apprentices will research the structure of the National Electric Code and define the requirements of the code that are common to all electrical installations. In addition, apprentices will examine the installation requirements for fire pumps, emergency systems and fire alarms. This is the first course module of 8 dealing with electrical codes applicable to the trade. (Prerequisite: 413-751 AC Electricity)
0.5 Credit hours
18 Lecture hours

413-753 - Codes for Industrial Electricians 2
In this module of Codes for Industrial Electricians, apprentices will learn how to plan for the installation of overcurrent protection devices and how to select the proper boxes, cabinets and conduits for industrial electrical installations as called for in the NEC and other electrical codes. This is the second of 8 course modules on the NEC. (Prerequisite: 413-752 Codes for Industrial Electricians 1)
0.5 Credit hours
18 Lecture hours

413-754 - Codes for Industrial Electricians 3
Course three of eight examines the application of grounding to industrial electrical situations as required by the NEC and other electrical codes. (Prerequisite: 413-752 Codes for Industrial Electricians 1)
0.5 Credit hours
18 Lecture hours

413-755 - Codes for Industrial Electricians 4
Course four of eight on the NEC continues to examine Article 250 and grounding applications for industrial electrical installations. Apprentices will complete their review of this portion of the NEC and examine additional related electrical codes in effect across Wisconsin. (Prerequisite: 413-752 Codes for Industrial Electricians 1)
0.5 Credit hours
18 Lecture hours

413-756 - Codes for Industrial Electricians 5
Course five of 8 examines article 300 of the NEC and wiring methods for industrial electrical applications. In addition, apprentices will determine sizing requirements for cords and cables for installations common to industrial facilities. Finally, the course will identify code requirements for equipment installations in hazardous locations. (Prerequisite: 413-752 Codes for Industrial Electricians 1)
0.5 Credit hours
18 Lecture hours

413-757 - Codes for Industrial Electricians 6
Course six of 8 covers the selection of proper conductors and raceways for industrial electrical installations as required by the NEC and other electrical codes. In addition, course competencies will include examining the installation requirements for data and communication cables. (Prerequisite: 413-752 Codes for Industrial Electricians 1)
0.5 Credit hours
18 Lecture hours

413-758 - Codes for Industrial Electricians 7
Course seven of 8 reviews the code requirements for the selection of electrical components for typical industrial electrical motor installations. Course module includes sizing of controls, conductors, switches, branches, and more. (Prerequisite: 413-752 Codes for Industrial Electricians 1)
0.5 Credit hours
18 Lecture hours

413-759 - Codes for Industrial Electricians 8
Course eight of 8 reviews the electrical code requirements which provide for the protection of various industrial transformer installations. Course competencies include developing plans, sizing equipment and components, safety, and references to applicable sections of the NEC. (Prerequisite: 413-752 Codes for Industrial Electricians 1)
0.5 Credit hours
18 Lecture hours

413-760 - Industrial Electrician Transformers
This course is designed to introduce the Industrial Electrician Apprentice to the basic concepts of single and three-phase transformers. The course will cover transformer theory, turns, current and voltage ratios as well as proper connections and use of various transformers. (Prerequisite: 413-751 AC Electricity)
1 Credit hours
18 Lecture hours
18 Lab hours

413-761 - Industrial Electrician Motors and Generators
This course introduces concepts for Industrial Electrician Apprentices to explore motor controls. This course introduces concepts, terminology, and safety. In addition, this is designed to give the Industrial Electrician Apprentice the knowledge required by industry to maintain electric motors and generators. This course material will cover DC motors and generators, single-phase and three-phase motors, as well as alternators. (Prerequisite: 413-751 AC Electricity)
1 Credit hours
18 Lecture hours
18 Lab hours

413-762 - Industrial Electrician Motor Controls 1
This course will lead students through the fundamentals of electric motor control. Students will learn to recognize and draw the basic symbols, the language of motor control, and how to apply these symbols, into current industrial format. Students will also learn to draw and read ladder and wiring diagrams. Introduces logic used in motor control and students will be required to apply this logic in order to correctly interpret, design, and wire control circuits. (Prerequisite: 413-761 Industrial Electrician Motors and Generators)
1 Credit hours
18 Lecture hours
18 Lab hours

413-763 - Industrial Electrician Motor Controls 2
This is the second course of three and examines motor controls applicable to the industrial electrician trade. (Prerequisite: 413-762 Industrial Electrician Motor Controls 1)
1 Credit hours
18 Lecture hours
18 Lab hours

413-764 - Industrial Electrician Motor Controls 3
This is the third of three courses examining motor controls applicable to the industrial electrician trade. Applications and assessment activities are intended in this course. (Prerequisite: 413-763 Industrial Electrician Motor Controls 2)
1 Credit hours
18 Lecture hours
18 Lab hours

413-765 - Power Systems and Variable Speed Drives
This course provides the opportunity for students to learn about power systems and variable speed drives (VSD's). Topics include electricity, electronics, power transmissions, motor operations, AC and DC motor drives, servo and stepper drives, peripherals and communication. Apprentices will also explore closed loop control, feedback devices, and drive maintenance and the troubleshooting of VSD's. Course includes lab/shop and classroom lecture-lab hours. (Prerequisite: 413-764 Industrial Electrician Motor Controls 3)
2 Credit hours
36 Lecture hours
36 Lab hours

413-766 - Fluid Power Systems-Pneumatics
This is a pneumatics course customized for Industrial Electrician apprentices who deal with fluid power systems. This course will relate the basics of pneumatic theory and pneumatic components. Safety and the interrelationship between pneumatic power with electrical control is emphasized.
0.5 Credit hours
7 Lecture hours
7 Lab hours

413-767 - Fluid Power Systems-Hydraulics
The hydraulics course is customized for Industrial Electricians and relates the basics of hydraulic theory and hydraulic components. Safety and the interrelationship between hydraulic power with electrical control is emphasized. (Prerequisite: 413-766 Fluid Power Systems - Pneumatics)
0.5 Credit hours
7 Lecture hours
7 Lab hours

413-768 - Solid State Electronics
This course provides the apprentice with the skills and knowledge for troubleshooting basic solid-state devices and circuits. The construction, identification, and operating characteristics of solid-state devices is investigated. The apprentice builds test circuits, gathers and analyzes data, and follows safety procedures. Methods for locating defective components are applied. The replacement of printed circuit board components is performed. Also examined is the effect of temperature on the operation of solid-state devices. (Prerequisite: 413-751 AC Electricity)
2 Credit hours
36 Lecture hours
36 Lab hours

413-769 - Programmable Logic Controllers 1
This course is designed to teach the fundamentals of a Programmable Logic Controller (PLC) and its programming software. The first course of 3 will introduce terminology, concepts, print reading and safety.
1 Credit hours
18 Lecture hours
18 Lab hours

413-770 - Programmable Logic Controllers 2
This course is designed to teach the fundamentals of a Programmable Logic Controller (PLC) and its programming software. The second course of 3 will introduce basic programming fundamentals in addition to applying timer and counter instructions within a PLC program. (Prerequisite: 413-769 Programmable Logic Controllers 1)
1 Credit hours
18 Lecture hours
18 Lab hours

413-771 - Programmable Logic Controllers 3
This is the third course of 3 for Industrial Electrician apprentices. PLC applications and assessment projects are planned. (Prerequisite: 413-770 Programmable Logic Controllers 2)
1 Credit hours
18 Lecture hours
18 Lab hours

413-772 - Green Awareness for the E&I Trades
Green Awareness for the E&I Trades examines new and emerging technologies influenced by green trends which are impacting work processes today and in the future. The course introduces apprentices to green related knowledge and skills. Green topics covered in this course include energy efficiency; energy conservation; changes in state, national and local codes; lighting alternatives; alternative energy generation; energy efficient motors, drives, controllers and equipment; eliminating toxic materials and reducing wastes; and specific 'green' applications for the various trades involved under the E&I trades.
1 Credit hours
28 Lecture hours

413-773 - Safety and Print Reading
This course will acquaint the apprentice with the interpretation of "Prints" (blueprints) and other engineering and manufacturing documentation. The primary focus of the course will be on the basics of prints and how they are used to convey information to technicians. Application of electrical prints from industrial settings will be studied.
0.5 Credit hours
18 Lecture hours