

# Courses Designated for Apprenticeships Only

**INT101 Metrics for Welding 1-4 Credits**

This course is designed to help the skilled trades person understand the metric system, its prefixes, lengths, volumes, and weights; and, how to convert these units from the English metric system and/or vice versa.

(1+0)

**INT102 Welding Safety 1-4 Credits**

This course covers safety and health topics for workers involved in construction, general fabrication, and maintenance. The focus of the class will be on exposing potential hazards and safety or health problems associated with welding; showing that with properly instituted precautionary measures, welding is a safe occupation.

(1+0)

**INT103 Welding Processes I 3 Credits**

This course is a study of the major welding processes. The focus of the class will be on learning the principles and practices of these processes in the classroom and laboratory.

(2+2)

**INT104 Intro to Ironworking 1-4 Credits**

This course is an introduction to ironworking and its place in the construction industry. The focus of the class will be on revealing the nature of work, working conditions, employment, training, wage, and advancement opportunities.

(1+0)

**INT105 Pre-Casting Basics 3 Cr. Hrs.**

This course is designed to cover the essentials of precast concrete products and their use in the construction industry. It is designed for skilled trades, construction workers, and those who perform maintenance and repair work, as well as those who install precast concrete work in new construction.

(2+2)

**INT106 Reinforcing Basics 3 Cr. Hrs.**

This course is designed to cover the essentials of the proper utilization of reinforcement bars and welded mesh for concrete construction of highways, bridges, office and other large buildings, and power transmission towers. The class is designed for skilled trades, construction, and maintenance personnel who build, maintain, and perform repairs on the above mentioned or similar structures.

(2+2)

**INT107 Print Reading & Sketching A 1 Cr. Hrs.**

This is the first course in a sequence of 3 one credit hour courses. These three courses together are equivalent to IND107. Emphasis on PRINT READING including lines, abbreviations, terminology, view identification, dimensioning practices, dimensioning calculations, tolerancing calculations, and SKETCHING including orthographic, isometric, section, and auxiliary views. The course objective is for students to gain a basic proficiency for understanding and manipulating technical drawings and associated conventions. The course material for Print Reading and Sketching includes the alphabet of lines, orthographic projection, ordinary views, section views, auxiliary views, pictorial sketching, dimensioning, tolerancing, screw threads and fasteners, mathematics for design and an introduction to geometric dimensioning and tolerances.

(.5+.9)

Prerequisite: INT111

**INT108 Print Reading & Sketching B 1 Cr. Hrs.**

This is the second course in a sequence of 3 one credit hour courses. These three courses together are equivalent to IND107. Emphasis on PRINT READING including lines, abbreviations, terminology, view identification, dimensioning practices, dimensioning calculations, tolerancing calculations, and SKETCHING including orthographic, isometric, section, and auxiliary views. The course objective is for students to gain a basic proficiency for understanding and manipulating technical drawings and associated conventions. The course material for Print Reading and Sketching includes the alphabet of lines, orthographic projection, ordinary views, section views, auxiliary views, pictorial sketching, dimensioning, tolerancing, screw threads and fasteners, mathematics for design and an introduction to geometric dimensioning and tolerances.

(.5+.8)

Prerequisite: INT107

**INT109 Print Reading & Sketching C 1 Cr. Hrs.**

This is the third course in a sequence of 3 one credit hour courses. These three courses together are equivalent to IND107. Emphasis on PRINT READING including lines, abbreviations, terminology, view identification, dimensioning practices, dimensioning calculations, tolerancing calculations, and SKETCHING including orthographic, isometric, section, and auxiliary views. The course objective is for students to gain a basic proficiency for understanding and manipulating technical drawings and associated conventions. The course material for Print Reading and Sketching includes the alphabet of lines, orthographic projection, ordinary views, section views, auxiliary views, pictorial sketching, dimensioning, tolerancing, screw threads and fasteners, mathematics for design and an introduction to geometric dimensioning and tolerances.

(.5+.8)

Prerequisite: INT108

Education is the most  
powerful weapon  
which you can use  
to change the world.

*- Nelson Mandela*

**INT110 Safety Equipment & Procedures 1 Cr. Hrs.**  
This is an introductory course to cover the basics of safety equipment and safety procedures one will encounter in an industrial workplace. Topics covered will include Lock out/Tag out, Take two processes, Personal Protective equipment, and First aid response in emergencies. Students will be required to attend one meeting on campus to facilitate hands on demonstration of some procedures.  
(1+0)

**INT111 Hazardous Materials 1 Cr. Hrs.**  
This is an introductory course to cover the basics of hazardous materials, Material Safety Data Sheets (MSDS), and the use of lifts and cranes.  
(1+0)  
Prerequisite: INT110

**INT115 Solidworks A 1 Cr. Hrs.**  
This is the first course in a sequence of 4 one credit hour courses. These four courses together are equivalent to CAD213 CAD3. Students will develop and plot advanced 3D models, 2D detail drawings and 3D assembly drawings as used in the modern industry today. Students will also learn how to link their 3D models to develop design tables and bill of materials. This course is an advanced course in mastering the commands utilizing SolidWorks 3D feature-based parametric solid modeling design tool software.  
(.25+.75)  
Prerequisite: INT114

**INT116 Solidworks B 1 Cr. Hrs.**  
This is the second course in a sequence of 4 one credit hour courses. These four courses together are equivalent to CAD213 CAD3. Students will develop and plot advanced 3D models, 2D detail drawings and 3D assembly drawings as used in the modern industry today. Students will also learn how to link their 3D models to develop design tables and bill of materials. This course is an advanced course in mastering the commands utilizing SolidWorks 3D feature-based parametric solid modeling design tool software.  
(.25+.75)  
Prerequisite: INT115

**INT117 Solidworks C 1 Cr. Hrs.**  
This is the third course in a sequence of 4 one credit hour courses. These four courses together are equivalent to CAD213 CAD3. Students will develop and plot advanced 3D models, 2D detail drawings and 3D assembly drawings as used in the modern industry today. Students will also learn how to link their 3D models to develop design tables and bill of materials. This course is an advanced course in mastering the commands utilizing SolidWorks 3D feature-based parametric solid modeling design tool software.  
(.25+.75)  
Prerequisite: INT116

**INT118 Solidworks D 1 Cr. Hrs.**  
This is the fourth course in a sequence of 4 one credit hour courses. These four courses together are equivalent to CAD213 CAD3. Students will develop and plot advanced 3D models, 2D detail drawings and 3D assembly drawings as used in the modern industry today. Students will also learn how to link their 3D models to develop design tables and bill of materials. This course is an advanced course in mastering the commands utilizing SolidWorks 3D feature-based parametric solid modeling design tool software.  
(.25+.75)  
Prerequisite: INT117

**INT120 HVACR I 3 Cr. Hrs.**  
An introductory Heating, Ventilation, Air Conditioning and Refrigeration course for skilled trades personnel. The course is a study of basic thermo-dynamic principles, with a practical approach to applications in a residential, commercial and industrial environment. The course will cover basic heating and cooling concepts, refrigerant properties, psychometrics, terminology, safety, troubleshooting and applications of basic mechanical heating and cooling components and their electric / mechanical control.  
(2+2)  
Prerequisite: IND120 or EET121

**INT121 Programming CNC A 1 Cr. Hrs.**  
This is the first course in a sequence of 3 one credit hour courses. These three courses together are equivalent to MET222 Programming CNC. In this course the student will view a blueprint of a mechanical part to determine the datum, the order of operations and appropriate fixtures to make the part in a CNC machine. G & M code programs will be written and loaded to the CNC mill or lathe which will create the machined surfaces of the part. Conversational programming will be demonstrated. A familiarity with geometry, trigonometry, computers, and CAD is helpful.  
(.5+.9)  
Prerequisite: INT118

**INT122 Programming CNC B 1 Cr. Hrs.**  
This is the second course in a sequence of 3 one credit hour courses. These three courses together are equivalent to MET222 Programming CNC. In this course the student will view a blueprint of a mechanical part to determine the datum, the order of operations and appropriate fixtures to make the part in a CNC machine. G & M code programs will be written and loaded to the CNC mill or lathe which will create the machined surfaces of the part. Conversational programming will be demonstrated. A familiarity with geometry, trigonometry, computers, and CAD is helpful.  
(.5+.8)  
Prerequisite: INT121

**INT123 Programming CNC C 1 Cr. Hrs.**

This is the third course in a sequence of 3 one credit hour courses. These three courses together are equivalent to MET222 Programming CNC. In this course the student will view a blueprint of a mechanical part to determine the datum, the order of operations and appropriate fixtures to make the part in a CNC machine. G & M code programs will be written and loaded to the CNC mill or lathe which will create the machined surfaces of the part. Conversational programming will be demonstrated. A familiarity with geometry, trigonometry, computers, and CAD is helpful.

(.5+.8)

Prerequisite: INT122

**INT124 CAM IA 1 Cr. Hrs.**

This is the first course in a sequence of 4 one credit hour courses. These four courses together are equivalent to MET223 Computer Aided Manufacturing (CAM). This course is a study in the basic fundamental of Computer Aided Manufacturing (CAM). The student will become proficient in the use of manipulating CAM software in the hands-on environment. The goal is to generate and import CAD geometry, develop correct tool paths to the geometry, generate (post process) NC files, understand tooling and create the part on a CNC machining center. Datums, tool selection, speeds and feeds, and part identification will be emphasized.

(.25+.75)

Prerequisite: INT123

**INT125 CAM IB 1 Cr. Hrs.**

This is the second course in a sequence of 4 one credit hour courses. These four courses together are equivalent to MET223 Computer Aided Manufacturing (CAM). This course is a study in the basic fundamental of Computer Aided Manufacturing (CAM). The student will become proficient in the use of manipulating CAM software in the hands-on environment. The goal is to generate and import CAD geometry, develop correct tool paths to the geometry, generate (post process) NC files, understand tooling and create the part on a CNC machining center. Datums, tool selection, speeds and feeds, and part identification will be emphasized.

(.25+.75)

Prerequisite: INT124

**INT126 CAM IC 1 Cr. Hrs.**

This is the third course in a sequence of 4 one credit hour courses. These four courses together are equivalent to MET223 Computer Aided Manufacturing (CAM). This course is a study in the basic fundamental of Computer Aided Manufacturing (CAM). The student will become proficient in the use of manipulating CAM software in the hands-on environment. The goal is to generate and import CAD geometry, develop correct tool paths to the geometry, generate (post process) NC files, understand tooling and create the part on a CNC machining center. Datums, tool selection, speeds and feeds, and part identification will be emphasized.

(.25+.75)

Prerequisite: INT125

**INT127 CAM ID 1 Cr. Hrs.**

This is the fourth course in a sequence of 4 one credit hour courses. These four courses together are equivalent to MET223 Computer Aided Manufacturing (CAM). This course is a study in the basic fundamental of Computer Aided Manufacturing (CAM). The student will become proficient in the use of manipulating CAM software in the hands-on environment. The goal is to generate and import CAD geometry, develop correct tool paths to the geometry, generate (post process) NC files, understand tooling and create the part on a CNC machining center. Datums, tool selection, speeds and feeds, and part identification will be emphasized.

(.25+.75)

Prerequisite: INT126

**INT200 Welding Processes II 2 Cr. Hrs.**

This course is an advanced study of SMAW and its applications in construction, maintenance, repair, and general fabrication. The focus of the class will be on advanced SMAW practices and techniques which conform to standards, codes, and specifications.

(2+0)

**INT201 Rigging 3 Cr. Hrs.**

This course is a study of rigging safety for the skilled trades' persons, maintenance personnel, and/or construction workers. The focus of the class will be on introducing the different types of rigging equipment and how to properly use them.

(2+2)

**INT202 Shielded Metal Arc Welding 2 Cr. Hrs.**

This course is designed to develop basic knowledge and skills in the shielded metal arc welding process. The focus will be on welding terms and definitions, how to join common metals, joint and weld classifications, welding positions, power sources selection, and flat and horizontal welding techniques and practices.

(2+0)

**INT203 Shielded Metal Arc Welding 2 Cr. Hrs.**

This course is an advanced study of shielded metal arc welding practices and procedures. The focus will be on advanced topics in SMAW and weld quality.

(1+2)

**INT204 Structural Welding 3 Cr. Hrs.**

This course is the study of the basics of welding structures. The focus will be on the strength of the weld on the structure and how to best anchor and support beams and cross members on building structures.

(2+2)

**INT210 FCAW & GMAW Welding 5 Cr. Hrs.**

This course is an advanced study of gas metal arc welding, and flux core arc welding practices and procedures. The focus will be on advanced topics in GMAW and FCAW and weld quality.

(4+2)

**INT212 Welding Fabrication 6 Cr. Hrs .**

A study of the layout and fabrication of an industrial product. The student will complete welding projects, applying layout procedures, joint design, and use of fixtures. The course is relative to actual industrial fabrication standards, with an emphasis on quality.  
(5+2)

**INT213 Ornamental Welding I 5 Cr. Hrs.**

This course is a study of the various types of fabrication equipment when working with iron and steel. This equipment is then applied in a process to fabricate curtain and window walls. Basic layout concepts are studied, as well as how to effectively apply sealants and glazes. Students will also learn how to test the systems that are fabricated.  
(4+2)

**INT214 Ornamental Welding 4 Cr. Hrs.**

This course is an advanced study of ornamental welding. Students will learn how to install store fronts, entrance ways, swinging doors, sliding doors, hollow metal doors and balanced doors. Students will also study how to install service doors, sloped walls, stairs and handrails, toilet partitions and vanity supports.  
(3+2)

**INT215 Welding Certification 3 Cr. Hrs.**

This course is a study of the inspection, testing, and codes of welding in a construction environment. Students will apply the AWS welding symbols in the FCAW, GMAW, and GTAW. A focus of the course will be on testing procedures and how these can be converted to a certification for a particular welding process.  
(2+2)

**INT220 HVACR II 3 Cr. Hrs.**

An intermediate study of the HVAC field. Studies will include commercial and industrial designs and equipment, Load Calculations and System Sizing. Concepts of equipment control will be introduced featuring Low Voltage, High Voltage methodologies.  
(2+2)

Prerequisite: INT120

**INT221 HVAC III Heating Systems 3 Cr. Hrs.**

Learning outcomes to be developed in this course focus on the heating aspect of climate control. Topics to be covered would include "forced air" heating applications including natural gas, propane, fuel oil, electric resistance and heat-pump systems and their controls. Other heating topics would include Hydronics applications; i.e. residential, commercial and institutional boiler systems and their controls. Heat-pump technology will feature both "air-to-air" and geothermal technologies.  
(2+2)

Prerequisite: INT220

**INT222 HVACR IV Advanced HVAC Control 3 Cr. Hrs**

Learning outcomes to be developed in this course will focus on the various controls now being applied to HVAC-R systems. Electro-mechanical, pneumatic and Direct Digital Control (DDC) will be featured during this coursework with particular attention to DDC applications. The Programmable Logic Controller and its networking capabilities and user interface will be explored. Other topics explored will be the integration of fire/life safety systems with modern environmental equipment as well as system controlled environmental quality.  
(2+2)

(2+2)

Prerequisite: INT221

**INT223 HVACR V Advanced Topics 3 Cr. Hrs.**

Learning outcomes to be developed in this course will focus on some of the advanced and alternative energy efficient designs affecting climate control systems. Other topics to be covered may include energy auditing and energy management, energy procurement and energy cost accounting and advanced building architectural blue print interpretation.  
(2+2)

(2+2)

Prerequisite: INT222

**INT230 High Pressure Welding 3 Cr. Hrs.**

The high pressure pipe welding course is designed to prepare the student for welding qualification and certification in accordance with the ANSI/ASME Boiler and Pressure Vessel Code, Section IX. Through classroom and hands-on skill training the student will be afforded the opportunity to develop the knowledge and skill necessary to weld high pressure pipe, utilizing the shielded metal arc welding (SMAW) process in all four welding positions. Uphill welding progression will be utilized for the vertical welding.  
(2+2)

(2+2)

**ITR118 SPC Basics 1 Cr. Hr.**

This course provides an introduction to basic Statistical Process Control (SPC) concepts and how the SPC tools can be used for problem solving in a work environment. The basics of data collection, charting and analysis will be reviewed as well as basic problem solving techniques (critical thinking, brainstorming, flowcharts and fishbone diagrams). Students will also learn how to identify and interpret basic SPC charts (pareto, histogram, scatter plot, run and pseudo control). Students will walk through a basic problem and use the SPC tools to find solutions.  
(1+0)

(1+0)

**ITR119 Intro to GIBBS CAM 1 Cr. Hr.**

This is an introductory class on the use and application of GibbsCAM software. The focus will be on safety in programming, GibbsCAM interface, CAD elements, view, creating geometry, tool creation and description, tooling, machine operation (Mill, Lathe, EDC, etc.), rendering and post processing. Plenty of hands on with computer, CNC mills and lathe. This is a 16 hour course.  
(1+0)

(1+0)

**ITR121 GIBBS CAM- Intermediate 1 Cr. Hr.**  
An advanced study of GibbsCAM software, including: advanced mill, introductory 3D, coordinate systems, geometry creation in 3D, multi-axis basics, solid surface, solid modeling, surface modeling, core and cavities, 3D machining, face cutting, tool path projections and importing (models, drawing, and geometry).  
(1+0)

**ITR132 Elec. Safe Work Practices 1 Cr. Hr.**  
This 16-20 hour seminar is focused toward plant maintenance personnel that are responsible for maintaining and troubleshooting electrical equipment in a production or process environment. Basic electrical terms will be discussed along with an emphasis on wiring and troubleshooting. Trainees will wire simple control circuits and troubleshoot faulted equipment, by using techniques and equipment covered in the seminar. Components covered include Start/Stop stations, Limit Switches, Solenoids, Pilot Lights, Relays, Motor Starters and Control Transformers. An emphasis will be on interpreting an electrical print.  
(1+0)

**ITR135 Principles and Theory of Mathematics 4 Cr. Hrs.**  
This course is designed to provide the student with a focus on computational skills, basic algebra concepts, and beginning trigonometry as applied to electrical and industrial problems. Examples cover operations with whole numbers, fractions, decimals, ratios, proportions, and integers. Basic algebraic rules and techniques are included with focus on linear equations, graphing, and angles. Students will proceed at an individualized pace through the various operations, but complete at least entry level algebra and trigonometry concepts as applied in simulated career examples in which electricians measure and produce 60 degree and 120 degree angle bends for rigid and thinwall conduit installations. Iron workers will demonstrate simulated angular displacement of the welding head for overhead and underwater welds.  
(3+2)

**ITR146 Industrial Hydraulics 2 Cr. Hrs.**  
This is a beginning course on basic hydraulic systems in an industrial environment. The focus of the class will be on component identification, operation, blueprint reading, maintenance, and troubleshooting. The students will connect circuits according to print specifications and make the circuits functional. Students will also learn root cause analysis troubleshooting in a hydraulics circuit. The maintenance number for this course is: 2049. This is a 40 contact hour course.  
(2+0)

**ITR147 FANUC Vision System 2 Cr. Hrs.**  
This is a beginning course on vision systems used in an industrial setting. The focus of the class will be on the functionality and repair of a Fanuc robotic vision system. The course covers the functionality and layout of each vision component, how to set robot guidance, how to setup and troubleshoot the 4 vision tools namely locators, calipers, histograms, and blobs. The trainees will also setup a project and calibrate a 3D laser and a 2D camera. The maintenance number for this course is:3092. This is a 40 contact hour course.  
(2+0)

**ITR148 FANUC RJ3iB Elec Service 2 Cr. Hrs.**  
This is a basic course on the functionality and repair of a Fanuc robotic system. The course covers the functionality and layout of each individual component, how the controller powers up, power distribution and signal tracing for AC and DC circuits. The trainees will also learn how to locate and identify all fuses and indicators, as well as the mapping and troubleshooting of inputs and outputs. The maintenance number for this course is: 3401. This is a 40 contact hour course.  
(2+0)

**JAT100 Electrical Career Orientation 2 Cr. Hrs.**  
This course includes orientation to the electrical career, apprenticeship, and the relationship between the National Electrical Contractors Association (NECA) and the International Brotherhood of Electrical Workers (IBEW). Topics include workplace safety and hazards, building wire, insulation properties, and commonly used electrical materials. Application of math computations is emphasized.  
(2+0)

**JAT102 National Electrical Code I 2 Cr. Hrs.**  
This course includes introduction to the National Electrical Code (NEC) and interpretation of articles of the NEC requirements for wiring applications. Wire properties, conductor insulation, and wiring devices are emphasized. NEC requirements for installation of wiring devices are studied, including boxes, receptacles, switches, and fittings.  
(2+0)

**JAT103 Orientation Level II 1 Cr. Hr.**  
This course is a continuation of orientation to requirements of the electrical career. Emphasis is on avoiding hazards including drug abuse. American labor organization history is stressed with focus on parliamentary procedure, union by-laws, and union constitution. The COMET program is also introduced.  
(1+0)

**JAT104 Conduit Fabrication I 2 Cr. Hrs.**  
This course will focus on conduit fabrication. Emphasis is on using basic trigonometric functions, types of conduit, bending techniques, and conduit threading techniques. Hand bending at 90 degrees and bending kicks and offsets are included.  
(1+2)

**JAT106 Conduit Fabrication II 2 Cr. Hrs.**

This course is a continuation of Conduit Fabrication I. Emphasis is on advanced types of bending, including three and four-bend saddles, push-through bending at 90 degrees, bending kicks, and offsets. Mechanical, electric, and hydraulic benders are used along with hand bending.  
(1+2)

**JAT108 DC Theory I 4 Cr. Hrs.**

This course includes the principles of electricity and energy sources. There is an introduction to switches, conductors, and circuits. Voltage, wattage, resistance, electrical circuits, and Ohm's Law are included. Series circuits, parallel circuits, and combination circuits are studied. There is a focus on potential hazards and the use of test instruments.  
(3+2)

**JAT110 AC Theory I 3 Cr. Hrs.**

This course includes the principles of electricity and energy sources and the basic characteristics of alternating current circuits. There is an introduction to AC resistive circuits, inductance, frequency, reactance, and vectors. RL circuits, voltage, impedance, current, and capacitance are included. Series and parallel capacitors are studied. There is a focus on potential hazards and working safely with capacitors.  
(2+2)

**JAT112 Test Instruments 1 Cr. Hr.**

This course is a study of the general use of test instruments for electrical applications. There is an introduction to test instrument abbreviations and symbols, and the use of test instruments on receptacles, meters, and switches. There is also a focus on line splitters, troubleshooting hidden diodes, and generators.  
(1+1)

**JAT114 Transformers I 1 Cr. Hr.**

This course is a study of transformer principles and operations. Topics emphasized are magnetism, polarity, step-up transformers, step-down transformers, and using windings to vary voltages. Delta-Delta and Delta-Wye transformers are included.  
(1+1)

**JAT116 Electrical Safety I 2 Cr. Hrs.**

This course will focus on electrical safety and safety-related work practices. Hazard awareness and a culture of safety are emphasized. OSHA requirements are studied, as well as the history, evolution, and scope of NFPA 70E. Lockout, tagging, and control of hazardous energy are stressed.  
(2+0)

**JAT118 Blueprints I 1 Cr. Hr.**

This course will study of the fundamentals of blueprint drawing and making sketches. Emphasis is placed on understanding architectural views, common scales, elevation, and schedules. The use of electrical and mechanical symbols is included, as well as residential blueprints.  
(1+0)

**JAT120 Codeology – NEC 3 Cr. Hrs.**

This course will study of the National Electrical Code (NEC) and how to access information in the code book. Locating code information and understanding keywords and phrases are emphasized. Students will be able to access code rules regarding a variety of topics such as wiring, appliances, motors, heating systems, and communication systems.  
(3+0)

**JAT122 National Electrical Code II 2 Cr. Hrs.**

This course is a continuation of National Electrical Code I and includes National Electrical Code (NEC) requirements for wiring applications. The sizing of wire and ampacity are emphasized. A study of branch circuits, feeders, switches, and conduit is included. NEC requirements for wiring methods are studied, along with various boxes and fittings.  
(2+0)

**JAT124 AC Theory II 3 Cr. Hrs.**

This course is a continuation of AC Theory I. There is a focus on inductors in series and in parallel connections, as well as voltage, impedance, and current in series RC and RLC circuits. Parallel RL circuits and parallel RC circuits are studied with emphasis on voltage, impedance, and current. Students are expected to apply AC theory to solve real world problems.  
(2+2)

**JAT126 National Electrical Code III 2 Cr. Hrs.**

This course is a continuation of National Electrical Code II and includes National Electrical Code (NEC) requirements for overcurrent protection. Types of Overcurrent Protection Devices (OCPD) are studied, including circuit breakers and fuses. A study of OCPD ampacity sizing, conductor tap rules, and ground-fault protection of equipment is included. Students are expected to apply overcurrent protection methods to solve real world problems.  
(1+2)

**JAT127 Lightning Protection I 1 Cr. Hr.**

This course focuses on lightning protection for electrical systems. Topics covered include ground work, down conductors, and bonding with a focus on roof tops. Emphasis is on types of protection for metal buildings and wood structures. Surge protection devices are also included.  
(1+0)

**JAT128 Fire Alarms 1 Cr. Hr.**

This course will study of the installation, programming, and troubleshooting of fire alarm systems. Emphasis is on wiring methods, initiating devices, and notification appliances. There is also a focus on system interfaces, emergency control systems, and voice/alarm communications systems. Supervising stations with single and multiple station alarms are included.  
(1+0)

**JAT129 Lighting Essentials I 1 Cr. Hr.**  
This course focuses on light sources and various luminaires. Topics covered include switching and dimming, lighting calculations, and lighting documentation. Emphasis is on types of ballasts, including fluorescent and high intensity. LED lighting applications are also included.  
(1+0)

**JAT130 Fiber Optics 2 Cr. Hrs.**  
This course includes introduction to fiber optic communications and wiring installations. The principles of fiber optics, terminology, transmission systems, and components are emphasized. Topics include optical fiber, fiber-optic cable, connectors, and splices. Applications focus on the design of fiber-optic networks, installation, and testing with implementation at the job site.  
(1+2)

**JAT131 Electrical Safety II 1 Cr. Hr.**  
This course is a continuation of the first electrical safety course. Emphasis is on the control of hazardous energy by understanding the calculation of short circuits, arc flash hazards, and methods to reduce risks. Precautions are studied, including protective equipment and maintenance safety.  
(1+0)

**JAT170 DC Theory II 3 Cr. Hrs.**  
This course is a continuation of DC Theory I. There is a focus on the Principle of Superposition to circuit calculations and Kirchhoff's Laws of voltage, current, single voltage source, and two voltage sources. Thevenin's Theorems and Norton's Theorems are studied, along with magnetism and electromagnetism. There is also an emphasis on DC Generators and Motors and using DC theory to solve real world problems.  
(2+2)

**JAT172 Distributed Generation 1 Cr. Hr.**  
This course will study of information technology sites and applications of Uninterruptible Power Supplies (UPS). Emphasis is on components, installation, and servicing of power systems. There is also a focus is on fuel cell maintenance and troubleshooting.  
(1+0)

**JAT174 Health Care Systems I 1 Cr. Hr.**  
This course will study of wiring in health-related facilities according to general NEC requirements. Emphasis is on patient care protection, wiring in patient care locations, and protection in critical care areas. There is also a focus on nurse call system installation and troubleshooting. Applications include essential electrical systems for hospitals, nursing homes, limited care, and other health care facilities.  
(1+0)

**JAT175 Health Care Systems II 1 Cr. Hr.**  
This course is a continuation of Health Care Systems I, wiring in health-related facilities. Emphasis is on requirements for isolated power systems. Applications include inhalation anesthetizing locations, diagnostic imaging equipment, pools and tubs, and operational facilities.  
(1+0)

**JAT176 Photovoltaics I 1 Cr. Hr.**  
This course is an introduction to photovoltaic systems and the fundamentals of photovoltaic devices. Topics include solar radiation, site surveys and planning, photovoltaic modules and arrays, and inverters. Emphasis also focuses on electrical integration and utility interconnection.  
(1+0)

**JAT178 Hazardous Locations I 1 Cr. Hr.**  
This course will study of hazardous locations in the electrical industry and the types of hazards present. Emphasis is on the background of electrical hazard identification and the classification of hazardous areas. Understanding the requirements for electrical installation in Class I, II, and III locations is a major focus. Students are expected to locate hazardous locations and types of hazards on the job.  
(1+0)

**JAT180 Motors II 2 Cr. Hrs.**  
This course is a continuation of Motors I with emphasis on advanced motor systems. Topics include synchronous motors, braking, and multispeed motors. Emphasis also focuses on adjustable-speed drives, clutches, and motor alignment. Students are expected to apply skills to solve real world motor problems.  
(1+2)

**JAT182 Structured Cabling 1 Cr. Hr.**  
This course introduces the need for structured cabling and TIA/EIA standards. Emphasis is on cabling system performance and safety codes. Topics include unshielded twisted pathways, telecommunications grounding and bonding, and configuring structured cabling systems. Residential telecommunications and UTP cabling systems are also covered.  
(1+0)

**JAT183 Buiding Automation CDA 1 Cr. Hr.**  
This course introduces automated controls for building systems. The focus is on electrical systems, lighting sources and controls, and HVAC systems. There is also emphasis on plumbing systems, fire protection, security systems, voice-data-video (VDV) systems, and elevator systems.  
(1+0)



**JAT184 Installer/Tech CCTV I 2 Cr. Hrs.**

This course introduces surveillance video practices and technology. Emphasis is on video imaging, including image splitting, reversal, and annotation. The use of printers, low light level cameras, and thermal infrared is included. There is also a focus on control room console design, testing, and application solutions.

(1+2)

**JAT185 Installer/Tech CCTV II 1 Cr. Hr.**

This course expands on applications of surveillance video technology. Emphasis is on low lighting challenges of video imaging of residential settings. There is also a focus on design, testing, and application solutions.

(1+0)

**JAT186 Installer/Tech LAN I 2 Cr. Hrs.**

This course introduces the basics of networking technologies. Emphasis is on Ethernet basics, the need for security, viruses and monitoring software, and network operating systems. Topics include switches, routers, and storage. There is also a focus on addresses, tools, utilities, protocols, and remote network access.

(1+2)

**JAT188 Installer/Tech Sound Reinforcement 1 Cr. Hr.**

This is a study of sound reinforcement using indoor and outdoor sound systems. Drawing, reading, and interpreting specifications for sound diagrams will be a focus. A variety of sound equipment is covered, including microphones, speakers, amplifiers, mixers, and cabling. Installation and troubleshooting are emphasized.

(1+0)

**JAT189 Installer/Tech RF Communication 1 Cr. Hr.**

This course includes the basics of signal technology using radio frequency communication. Basic operations are emphasized, including signal characteristics and signal power. Topics include frequency, filters, harmonics, and antennas for communication systems.

(1+0)

**JAT190 Installer/Tech Telephony 1 Cr. Hr.**

This course includes the basics of telephone technology and principles of a telephone system. Basic operations are emphasized, including wiring and signal transmission. Topics include analog versus digital systems, electronic components, and PBX systems.

(1+0)

**JAT200 Grounding and Bonding I 1 Cr. Hr.**

This course covers circuit basics and overcurrent protection. Topics include grounding electrodes and requirements for grounded conductors. There is also a focus on grounding equipment and grounding receptacles.

(1+0)

**JAT201 AC Theory III 1 Cr. Hr.**

This course is an extension of the focus on AC Theory with emphasis on circuit filters. Topics include filter design, filter analysis, and power factors. Low-pass filter design, high-pass filter design, band-pass filter analysis, and band-reject filter analysis are emphasized. A study of AC generators is included, as well as three-phase systems.

(1+0)

**JAT202 Blueprints II 1 Cr. Hr.**

This course is a continuation of the first blueprints course. Emphasis is on analyzing drawings and laying out residential circuits. Students also learn to understand job costs, interpret specifications, and effectively use blueprints in wiring systems.

(1+0)

**JAT203 Electrical Safety III 1 Cr. Hr.**

This course is a review of electrical safety principles and focuses on updated safety issues. Emphasis is on the control of hazardous energy inherent in new technology applications in household and commercial applications. Precautions are emphasized to identify proactive measures to prevent safety hazards and methods to upgrade systems to provide increased safety.

(1+0)

**JAT204 Electrical Safety II 2 Cr. Hrs.**

This course is a continuation of the first electrical safety course. Emphasis is on the control of hazardous energy by understanding the calculation of short circuits, arc flash hazards, and methods to reduce risks. Precautions are studied, including protective equipment and maintenance safety.

(1+2)

**JAT206 Transformers II 1 Cr. Hr.**

This course is a continuation of Transformers I. Emphasis is on real world transformer connections, harmonics, power generation, and power distribution. Reactors, isolation transformers, and autotransformers are also covered.

(1+0)

**JAT208 Blueprints III 1 Cr. Hr.**

This course is a continuation of Blueprints II. Emphasis is on analyzing drawings and laying out industrial circuits. Students will review the understanding of specifications in wiring systems and apply prior knowledge regarding residential wiring schemes to the industrial setting, including more advanced prints and a variety of industrial applications. There is emphasis on applications at industrial job sites.

(1+0)

**JAT210 Code Calculations I 1 Cr. Hr.**

This course is a study of code calculation related to the installation of cable tray systems. Emphasis is on electrical equipment and special equipment which requires surface metallic raceways for wiring. Ampacity of conductors in cable trays is a major focus. Topics covered include electric welders and commercial loads in accordance with the NEC.

(1+0)

**JAT212 Motor Control I 3 Cr. Hrs.**

This course is an introduction to magnetic motor controls and the devices that control and protect motors. Topics include manual pilot devices, automatic pilot devices, and magnetic control relays. Emphasis also focuses on control transformers, basic motor starters, and control timers. Students are expected to apply skills to solve real world motor control problems.

(2+2)

**JAT214 Motors I 2 Cr. Hrs.**

This course is an introduction to DC and AC motors and protection of the motors. Topics include wiring and troubleshooting motors of various types. Emphasis also focuses on motor circuits and motor circuit protection. Students are expected to apply skills to solve real world motor control problems.

(1+2)

**JAT216 Grounding and Bonding II 2 Cr. Hrs.**

This course is a continuation of Grounding and Bonding I. Emphasis is on grounding of electrical systems and requirements for separately driven systems. Topics include special occupancies and equipment, limited-energy systems, ground-fault circuit interrupters (GFCI), and test instruments. Grounding rules for medium and high voltage systems are also covered.

(1+2)

**JAT218 National Electrical Code IV 2 Cr. Hrs.**

This course is a continuation of National Electrical Code III and includes National Electrical Code (NEC) requirements for overcurrent protection of swimming pools, fountains, and similar installations. Types of Overcurrent Protection Devices (OCPD) for water-borne devices are the primary focus. A study of remote-control, signaling, and power-limited circuit protection is included. Students are expected to apply overcurrent protection methods to solve real world problems.

(1+2)

**JAT219 National Electrical Code V 1 Cr. Hr.**

This course is a continuation of the focus on the National Electrical Code for special applications of multi-outlet assemblies. Topics include wire mesh cable trays, surface raceways, and in-floor installations. Code rules for solar voltaic systems are also covered.

(1+0)

**JAT220 Motor Control II 2 Cr. Hr.**

This course is a continuation of Motor Control I with emphasis on solid state devices used to control motors. Emphasis is on electronic control devices, including relays, starters, programmable timers, and AC motor speed control. Students are expected to apply control principles to real work situations with motors.

(1+2)

**JAT221 National Electrical Code VI 1 Cr. Hr.**

This course is a continuation of the focus on the National Electrical Code for special applications of overcurrent protective devices (OCPD). Emphasis is on protection of branch circuit devices and specialized components such as air conditioning and refrigeration devices, as well as alternative power systems.

(1+0)

**JAT222 Rigging, Hoisting, and Signaling 1 Cr. Hr.**

This course will focus on the principles of properly rigging devices for lifting various loads. Emphasis is on tying knots, rigging equipment, and properly hoisting loads. Topics include the use of slings, chains, and block and tackle hoists, as well as proper hand signals. Students are expected to apply rigging and hoisting principles to real work situations.

(1+0)

**JAT224 Code Calculations 1 Cr. Hr.**

This course is a continuation of Code Calculations I. Emphasis is on conductor ampacity, ampacity calculations, box size calculations, box fill calculations, raceway fill calculations, electrical load calculations, and range and appliance calculations. Topics covered include parameters of multifamily dwellings, and commercial loads in accordance with the NEC.

(1+0)

**JAT270 Transformers III 1 Cr. Hr.**

This course is a continuation of Transformers II. Emphasis is on special transformers and special connections. Topics covered include electrical safety, buck-boost transformers, three-phase buck-boost transformers, and installation. Maintenance and troubleshooting of transformers are also included.

(1+0)

**JAT272 Motor Control III 1 Cr. Hr.**

This course is a continuation of Motor Control II with emphasis on advanced devices used to control motors. Emphasis is on variable frequency drives, programmable logic controllers, and troubleshooting control systems. Students are expected to apply control principles to real work situations with motors.

(1+0)

**JAT274 Instrumentation 2 Cr. Hrs.**

This course will study of instrumentation, including installation, monitoring, calibration, maintenance, and troubleshooting. Fundamentals of pressure, flow, level, and temperature are studied. There is emphasis on pneumatics, control valve actuators, instrument tubing, and control systems.

(1+2)

**JAT275 Instrumentation II 2 Cr. Hrs.**  
This course is a study of analytical instruments and their maintenance, including control valves. Process control systems are emphasized through the use of loop-checking systems, process control systems, and start-up systems. Topics include project management and distributed control systems.  
(1+2)

**AT276 Programmable Logic Controllers 2 Cr. Hrs.**  
This course will study of programmable logic controllers. Emphasis is on input devices, output actuators, programming, timers, and counters. The application of arithmetic instructions, move instructions, BCD conversion, and comparison instructions are included. There is also a focus on data handling and manipulation, PLC sequencer functions, analog sensors, control systems, intermittent and continuous process control, and industrial networks. Students also use PLC Standard IEC Structured Text Language and PLC Standard IEC Sequential Function Charts.  
(1+2)

**JAT278 Electrical Project Supervision 1 Cr. Hr.**  
This course will study of the supervisor's role in leading electrical projects. Emphasis is on team building, communications, job site documentation, employee relations, and safety fundamentals. Topics include managing the contract, understanding the estimate, and management of tools and materials. There is also a focus on effective planning and scheduling to manage a project.  
(1+0)

**JOU101-150 Special Topics .25- 4 Cr. Hrs.**  
These courses are special topics generated by changing needs for special technology or updated industry standards. The courses will be offered at training centers off campus.

**RTI102 Shop Algebra 2 Cr. Hrs.**  
Basic elementary algebra. Material covered includes fundamental operations of positive and negative numbers, grouping symbols, algebraic axioms, equations, formula manipulation, special products, factoring, quadratic equations, and related applications to the shop.  
(2+0)  
Co-requisite: MTH050 or instructor permission

**RTI103 Shop Geometry & Trigonometry 3 Cr. Hrs.**  
Geometry includes definitions and descriptions of geometric terms, axioms, theorems, propositions dealing with straight lines, triangles, polygons and circles, as well as perpendicular and parallel relationships. Trigonometry includes definitions of basic trigonometric functions, use of trigonometric tables, solutions of right angle and oblique triangle problems, use of sine, cosine, tangent and their reciprocals in the solutions of unknown angles, logarithms, and practical shop problems.  
(2+2)  
Prerequisite: RTI102 or MTH080

**RTI121 Shop Graphics – Blueprint Reading and Drafting 3 Cr. Hrs.**  
Print Reading and sketching including the alphabet of lines, orthographic projection, ordinary views, section views, auxiliary views, pictorial sketching, dimensioning, tolerancing, screw threads and fasteners, mathematics for design and an introduction to geometric dimensioning and tolerances.  
(2+2)

**RTI123 Electrical Print Reading 2 Cr. Hrs.**  
This course is a study of the basics of print reading for the skilled trades person. One element of this course is how to draw and sketch symbols on a print, and how to interpret basic blue prints. The focus of the course will be on electrical symbols and prints, but the course will also cover Mechanical symbols and prints as well.  
(2+0)

**RTI131 Industrial Safety 2 Cr. hrs.**  
This is a course in hazard recognition. Although students learn to identify potential hazards in the workplace, they will also develop a greater awareness of hazards in their environment in conjunction with the Industrial Commission of Ohio.  
(2+0)

**RTI135 Construction Safety 1 Cr. Hr.**  
This course emphasizes safety awareness and procedures for maintaining a safe work environment. Topics include construction hazards, health considerations, and injury prevention.  
(1+0)

**RTI141 Precision Measurement 2 Cr. Hrs.**  
Introductory course in learning to use the Machinery's Handbook Index to read and understand the various mechanical tables, rules, formulas, and general data. This course places emphasis on precision tools, reading and proper use of precision measuring tools and instruments such as mirometers, vernier devices, dial indicators and a review of tables and formulas.  
(2+2)

**RTI142 Applied Statistical Method 2 Cr. Hrs.**  
This class establishes the reason for and the philosophy behind a successful quality control program. It covers how to use probability, X-bar and R charts and MIL-STD-105D to solve quality problems.  
(2+0)  
Prerequisite: MTH080 or RTI102

**RTI143 Bench Work 2 Cr. Hrs.**

This is the first machine shop course. Students learn the use of hand and power hack saws, burring, layout work on the bench, shearing a drilled section, filing and polishing, use of hand taps, and cutting threads with a die.

(2+0)

Prerequisite: RTI21 or instructor permission

**RTI144 Machine Repair 2 Cr. Hrs.**

Basic fundamentals of methods and means to rebuild a production machine such as realignment of columns of tables, scraping of ways, replacing spindles, gears, bearings, gibs, etc.

(2+0)

Prerequisite: RTI143

**RTI146 BICSI Apprentice Training 4 Cr. Hrs.**

This is the first in a series of three courses designed to teach the proper methods and procedures used to install telecommunication cabling systems in accordance with established industry standards. Both a written and hands-on exam must be passed to obtain in order to be registered with the Building Industry Consulting Services International at this beginning level.

(1+0)

**RTI152 Programming of Numerically Controlled Machines 3 Cr. Hrs.**

This course introduces the advantages and uses of Computer Numeric Controls in manufacturing. Students will use the blueprint of a mechanical part to determine the datum, the sequence of operations required, and the appropriate tooling to create a part using a CNC machine. G & M code programs will be written for use on a CNC mill or lathe, which will machine the part according to specifications. There is also an emphasis on workplace safety and safe work procedures. An introduction to geometric dimensioning and tolerances is included.

(3 + 0)

**RTI153 Residential: Wiring I 4 Cr. Hrs.**

This course is an introduction to the basics on residential wiring techniques. This class will do an overview of the complete installation process, and then move to specific installation issues. The students will be introduced to the National Electrical Code, and blueprint interpretation.

(4+0)

**RTI154 Construction Electricity I 4 Cr. Hrs.**

This course is an introduction to the basics of construction electricity. This class will do an overview of basic tools and installation concepts that will be focused on in later lessons. The student will also study the basics of DC electrical circuits.

(4+0)

**RTI155 Residential: Wiring II 4 Cr. Hrs.**

This course is a continuation of the basics of residential wiring. This class will focus more on the more advanced topics of residential wiring such as service entrances, and specialized outlets and wiring methods. Students will also working in a lab environment with hands on exercises to support the topics discussed in class.

(3+2)

**RTI156 Construction Electricity II 4 Cr. Hrs.**

This course is an intermediate type of course on the study of basic electrical circuit concepts. This class will do an overview of the operation of series and parallel circuit characteristics. The students will be introduced to the National Electrical Code, and basics on how to interpret it.

(4+0)

**RTI157 NEC Fundamentals 2 Cr. Hrs.**

This course is an introduction to the use of the National Electrical Code book. Students will learn to interpret the NEC articles and sections. The focus of this class will be on basic terms, navigation and interpretation, with the emphasis being on conductors and insulators.

(2+0)

**RTI166 National Electric Code I 1 Cr. Hr.**

This course is a breakdown of the three credit hour course RTI172, National Electrical Code that has been divided up into one credit hour sections. This will be offered at business sites in a five-week timeframe.

(1+0)

**RTI169 Transformer Connections 1 Cr. Hr.**

This course is a study of the various connections and configurations of single and three phase transformers. The focus will be on the student being able to connect a single phase transformer for high and low voltage, and three phase transformers for the desired configuration. Students will learn proper ways to ground transformer systems.

(1+0)

**RTI171 Industrial Electricity I 3 Cr. Hrs.**

A beginning course in electrical theory. Topics covered include electron flow, conductors, sources of electricity, electrical components, Ohm's Law dealing with voltage, current and resistance in the series, parallel and series parallel circuits. Also, briefly covers motors, generators and transformers. Lab work includes use of meters and how to measure circuit variables.

(2+2)

Prerequisite: MTH050 or satisfactory score on Course Placement Test.

**RTI172 Industrial Wiring (NEC) 3 Cr. Hrs.**

This course is focused on basic wiring concepts in an industrial workplace. Topics include, wire & conduit sizing and installation, switching circuits, distribution equipment and grounding equipment. Students will wire on industrial grade equipment. Students will also learn basic National Electrical Code information, primarily on Article 79 for Industrial Machinery. This course was named National Electrical Codes.

(2+2)

Prerequisite RTI 171 or instructor permission

**RTI174 Electrical prints & Troubleshooting 3 Cr. Hrs.**

Practical experience is provided along with the theory of operation for using equipment like the YOM, clamp-on voltmeter and other electrical test pieces. The student learns to troubleshoot by studying electrical schematics, wiring diagrams, pictorial drawings and demonstration boards using them for testing the various types of electrical circuits.

(3+0)

Prerequisites: RTI194 or instructor permission

**RTI178 Industrial Electricity C 1 Cr. Hr.**

This course is part of a breakdown of the three credit hour course RTI171, Industrial Electricity that has been divided up into two, one credit hour sections and a two hour lab section. This will be offered at business sites in a five-week timeframe. RTI178 will account for one credit hour.

(1+0)

**RTI179 Close Circuit TV 1 Cr. Hr.**

This course is a study of basic operation of Close Circuit TV (CCTV) systems used in a commercial and industrial environment. The focus will be on the operation of video systems, and the operation of each component. Students will learn basic applications of these systems.

(1+0)

**RTI181 Applied Welding Techniques 3 Cr. Hrs.**

A general orientation of three non-pressure processes commonly used in industry to join metal fusion alone - the oxy-acetylene, arc, and TIG methods. Topics covered include welding theory and practice, study of equipment safety measures, welding symbols and techniques, electrode classification, types of welds, and fusion of various types of metals.

(2+2)

Prerequisite: RT1121 or instructor permission

**RTI182 Maintenance Electricity 3 Cr. Hrs.**

This course is a study of the basic electrical concepts. Direct Current circuits will be the focus of this course, as well as the various circuit configurations. Students will prove the basic concepts though hands on lab experiments.

(3+0)

**RTI183 Alarm Signaling and Low Voltage Circuits I 2 Cr. Hrs.**

This course is a study of basic low voltage circuits found in a commercial or industrial installation. The focus of this class will be on basic security sensors and alarms, and how they interface to a system. Students will learn how to install and troubleshoot these devices.

(2+0)

**RTI184 Alarm Signaling and Low Voltage Circuits II 2 Cr. Hrs.**

This course is a study of basic low voltage circuits found in a commercial or industrial installation. The focus of this class will be on basic safety sensors and alarms, and how they interface to a system. Students will learn how to install and troubleshoot these devices.

(2+0)

**RTI185 Premises Cabling 2 Cr. Hrs.**

This course is a study of the installation and operation of Local Area Networks. The focus of the course will be on the installation on and troubleshooting of network systems found in a commercial and industrial environment. Students will be taught how to install and troubleshoot networking equipment.

(2+1)

**RTI188 Fire Alarms 1 Cr. Hr.**

This course is a study of basic fire alarm systems. The focus will be on the student understanding the operation and maintenance of a fire alarm system. The students will be introduced to Modern and legacy fire alarm systems.

(1+1)

**RTI191 Electrical Principles and Applications. 3 Cr. Hrs**

This course is a study of basic semiconductor devices used in electronics. The focus of the class will be on the operation and characteristics of the basic semiconductor device, and how it is used in specialized equipment. Students will do hands on lab exercises to learn how to connect the devices in a circuit, and how to troubleshoot them.

(2+3)

**RTI194 Industrial Electricity II 3 Cr. Hrs.**

An advanced study of Industrial Electricity, focusing on electromagnetic devices, such as transformers, and relay types of devices. Student will wire relay circuits, timer circuits, and learn basic ladder logic and control system wiring concepts. Single and three phase distribution systems will also be discussed.

(2+2)

Prerequisite: RTI171

**RTI201 Industrial Applied Physics 3 Cr. Hrs.**

Includes the application of Laws of Physics to machine operations, fluids, material properties, electricity, rigging and erecting, the efficient use of levers, gears, pulleys, parallel and non-parallel forces, uniformly accelerated motion and momentum in machining operations, machinery installation, and safe working methods in today's modern factory. Also includes properties of solids, liquids, and gases, expansion of materials, friction, and heat.

(2+2)

Prerequisite: RTI103 or instructor permission

**RTI210 Residential Security/ Communications 2 Cr. Hrs.**

This course is a continuation of the study of the installation of branch circuits in a residential -environment. Low voltage circuit installation and communication -systems will also be discussed. The focus will be on installation and troubleshooting these circuits.  
(2+0)

**RTI211 Residential: Installation/Code 2 Cr. Hrs.**

This course is a study of the National Electrical Code that pertains to residential installations. The focus of the class will be to interpret the NEC articles and sections, and how that relates to installation and practices of residential wiring installations.  
(2+2)

**RTI212 Installer: Telephone & Security Systems 3 Cr. Hrs.**

This course is a study of the basics and characteristics of telephone and security systems. The students will be introduced to the various types of systems used in commercial and industrial installations. The focus of the course will be on the installation and troubleshooting of systems.  
(3+0)

**RTI213 Residential & Commercial Electronics 3 Cr. Hrs.**

This course is an introduction to the basics on residential wiring techniques. This class will do an overview of the complete installation process, and then move to specific installation issues. The students will be introduced to the National Electrical Code, and blueprint interpretation.  
(3+0)

**RTI214 Commercial Wiring/Print Reading 2 Cr. Hrs.**

The primary purpose of this course is to acquaint the learner with a ready source of information relevant to the NEC (National Electric Code) used in Commercial Wiring installations. Focus will also be on reading and interpreting electrical prints.  
(2+0)

**RTI215 National Electrical Code II 3 Cr. Hrs.**

This course is a second level study of the National Electrical Code. This class will focus on the grounding techniques and requirements specified by Article 250 of the NEC. The students will be introduced to high voltage circuits and ground fault circuits.  
(3+0)

**RTI216 National Electric Code III 2 Cr. Hrs.**

This course is a third level study of the National Electrical Code. This class will focus on the sizing of components in the motor branch circuit. The students will be introduced to hazardous location classifications and specifics, as well as special equipment specified by the NEC.  
(2+0)

**RTI217 National Electric Code IV 3 Cr. Hrs.**

This course is a fourth level study of the National Electrical Code. This class will focus on the installation of more advanced and specialized equipment in the NEC. The students will also focus on the preparation for the NEC exam.  
(3+0)

**RTI218 Residential: Distribution/ Troubleshooting 4 Cr. Hrs.**

This course is a study of the installation of branch circuits in a residential environment. The focus of the class will be on the installation and troubleshooting of various types of branch circuits found in the home. Specialized areas outside of the home will also be discussed.  
(3+2)

**RTI220 Electrical Test Equipment 2 Cr. Hrs.**

This course is an introduction to the basic operation and application of various types of test equipment. Digital and analog types of meters will be discussed as well as oscilloscopes. The students will use the oscilloscope to measure voltage and time of an AC waveform, and then calculate the frequency.  
(2+0)

**RTI223 Rigging & Erecting 2 Cr. Hrs.**

Applies the Laws of Physics to moving, setting up, and securing machines. Leverage and mechanical advantage, and the care and selection of equipment are other considerations in this course.  
(2+0)

**RTI224 Descriptive Geometry 2 Cr. Hrs.**

A study of the relationship of points, lines and planes as they apply to manufacturing drawings. The course includes drawing lines and reading them in prints. Students will be able to read prints related to manufacturing.  
(2+0)

**RTI225 Geometric Dimensioning & Tolerancing 2 Cr. Hrs.**

A basic course in dimensioning. Covers the principles of the ANSI Y14.5M standard. Intended to teach the student to read and interpret drawings utilizing the ANSI Y14.5M standard. Common practices not included in the standard and their interpretation are also considered.  
(2+0)

**RTI226 Jig & Fixture Design 2 Cr. Hrs.**

To study and learn the function and design of basic drilling, boring, milling, and welding jigs, and fixtures that are either standardized or commercial plus special applications from problems occurring in shop situations.  
(2+0)

Prerequisites: RTI121, RT1103 or instructor permission

**RTI227 Die Thoery & Design Fundamentals 3 Cr. Hrs.**

This course investigates the details and techniques of die design theory and practice. Included is a study of forming and cutting dies and their component parts such as die blocks, strippers, stock guides, shredders, knockouts, nest gages, pushers, die stops, strip layout die sets, stock utilization and engineering formulas. A die design project will be required in which manipulative skills of design will be developed. Project areas include piece dies, blank dies, compound dies, progressive dies, forming dies, trim dies, cam dies and press dies.

(2+2)

Prerequisites: RTI121, RTI103 or instructor permission

**RTI228 Patternmaking Fundamentals 3 Cr. Hrs.**

The selection, use, and maintenance of hand tools, pattern shop tools and materials used in building patterns for industry. Also included are concepts of shop theory as applied to the molder and core maker it includes the processes from melting to the production of cores, sand type's binders, metallurgy, cooling and heat treatment.

(2+2)

Prerequisite: RTI226, course should be taken near end of apprentices program.

**RTI231 Metallurgy & Heat Treatment 2 Cr. Hrs.**

A basic course covering the nature and behavior of metals, crystall structure, theory of alloys, principles of heat treatment, properties of met and alloys and testing applications. The Rockwell and Brinell testers will be used.

(2+0)

Prerequisite: MTH080 or RTI102

**RTI232 Lubricants & Coolants 2 Cr. Hrs.**

Deals with the properties of commercial lubricants and coolants used various machines and machining operation. Both physical and chemical properties and their effects on the environment are studied.

(2+0)

**RTI233 Industrail Pipefitting 2 Cr. Hrs.**

A study of the specifications, application, installation, and maintenance of various kinds of pipe, fittings, valves, pumps, and hand tools. The analysis of job requirements in terms of materials, time utilization and sequence operation is discussed.

(2+0)

**RTI234 Hydraulics & Pneumatics 3 Cr. Hrs.**

Presents basic components of hydraulic and pneumatic systems including pumps, control valves, control assemblies, and actuators. It also covers general understanding of basic laws and formulas used in designing simple hydraulic circuits including standard hydraulic symbols and maintenance procedures.

(2+2)

**RTI246 BICSI Installer Trainer II 4 Cr. Hrs.**

This course will be offered for the IBEW (Industrial Building and Electrical Workers) for their trainees programs. This course is a study of proper procedures for starting and working at a construction site. The focus of the class will be on safely installing systems and termination of wires on a new construction site.

(4+0)

**RTI265 Instrumentation & Controls I 3 Cr. Hrs.**

This course is a study of the operation and troubleshooting of Industrial Instrumentation systems. The focus will be on analog monitoring and controlled devices, connected to stand alone and PLC based controlled systems. The concepts of temperature, pressure, level and flow will be discussed, as well as the transmitters that connect the analog sensor signal to the analog I/O.

(2+1)

Prerequisite: RTI171, PLC200

**RTI276 Motors & Motor Controls 3 Cr. Hrs.**

This course is a study of the operation of DC & AC Motors and the device that control and protect the motors. Students will wire, program, and troubleshoot solid state motor drive systems. A focus will be on how the drive is interfaced to a PLC system. Motor soft starts and reversing circuit will also be discussed.

(2+2)

Prerequisite: RTI194

**RTI277 Industrial Electronics 3 Cr. Hrs.**

This course is a study of the electronic devices used in modern day industrial machinery. Solid state switching devices will be discussed, that includes transistors, SCRs and Triacs, as well as the firing devices used in current controlled circuits. Power supply circuits and basic amplifier circuits using controlled circuits. Power supply circuits and basic amplifier circuits using Operational Amplifiers will also be discussed. Students will focus on operation, application and troubleshooting of the various electronic devices.

(2+2)

Prerequisite: RTI171

**RTI282 Motor Control Systems: INT 2 Cr. Hrs.**

This course is a study of the basics of motor control systems used in an industrial or commercial environment. The focus will be on relay panel type of control systems. Students will learn basic wiring configurations and troubleshooting techniques.

(2+0)