Industrial Technical Maintenance II builds on skills learned in Industrial Technical Maintenance I. This course includes classroom and practical experiences that prepare students to apply technical knowledge and skills to repair and maintain industrial machinery and equipment. Instructional activities are focused on electrical systems, electronic and process control systems, welding, and piping maintenance processes. Instruction includes in-depth training in diagnostic processes and problem-solving skills.

- DOE Code: 5688
- Recommended Grade Level: Grades 12
- Required Prerequisites: Industrial Technical Maintenance I
- Credits: 2 semester course, 2 semesters required, 2-3 credits per semester, maximum of 6 credits
- Counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas

Application of Content and Multiple Hour Offerings
Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences. When a course is offered for multiple hours per semester, the amount of laboratory application or work-based learning needs to be increased proportionally.

Career and Technical Student Organizations (CTSOs)
Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in SkillsUSA, the CTSO for this area.

Domain — Electrical Systems
Core Standard 1 Students analyze electrical systems to perform maintenance and repair processes

Standards
ITMII-1.1 Analyze and demonstrate adherence to safety, health and environmental rules and regulations for electrical power and control systems
ITMII-1.2 Read and interpret electrical motor control and programmable controller system schematics, including identifying schematic symbols, signal flow and operation of the components and system
ITMII-1.3 Adjust and test limit switches, pressure switches, float switches and electronic proximity sensors
ITMII-1.4 Use a multimeter to measure voltage, current and resistance in an electrical circuit to verify system operation and power levels
ITMII-1.5 Select, install and test fuses and circuit breakers
ITMII-1.6 Install and test Direct Current (DC) electric motors in a manual motor control circuit
ITMII-1.7 Install and test single and 3-phase Alternating Current (AC) electric motors in a manual motor control circuit
ITMII-1.8 Install and test electrical relay control components in control system
ITMII-1.9 Install and test electro-fluid power components and circuits
ITMII-1.10 Test and repair machine electrical ground
ITMII-1.11 Troubleshoot an electrical motor relay control circuit
ITMII-1.12 Troubleshoot a solenoid-operated fluid power relay control circuit
ITMII-1.13 Test and replace electrical control wiring using terminal attachment
ITMII-1.14 Test and replace electrical control wiring using solder attachment
ITMII-1.15 Test and replace transformers

Domain – Electronic Control Systems

Core Standard 2 Students analyze electronic control systems to perform maintenance and repair procedures.

Standards

ITMI-2.1 Adhere to safety, health and environmental rules and regulations for electronic power and control systems
ITMI-2.2 Connect and test linear and switching DC power supplies
ITMI-2.3 Install and test solid-state AC and DC discrete and analog relays
ITMI-2.4 Install, adjust and test analog sensors and signal conditioning equipment
ITMI-2.5 Install and operate an AC variable frequency volts-to-hertz motor drive system
ITMI-2.6 Connect and transfer programs to a Programmable Controller (PLC) using a PC
ITMI-2.7 Create a basic PLC ladder-style program
ITMI-2.8 Install and test basic PLC components
ITMI-2.9 Troubleshoot PLC and controlled components

Domain – Process Control Systems

Core Standard 3 Students examine process control systems to maximize machine life and output.

Standards

ITMI-3.1 Adhere to safety, health and environmental rules and regulations for process control systems
ITMI-3.2 Read and interpret process control system documentation, including identifying components on a piping and Instrumentation diagram (P&ID), instrument tag and instrument index
ITMI-3.3 Calibrate, adjust and test analog sensors and signal conditioning equipment
ITMI-3.4 Calibrate, adjust and test pneumatic proportional valves and current to pneumatic (I/P) transmitters
ITMI-3.5 Build a simple/basic process single loop system
Domain – Maintenance Welding

Core Standard 4 Students perform welding processes to maintain machine components.

Standards

ITMII-4.1 Adhere to safety, health and environmental rules and regulations for welding
ITMII-4.2 Use an acetylene Torch to cut steel parts
ITMII-4.3 Explain welding theory, equipment and selection process
ITMII-4.4 Prepare metal parts to be welded including degreasing, cleaning, grinding and inspecting
ITMII-4.5 Set up a Shielded Metal Arc Welder (SMAW) for operation and make basic welds
ITMII-4.6 Use a Gas Metal Arc Welder (GMAW) to make basic welds on flat steel
ITMII-4.7 Visually inspect welds identify defects
ITMII-4.8 Use plasma cutter to cut flat stock

Domain – Maintenance Piping

Core Standard 5 Students perform appropriate procedures to maintain the working life of piping.

ITMII-5.1 Adhere to safety, health and environmental rules and regulations for piping systems
ITMII-5.2 Read and interpret piping schematics
ITMII-5.3 Identify and select proper materials for installation and replacement
ITMII-5.4 Prepare material for installation or repair of piping systems
ITMII-5.5 Assemble and disassemble piping systems