

# Automation and Electrical Technology (AET)

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## **AET 1050. Electrical Math I. (3 Credits)**

Prerequisite(s): MAT 1010 or Departmental Approval

Utilizes algebraic formulas and methods to solve electrical problems related to DC electrical systems. Covers the calculation of voltage, current, resistance, power, and efficiency for DC circuits. Teaches circuit analysis techniques such as superposition, source transformations, Thevenin's theorem, mesh and nodal analysis. Introduces wire sizing and resistance calculations pertaining to the National Electrical Code. Introduces AC electrical system fundamentals.

Software fee of \$20 applies.

## **AET 1060. Electrical Math II. (3 Credits)**

Prerequisite(s): AET 1050

Utilizes algebraic formulas and methods to solve electrical problems related to AC electrical systems. Covers the calculation of voltage, current, resistance, reactance, impedance, power, VARs, volt-amperes and efficiency for single phase and three phase AC systems. Applies trigonometry, trigonometric functions, complex numbers, and phasors to circuit analysis techniques. Analyzes sine waves, transformers, transformer connections and power factor for single phase and three phase electrical systems. Introduces three phase balanced systems and faults.

## **AET 1130. Introduction to Automation. (2 Credits)**

Corequisite(s): AET 1135, AET 1150, AET 1155

Pre- or Corequisite(s): AET 1050

Introduces the difference between Engineering and Engineering Technology. Explores career paths in the Electrical Automation Industry. Incorporates engaged learning. Reviews basic DC theory involving voltage, current, resistance, batteries, magnetism, power and the use of digital meters. Covers troubleshooting techniques and applications of DC circuits.

Software fee of \$20 applies.

Lab access fee of \$45 for computers applies.

## **AET 1135. Introduction to Automation Lab. (1 Credit)**

Corequisite(s): AET 1130, AET 1150, AET 1155

Pre- or Corequisite(s): AET 1050

Reviews basic DC theory involving voltage, current, resistance, batteries, magnetism, power and the use of digital meters. Engages in troubleshooting techniques and applications of DC circuits in a lab-environment.

## **AET 1140. Applied AC Theory. (1 Credit)**

Corequisite(s): AET 1145

Pre- or Corequisite(s): AET 1050, AET 1130, AET 1135, AET 1150, AET 1155

Reviews basic AC theory involving voltage, current, resistance, reactance, impedance, magnetism, power and the use of digital meters. Discusses operation of inductors, capacitors, diodes, and transformers. Discusses troubleshooting techniques and applications of AC circuits.

## **AET 1145. Applied AC Lab. (2 Credits)**

Prerequisite(s): AET 1130, AET 1135, AET 1150, AET 1155

Corequisite(s): AET 1140

Pre- or Corequisite(s): AET 1050

Reviews basic AC theory involving voltage, current, resistance, reactance, impedance, magnetism, power and the use of digital meters. Discusses operation of inductors, capacitors, diodes, and transformers. Engages in troubleshooting techniques and applications of AC circuits in a lab environment.

## **AET 1150. Industrial Logic. (1 Credit)**

Corequisite(s): AET 1155, AET 1130, AET 1135

Pre- or Corequisite(s): AET 1050

Introduces digital logic and relay logic theory and industrial applications of logic circuits. Discusses numbering systems, boolean algebra, circuit simplification techniques, and logic devices such as latches, one-shots, timers, counters, flip flops, and shift registers. Emphasizes the relationship between ladder logic and digital logic and focuses on conversion between both formats. Discusses application and troubleshooting of logic circuits and introduces basic concepts of state machines.

## **AET 1155. Industrial Logic Lab. (1 Credit)**

Corequisite(s): AET 1150, AET 1130, AET 1135

Pre- or Corequisite(s): AET 1050

Applies digital logic and relay logic theory to industrial circuits in a hands-on setting. Utilizes boolean algebra and circuit simplification techniques when building logic circuits. Implements control circuits with relays, logic gates, and other applicable digital devices. Applies troubleshooting techniques to industrial control circuits.

**AET 1250. Industrial Electrical Code. (2 Credits)**

Prerequisite(s): (AET 1140, AET 1145) or Department Approval

Pre- or Corequisite(s): AET 1060

Covers pertinent topics within the National Electrical Code related to commercial and industrial environments. Covers code related to electrical plans, specifications, wiring and installation methods, feeder load calculations, motor installation, motor controllers, panelboards, hazardous locations, protective devices, and grounding for commercial and industrial applications.

Software fee of \$18 applies.

Lab access fee of \$45 for computers applies.

**AET 1280. Electric Motor Control. (4 Credits)**

Prerequisite(s): AET 1140, AET 1145

Corequisite(s): AET 1285

Pre- or Corequisite(s): AET 1060, AET 1250

Covers installation, troubleshooting, preventive maintenance, and theory on DC/AC motors, generators, and associated industrial control circuitry.

Expands on ladder logic, controls, sensors, motor starters, overloads, and electronic devices used to control and protect DC/AC Machines. Describes three phase systems, transformers, and delta-wye connections. Introduces AC variable speed drives. Supports hands-on labs and projects in AET 1285.

Software fee of \$20 applies.

Lab access fee of \$45 for computers applies.

**AET 1285. Electric Motor Control Lab. (4 Credits)**

Prerequisite(s): AET 1140, AET 1145

Corequisite(s): AET 1280

Pre- or Corequisite(s): AET 1060, AET 1250

Covers the proper use of tools and test equipment needed to maintain motors and their controllers. Emphasizes the use of schematics, line diagrams, ladder logic, and wiring diagrams. Covers DC/AC, single phase, and three phase motors. Integrates logic design, motor protection, and wiring of motor control centers. Includes the workings of single phase and three phase transformers including delta and wye configurations.

Course Lab fee of \$14 for supplies/materials applies.

Lab access fee of \$45 for computers applies.

Software fee of \$20 applies.

**AET 2010. Manufacturing Technology. (1 Credit)**

Corequisite(s): AET 2015

Provides exposure to manufacturing technology and equipment that is used to fabricate industrial components utilizing machine shop technology.

Covers safety and basic machining principles on a manual lathe and mill. Presents fundamental concepts of CNC programming and 3D modeling as it relates to a CAD/CAM system. Discusses basics of measuring and cutting tools, and shop mathematics as it relates to manufacturing. Covers fundamental principles from the machinery's handbook.

**AET 2015. Manufacturing Technology Lab. (2 Credits)**

Corequisite(s): AET 2010

Provides exposure with a hands-on approach to manufacturing technology and equipment that is used to fabricate industrial components utilizing machine shop technology.

Covers safety, and basic machining principles on a manual lathe and mill. Presents fundamental concepts of CNC programming and 3D modeling as it relates to a CAD/CAM system. Discusses basics of measuring and cutting tools, and shop mathematics as it relates to manufacturing. Covers fundamental principles from the machinery's handbook to manufacture and assembly.

**AET 2110. Industrial Electronics I. (4 Credits)**

Prerequisite(s): AET 1280, AET 1285, AET 1250

Corequisite(s): AET 2115

Pre- or Corequisite(s): AET 2250, AET 2255

Introduces semiconductor theory. Covers the concepts of PN junctions, transistors, voltage amplifiers, operational amplifiers, diodes, power electronics including the theory and operation of industrial solid state thyristor devices, power circuits, integrated circuits and other special semiconductor and industrial electronics. Includes lecture and demonstrations.

Course lab fee of \$29 for materials applies.

Lab access fee of \$45 for computers applies.

**AET 2115. Industrial Electronics I Lab. (2 Credits)**

Prerequisite(s): AET 1280, AET 1285, AET 1250

Corequisite(s): AET 2110

Pre- or Corequisite(s): AET 2250, AET 2255

Introduces semiconductor theory. Covers the concepts of PN junctions, transistors, voltage amplifiers, operational amplifiers, diodes, power electronics including the theory and operation of industrial solid state thyristor devices, power circuits, integrated circuits and other special semiconductor and industrial electronics. Includes practical hands-on labs.

Software fee of \$20 applies.

Lab access fee of \$45 applies.

**AET 2150. Introduction to Fluid Power Systems. (2 Credits)**

Prerequisite(s): AET 2250, AET 2255, AET 2110, AET 2115

Corequisite(s): AET 2155

Covers the fundamentals of hydraulic and pneumatic components and systems used in industrial applications. Studies pumps, motors, directional and flow control valves, cylinders, transmission, and fluids. Emphasizes maintenance, safety, and environmental problems. Examines troubleshooting techniques and blueprint/print reading.

Course Lab fee of \$15 for supplies/materials applies.

Lab access fee of \$45 computers applies.

**AET 2155. Introduction to Fluid Power Systems Lab. (1 Credit)**

Prerequisite(s): AET 2250, AET 2255, AET 2110, AET 2115

Corequisite(s): AET 2150

Covers the fundamentals of hydraulic and pneumatic components and systems used in industrial applications. Studies pumps, motors, directional and flow control valves, cylinders, transmission, and fluids. Emphasizes maintenance, safety, and environmental problems. Examines troubleshooting techniques and blueprint/print reading.

Software fee of \$20 applies.

Lab access fee of \$45 applies.

**AET 2160. Introduction to Industrial Internet of Things. (2 Credits)**

Prerequisite(s): AET 2250, AET 2255, AET 2110, AET 2115

Corequisite(s): AET 2165

Introduces smart sensors, safety, and basic electronic components found in variable speed drives. Covers stepper and servo motor integration via Ethernet/IP. Introduces industrial networking principles related to unmanaged and managed switches. Includes lecture and demonstration.

Course Lab fee of \$11 for materials applies.

Lab access fee of \$45 computers applies.

**AET 2165. Introduction to Industrial Internet of Things Lab. (1 Credit)**

Prerequisite(s): AET 2250, AET 2255, AET 2110, AET 2115

Corequisite(s): AET 2160

Introduces smart sensors, safety, and basic electronic components found in variable speed drives. Covers stepper and servo motor integration via Ethernet/IP. Introduces industrial networking principles related to unmanaged and managed switches. Includes practical hands-on labs.

Software fee of \$20 applies.

Lab access fee of \$45 applies.

**AET 2250. Industrial Programmable Logic Controllers--PLCs. (4 Credits)**

Prerequisite(s): AET 1280, AET 1285, AET 1250

Corequisite(s): AET 2255

Pre- or Corequisite(s): AET 2110, AET 2115

Covers the theory, programming, and industrial control system applications of small and medium sized programmable logic controllers (PLCs). Studies basic maintenance, operation, troubleshooting, and programming instructions / techniques for industrial PLCs. Concentrates on interfacing analog and digital I/O to the PLC. Covers human machine interface (HMI) configuration, programming and PLC integration. Includes lecture, demonstration, print reading, and industry examples.

Course lab fee of \$90 for equipment applies.

Lab access fee of \$45 for computers applies.

Canvas Course Mats \$85/McGraw applies.

**AET 2255. Industrial Programmable Logic Controllers--PLCs Lab. (2 Credits)**

Prerequisite(s): AET 1280, AET 1285, AET 1250

Corequisite(s): AET 2250

Pre- or Corequisite(s): AET 2110, AET 2115

Covers the theory, programming, and industrial control system applications of small and medium-sized programmable logic controllers (PLCs).

Examines basic maintenance, programming, and troubleshooting techniques for industrial PLCs. Covers human-machine interface (HMI) configuration, programming, and PLC integration. Includes PLC communications via serial and industrial Ethernet. Includes hands-on labs and projects.

Software fee of \$20 applies.

Lab access fee of \$45 applies.

**AET 2270. Industrial Programmable Automation Controllers--PACs. (2 Credits)**

Prerequisite(s): AET 2250, AET 2255, AET 2110, AET 2115

Corequisite(s): AET 2275

Introduces the theory and application of advanced industrial programmable automation controller (PAC) instructions, user-defined data types, add-on instructions, and advanced programming techniques. Studies PAC programming languages including ladder logic and function block pertaining to industrial control applications. Covers theory related to PAC integration of devices to variable speed drives, analog / digital sensors, and encoders. Includes advanced Human Machine Interface (HMI) programming concepts and introduces basic concepts of programmable safety relays. Includes lecture and demonstration.

Course lab fee of \$90 for equipment applies.

Lab access fee of \$45 for computers applies.

**AET 2275. Industrial Programmable Automation Controllers--PACs Lab. (1 Credit)**

Prerequisite(s): AET 2250, AET 2255, AET 2110, AET 2115

Corequisite(s): AET 2270

Covers the implementation and application of advanced industrial programmable automation controller (PAC) instructions, user-defined data types, add-on instructions, and advanced programming techniques. Develops PAC programs using ladder logic and function blocks to control systems and machines. Covers PAC integration of devices to variable speed drives, sensors, and encoders. Implements advanced human-machine interface (HMI) programming. Integrates programmable safety relays into class projects. Includes hands-on labs and projects.

Software fee of \$20 applies.

Lab access fee of \$45 applies.

**AET 2280. Process Control Instrumentation. (2 Credits)**

Prerequisite(s): AET 2250, AET 2255, AET 2110, AET 2115

Corequisite(s): AET 2285

Covers basic theory on measuring process variables such as temperature, pressure, level, and flow. Discusses open loop and closed loop control including PID loops. Introduces instrumentation maintenance, installation, and device specifications. Discusses basic calibrations, safety instruments and standards, classified areas, and intrinsically safe systems. Presents competency in process and instrumentation diagrams (P&ID). Covers HART and modbus communications in industrial instrumentation.

**AET 2285. Process Control Instrumentation Lab. (1 Credit)**

Prerequisite(s): AET 2250, AET 2255, AET 2110, AET 2115

Corequisite(s): AET 2280

Implements process control instrumentation on class projects. Integrates open loop and closed loop control including PID loops with industrial instrumentation and a PLC. Explores basic calibrations, safety instruments and standards, classified areas, and intrinsically safe systems. Implements process and instrumentation diagrams (P&ID) on industrial systems. Integrates HART and modbus communications into applicable industrial projects. Covers programming and troubleshooting of industrial instruments in a hands-on environment.

Course lab fee of \$90 applies.

Lab access fee of \$45 applies.

**AET 281R. Cooperative Work Experience. (1-8 Credits)**

Prerequisite(s): Approval of Department Chair

Provides paid on-the-job work experience that relates to the electrical and automation field. Implements and executes goals/learning objectives based on the job description from their work assignment. Reports on goals and learning objectives at the end of the experience. Work experience, the related class, and enrollment are coordinated by the AET Cooperative Coordinator. May be graded credit/no credit. May be repeated for a maximum of 16 credits toward graduation

**AET 285R. Cooperative Correlated Class. (1 Credit)**

Prerequisite(s): Approval of Department Chair

Designed to identify on-the-job problems and to remedy those problems through in-class discussion and study. Focuses on preparing for, participating in, and utilizing the experiences available from working in a cooperative education/internship program. May be graded credit/no credit. May be repeated for a maximum of 8 credits toward graduation.

**AET 2900. Capstone Project. (3 Credits)**

Prerequisite(s): AET 2010, AET 2015

Integrates the concepts of Automation and Electrical Technology curriculum into a semester-long project that will be designed, built, and presented at the Engineering Technology Fair.

**AET 291R. Special Topics in Industrial Systems. (3 Credits)**

Prerequisite(s): AET 2250, AET 2255, AET 2110, AET 2115

Explores special topics in the electrical, power, and automation fields. Offers topics depending on demand and industry needs. May be repeated for a maximum of 6 credits toward graduation.

Lab access fee of \$45 applies.