

Energy Sys Engr Tech (ESET)

Courses

ESET 1100 Engineering Technology Orientation: 1 semester hour.

An introduction to the opportunities and responsibilities of engineering technicians and exposure to fields of technology. Introduction to the resources and college services that enable success in the ESTEC programs. F, S, D

ESET 1100L Introduction to an Industrial Environment Laboratory: 1 semester hour.

A laboratory introduction to the skills of an engineering technician. Includes an overview of industrial safety, tools, and electrical wiring. PREREQ: Minimum score of 30 on ALEKS or equivalent. F, S, D

ESET 1101 Electrical Circuits I: 4 semester hours.

Includes measurements and calculation of current, voltage, resistance and power in series, parallel and combination circuits with DC and AC power sources. Voltage and current in resistive-capacitive (R-C) and resistive-inductive (R-L) circuits during switch transitions, AC power circuits including reactance and transformation. Voltage and current in non-resonant and resonant AC circuits and filters. PREREQ: Minimum score of 30 on ALEKS or equivalent. COREQ: ESET 1101L. F, S, D

ESET 1101L Electrical Circuits I Laboratory: 4 semester hours.

Electrical circuits are analyzed, designed and constructed using various DC and AC theories and electrical quantities are measured using appropriate test equipment. PREREQ: Minimum score of 30 on ALEKS or equivalent. COREQ: ESET 1101. F, S, D

ESET 1102 Electrical Circuits II: 5 semester hours.

Continuation of electrical circuit study introducing the fundamentals of semiconductors, amplifier theory, digital logic and logical devices. COREQ: ESET 1102L. F, S, D

ESET 1102L Electrical Circuits II Laboratory: 5 semester hours.

Laboratory applications and experiments in troubleshooting of semiconductor devices and circuits, digital logic and logic device application. COREQ: ESET 1102. F, S, D

ESET 1103 Introduction to Electronics Theory: 1 semester hour.

Fundamentals of DC electronics - soldering, DC analysis, electrical units, Ohm's Law, series and parallel resistive circuits, and related algebraic principles. D

ESET 1103L Introduction to Electronics Lab: 1 semester hour.

Experiments in DC electronic circuits covered in ESET 1103, using electronic components, equipment, and tools. D

ESET 1104 DC Electronics Principles Theory: 2 semester hours.

Fundamentals of DC electronics - voltage and current, meters, network theorems, and related algebraic principles. D

ESET 1104L DC Electronics Principles Lab: 2 semester hours.

Experiments in DC electronic circuits analyzing voltage and current, meters, and network theorems. D

ESET 1105 AC Electronics Principles Theory: 4 semester hours.

Electronics AC fundamentals - magnetism, inductors, capacitors, AC-DC network analysis, and related algebraic principles. D

ESET 1105L AC Electronics Principles Lab: 2 semester hours.

Experiments in basic AC electronic circuits topics covered in ESET 1105, using electronic components, equipment, and tools to analyze current and voltage. D

ESET 1106 Electronic Principles Capstone: 2-8 semester hours.

Fundamentals of DC and AC electronics: safety, soldering, electrical units, Ohm's Law, series and parallel resistive circuits, voltage and current, meters, network theorems, magnetism, inductors, capacitors, and AC-DC network analysis. D

ESET 1107 Principles of Control Devices Theory: 3 semester hours.

Comprehensive study of semiconductors, power supplies, transistor amplifiers, operational amplifiers, and related algebraic principles. COREQ: ESET 1107L. PRE-or-COREQ: ESET 1106. D

ESET 1107L Principles of Control Devices Lab: 3 semester hours.

Experiments involving semiconductors, power supplies, transistor amplifiers, and operational amplifiers. COREQ: ESET 1107. PREREQ: ESET 1106. D

ESET 1108 Principles of Digital Devices: 2 semester hours.

Digital fundamentals including logic gates, Boolean algebra, combination logic circuits, digital registers, counters, and timing circuits, and related algebraic principles. COREQ: ESET 1108L. PREREQ: ESET 1106. D

ESET 1108L Principles of Digital Devices Lab: 2 semester hours.

Experiments involving digital fundamentals including logic gates, Boolean algebra, combination logic circuits, digital registers, counters, and timing circuits. COREQ: ESET 1108. PREREQ: ESET 1106. D

ESET 1110 Introduction to Process Control: 1 semester hour.

An introduction to the basic concepts of process control through the study of control devices, process variables, instrument calibration, test equipment, and diagrams. PREREQ: ESET 1100. COREQ: ESET 1110L. F, S, D

ESET 1110L Introduction to Process Control Laboratory: 1 semester hour.

A laboratory introduction to the application and use of control devices, test equipment, and device calibration. PREREQ: ESET 1100L. COREQ: ESET 1110. F, S, D

ESET 1111 Principles of AC Circuit Analysis: 3 semester hours.

A/C circuit analysis and related mathematics, including phasor circuit analysis. PREREQ: MATH 1143. F, S, D

ESET 1112 Introduction to Digital Logic: 2 semester hours.

Digital fundamentals including logic gates, Boolean algebra, combinational logic circuits. Binary and hexadecimal number systems. COREQ: ESET 1112L. F, S, D

ESET 1112L Introduction to Digital Logic Laboratory: 1 semester hour.

Experiments involving digital fundamentals including logic gates, Boolean algebra, combinational logic circuits. COREQ: ESET 1112. F, S, D

ESET 1117 Introduction to Industrial Thermal Systems: 2 semester hours.

Overview of common industrial thermal systems which includes: heat exchangers; boilers; chillers; evaporators; and heating, air conditioning and ventilation (HVAC) systems. Exploration of thermal energy sources and introduction to fundamental thermal energy transfer and calculations. PREREQ: Minimum score of 30 on ALEKS or equivalent. COREQ: ESET 1117L

ESET 1117L Introduction to Industrial Thermal Systems Lab: 1 semester hour.

A laboratory experience that examines the different types and configurations of heat exchangers; boilers; chillers; and heating, air conditioning and ventilation (HVAC) systems. PREREQ: Minimum score of 30 on ALEKS or equivalent. COREQ: ESET 1117 F,D

ESET 1118 Industrial Maintenance Mechanic I: 2 semester hours.

An introduction to shop safety, craft related mathematics, industry related units of measure, technical drawings, modes of maintenance, simple machines, fasteners, lubrication, seals, and gaskets. PREREQ: minimum score of 14 on ALEKS or equivalent and permission of instructor. COREQ: ESET 1118L

ESET 1118L Industrial Maintenance Mechanic Lab I: 1 semester hour.

Application of shop safety; proper usage of tools; test and measurement devices; the ability to follow maintenance procedures; and the inspection, disassembly and assembly of industrial machines. PREREQ: Minimum score of 14 on ALEKS or equivalent. COREQ: ESET 1118. F,D

ESET 1119 Industrial Maintenance Mechanic II: 2 semester hours.

An introduction to pumps and drives, valves, piping components, millwright fundamentals, and fluid power. PREREQ: ESET 1118. COREQ: ESET 1119L. S,D

ESET 1119L Industrial Maintenance Mechanic Lab II: 1 semester hour.

Inspection, disassembly, assembly and installation of various types of pumps and valves. Preparation and joining of various types of piping and piping components. Basic leveling and alignment fundamentals of pumps and drive systems. Operation and testing of fluid power systems. COREQ: ESET 1119. S,D

ESET 1120 Introduction to Energy Systems: 2 semester hours.

Introduction to energy terminology, functions of power generation and mechanical processes, equipment, material, power cycles, mechanical physics and systems, and principles of heat transfer and fluid flow are covered. COREQ: ESET 1120L. F, S, D

ESET 1120L Introduction to Energy Systems Laboratory: 1 semester hour.

Laboratory exercises and/or industry experiences related to operations of selected industrial equipment in energy systems including pumps, valves, heat exchangers, turbines, and boilers with an emphasis on cause and effect. COREQ: ESET 1120. F,S,D

ESET 1121 Basic Electricity and Electronics: 4 semester hours.

Fundamental principles of electricity, Ohm's law, Kirchhoff's laws, and circuit analysis applied to DC and AC circuits. PREREQ: Minimum score of 30 on ALEKS or equivalent. COREQ: ESET 1121L. S, F

ESET 1121L Basic Electricity and Electronics Laboratory: 3 semester hours.

Basic principles of electrical measurement and testing of DC and AC circuits. PREREQ: Minimum score of 30 on ALEKS or equivalent. COREQ: ESET 1121. S, F

ESET 1122 Electrical Systems and Motor Control Theory: 3 semester hours.

Introduction to electrical system distribution and basic motor control including two- and three-wire control using a variety of devices and motor magnetic controllers. Control relays, time relays, solenoid valves, latching relays, and motor control centers. PREREQ: ESET 1121 and ESET 1121L or permission of instructor. COREQ: ESET 1122L. S, F, D

ESET 1122L Electrical Systems and Motor Control Theory Laboratory: 1 semester hour.

Applications of electrical systems and motor controls. PREREQ: ESET 1121 and ESET 1121L or permission of instructor. COREQ: ESET 1122. S, F, D

ESET 1123 Mechanical Power Transmission I: 2 semester hours.

This course covers mechanical drives including chain-drives, belts, gears, and coupled shafts. Proper application and use of bearings, statics, hoists and fasteners are discussed. PREREQ: Minimum score of 14 on ALEKS or equivalent. Permission of instructor. COREQ: ESET 1123L. F, D

ESET 1123L Mechanical Power Transmission Laboratory I: 2 semester hours.

This course covers the application of mechanical drives including chain-drives, belts, gears, and coupled shafts. Proper application and use of bearings, statics, hoists and fasteners are discussed. Students will apply safe work practices in an industrial setting. PREREQ: Minimum score of 14 on ALEKS or equivalent. Permission of instructor. COREQ: ESET 1123. F, D

ESET 1125 Introduction to Structural Welding: 1 semester hour.

An introduction to structural welding with an emphasis on carbon steel. Hands-on practice with cutting and joining through the use of hand-held torches and welders. S, D

ESET 1126 Introduction to Mechanical Drafting and Computer Aided Design: 1 semester hour.

An introduction to mechanical drafting and computer aided design. Course focuses on basic drafting skills and commonly used computer aided design software. This is a laboratory/lecture course. S, D

ESET 1127 Mechanical Power Transmission II: 2 semester hours.

Introduction to the following: machine dynamics, torque, kinematics, and vibration; stress, strain, and failures; lubrication and seals; and machine installation. PREREQ: ESET 1123, ESET 1123L, or permission of instructor. COREQ: ESET 1127L. S, D.

ESET 1127L Mechanical Power Transmission Laboratory II: 2 semester hours.

Application and testing of machine dynamics, kinematics and lubrication. Project design, management and teamwork is covered. COREQ: ESET 1127. S, D.

ESET 1130 Initial Operator Training and Student Operations: 4 semester hours.

Introduces fundamental concepts of nuclear reactor operation through trainee operations at the ISU AGN-201 reactor and GPWR simulator. Also covers core concepts used throughout the nuclear industry as an integral part of daily operations. Topics include fundamental operating principles, main reactor systems, reactor theory, radiation safety, Conduct of Operations (ConOps), regulations for licensing and relicensing, facility specific procedure training, and emergency operations. PREREQ: MATH 1143 or current minimum score of 60 on ALEKS or equivalent.

ESET 1140 Applied Technical Intermediate Algebra: 5 semester hours.

Topics in algebra, with an emphasis on solving equations and inequalities, systems of linear equations, quadratic equations, polar and rectangular coordinate systems, polynomial, absolute value, rational, and radical equations, inequalities, rational exponents, calculations and equations involving exponentials, logarithms and basic trigonometric functions. PREREQ: Minimum ALEKS score of 30 or equivalent. F,S,D

ESET 1141 Applied Mathematics I: 4 semester hours.

Basic math as it applies to Electrical Theory; includes algebraic and trigonometric topics as they relate to DC and AC (sine wave) circuit analysis. COREQ: ESET 1101 or ESET 1121. D

ESET 1142 Applied Mathematics II: 4 semester hours.

Continuation of ESET 1141. Selected algebraic and trigonometric topics as related to DC and AC (sine wave) circuit analysis with special emphasis on trigonometric solution and vector analysis. COREQ: ESET 1102 or ESET 1127. D

ESET 1151 Nuclear Industry Fundamental Concepts: 3 semester hours.

Introduces fundamental concepts used throughout the nuclear industry as an integral part of daily operations as facility technicians. Topics include fundamentals of Conduct of Operations (ConOps), Human Performance Enhancement (HPE), Task Performance Evaluation (TPE), Foreign Material Exclusion (FME) and Criticality Safety. COREQ: ESET 1151L. S, D

ESET 1151L Nuclear Industry Fundamental Concepts Lab: 1 semester hour.

Laboratory applications include fundamental principles of reactor and non-reactor nuclear facilities their main and support systems, applicable regulations, human performance and CONOPS, and the nuclear fuel cycle. COREQ: ESET 1151. S, D.

ESET 1152 Nuclear Careers and Information: 1 semester hour.

Focuses on student preparation for internship and job placement in the nuclear workforce. Topics include: job search, job titles and their descriptions, application, resume, cover letter, interview preparation, networking, and maintaining a portfolio. The course covers major changes and improvements taking place in the nuclear industry. PREREQ: Minimum score of 30 on ALEKS or equivalent. F, S.

ESET 1153 Radiological Control Fundamentals: 3 semester hours.

Laboratory experience that focuses on radiological control fundamentals necessary to be a radiological worker in the nuclear industry; including radiation effects, limits, monitoring programs, radiological control area access controls and postings, radiological emergencies and contamination control. Lab focuses on donning and doffing protective clothing, use of radiation and contamination detection instruments, performing exit surveys and demonstrating emergency actions. Students must obtain industry standard Radiological Worker II certification and pass the final written and hands-on practicum with an 80% to pass the course. PREREQ: Minimum score of 30 on ALEKS or equivalent. F, D

ESET 1162 Industrial Safety and Regulations: 2 semester hours.

An orientation to industrial safety, hazard recognition, safety planning, regulatory standards, and best practices. F,S,D

ESET 1181 Introduction to Cyber-Physical Systems: 3 semester hours.

Establishes fundamental understanding of cyber-physical systems with a focus on technologies used in industrial environments. PREREQ: Minimum score of 30 on ALEKS. F,D

ESET 1182 Information Technology Fundamentals: 3 semester hours.

This course provides an entry level understanding of the terminology and technology used in IT environments, including file structure, network interfaces, and available utilities in Windows and Linux operating systems. PREREQ: Minimum score of 30 on Aleks or equivalent.

ESET 1199 Experimental Course: 1-6 semester hours.

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

ESET 2200 Applications of Electronic Electrical and Power Systems Control Fundamentals and Safety: 6 semester hours.

Overview and application of electronic sensors, thyristor power control circuits, and networks. Electrical motor control, relays, timers, PLCs, and computer software used to design and verify motor control circuits. Basic process control print reading and device calibration methods. Includes troubleshooting techniques and safety practices. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. Su, D

ESET 2203 Fundamentals of Electrical Generation: 2 semester hours.

Introduction to generator and prime mover principles covering major sources of utility generation. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. F, D

ESET 2204 Process Control Devices: 2 semester hours.

Electronic control device theory and laboratory including sensors, device communication, controller fundamentals, control loops and loop tuning, device and system calibration and diagnostics, heat transfer, fluid flow, and refrigeration control. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. Su, D

ESET 2205 Fundamentals of Control Logic: 3 semester hours.

Introduction to control logic, relay logic principles, electronics in logic, logic and control drawings, fundamentals of programmable logic controllers (PLCs), and electrical automation concepts. PREREQ: Permission of instructor. S,F,D

ESET 2206 Health and Safety in Power Generation: 1 semester hour.

Regulatory and practical considerations of occupational health and safety associated with working with power generation systems. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. Su, D

ESET 2210 Principles of Power Generating Systems: 2 semester hours.

Transmission lines, generator and transformer characteristics, and fault detection and correction. Emphasis on circuit performance addressing voltage regulation, power factor, and protection devices. Lecture/Laboratory. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. F, D

ESET 2211 Sensors and Control Devices: 2 semester hours.

Theory and application of control devices, sensors, timers, relays. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. F, D

ESET 2212 Electrical Systems Documentation and Standards: 1 semester hour.

Introduction to print reading, technical specifications, print annotation, report writing, and electrical codes. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. F, D

ESET 2215 Controller Laboratory: 1 semester hour.

Applications of Programmable Logic Controls and DCS including I-O configuration, Ladder logic design and function block use. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. F, D

ESET 2216 Sensors and Control Device Laboratory: 1 semester hour.

Laboratory applications of sensors (including photoelectric and proximity types), relay and timer circuits, and application of automation devices. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. F, D

ESET 2218 Discrete Control Systems: 2 semester hours.

Discrete control concepts of power system operation including motor operated valve control, turbine sequencing and electrical system protection. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. F, D

ESET 2220 Thermal Cycles and Heat Transfer: 2 semester hours.

Introduction to the Rankin, Carnot, and Brayton cycles. Includes principles of heat transfer and fluid flow and thermodynamic principles. F, D.

ESET 2221 Nuclear Steam Supply Systems: 2 semester hours.

Survey of nuclear steam supply system function system components, overview of reactor principles and steam generation, turbine types and principles of operation, heat exchanger types and principles of operation, and review of major steam supply accidents and lessons learned. PREREQ: ESET 2220, ESET 1102, or ESET 1122 or permission of the instructor. S,D

ESET 2222 Process Control Theory: 3 semester hours.

Electronic instruments-sensors, indicators, transmitters, automated controllers, PID control, recorders, analytical equipment, troubleshooting. COREQ: ESET 2226. F,S,D

ESET 2223 Digital Control Theory: 2 semester hours.

Digital systems, digital control, analog-to-digital and digital-to-analog interfacing, signal conditioning, programmable controllers, computer application. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. F, S, D

ESET 2224 Measurement Theory: 2 semester hours.

Calibration calculations, pressure scales, level considerations, specific gravity, elevation suppression, closed and open systems, temperature scales, thermocouple and RTD values, bulb and capillary devices, heat transfer, flow with square root linearization, gas flow measurement calculations, mass flow, humidity measurements, PH measurements. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. S, D

ESET 2225 Instrument Calibration Laboratory: 1 semester hour.

Use of test equipment, power supplies, current and volt measurements, use of oscilloscope, capacitor checker, decade box, Wheatstone bridge, transmitter simulator, manometers, pressure calibration devices. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. S, D

ESET 2226 Process Control Devices Laboratory: 1 semester hour.

Set up, maintenance and troubleshooting of electronic sensors, indicators, transmitters, automated controllers, smart devices, analytical equipment, and device communications. COREQ: ESET 2222. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1140, or permission of instructor. F,S,D

ESET 2227 Digital Control Systems Laboratory: 1 semester hour.

Computer and programmable controller interfacing with transmitters and final elements, PID loops, auto tuning, set up to complete control loops, computer graphics. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. F, S, D

ESET 2228 Measurements Laboratory: 1 semester hour.

Calibration of transmitters, simulation of process variables, temperature, pressure, level flow, and humidity control loops. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1141, ESET 1142, or permission of instructor. S, D

ESET 2231 Microcontrollers: 2 semester hours.

Principles of motor controls, microcontroller and programmable logic controller (PLC) programming including I/O devices and integration of process control principles. COREQ: ESET 2231L. F, D

ESET 2231L Microcontrollers Laboratory: 1 semester hour.

Applications of motor controls, microcontroller and programmable logic controller (PLC) programming, including I/O device connections and interface to final elements of process control systems. COREQ: ESET 2231. F, D

ESET 2232 Electrical Machines: 3 semester hours.

Energy storage, transfer, and conversion, force and emf production, coupled circuit analysis of systems with both electrical and mechanical inputs. Applications to electric motors and generators and other electromechanical transducers. COREQ: ESET 2232L. F, D

ESET 2232L Electrical Machines Laboratory: 3 semester hours.

Laboratory applications of electrical machines including testing, evaluation and industry best practices for installation and troubleshooting. COREQ: ESET 2232. F, D

ESET 2233 Electrical Power Systems: 3 semester hours.

The electric power industry, operation of power systems, load flow, fault calculations, economic dispatch and general technical problems of electric power networks. COREQ: ESET 2233L. S, D

ESET 2233L Electrical Power Systems Laboratory: 3 semester hours.

Applications and laboratory studies of power network principles, equipment application and device evaluation. COREQ: ESET 2233. S, D

ESET 2235 Power Electronic Circuits: 2 semester hours.

Electronic theory addressing power electronic components, functions and configurations of power, multistage differential and operational amplifiers, oscillators, thyristors, power control and regulation circuits, sensors and networks. COREQ: ESET 2235L. S, D

ESET 2235L Power Electronic Circuits Laboratory: 1 semester hour.

Electronic laboratory addressing the components, functions and configurations of power, multistage differential and operational amplifiers, oscillators, thyristors, power control and regulation circuits, sensors and networks. COREQ: ESET 2235. S, D

ESET 2239 Pumps, Valves, and Fluid Flow: 5 semester hours.

Introductory fluid concepts that pertain to pumps, valves, and piping. Includes the operation and maintenance of various industrial pump and valve types. Emphasis is placed on maintenance and repairs of centrifugal pumps and control valves. PREREQ: ESET 1127, ESET 1127L, ESET 1151, ESET 1151L, or ESET 1130. COREQ: ESET 2239L. F, D

ESET 2239L Pumps, Valves, and Fluid Flow Laboratory: 4 semester hours.

Applications in the installation, testing, and maintenance of various pump and valve types. PREREQ: ESET 1127 and ESET 1127L, ESET 1151, ESET 1151L, or ESET 1130. COREQ: ESET 2239. F, D

ESET 2240 Pumps: 3 semester hours.

Introductory fluid concepts that pertain to centrifugal pumps, including pump seals, packing techniques, and bearings are covered. Includes the operation and maintenance of various industrial pump types. Emphasis is placed on centrifugal pump maintenance and repair. PREREQ: ESET 1127 and ESET 1127L or permission of instructor. COREQ: ESET 2240L. F, D

ESET 2240L Pump Applications Laboratory: 3 semester hours.

Applications in the installation, testing, and maintenance of various pump types. PREREQ: ESET 1123 and ESET 1123L or permission of instructor. COREQ: ESET 2240. F, D

ESET 2241 Valves and Piping: 2 semester hours.

Introduction to basic construction, components, materials, and function of piping and valves common to power generation, industrial, and commercial systems, including valve process control. PREREQ: ESET 1127 and ESET 1127L or permission of instructor. COREQ: ESET 2241L. F, D

ESET 2241L Valves and Piping Applications Lab: 2 semester hours.

Applications of valve and piping installation, layout, and maintenance including valve disassembly, reassembly, maintenance, and quality control practices. Valve control system maintenance and operation are covered. PREREQ: ESET 1127 and ESET 1127L or permission of instructor. COREQ: ESET 2241. F, D

ESET 2242 Practical Process Measurements and Control: 2 semester hours.

Principles of temperature, pressure, strain, flow, force, and vibration measurements are covered. Techniques of computerized data acquisition, reduction, and statistical precision and tolerance are reviewed. Signal for local indications and process control operation are also covered. Lecture plus laboratory work in selected topics. PREREQ: ESET 1122 or permission of instructor. F, D.

ESET 2243 Hydraulic and Pneumatic Power: 2 semester hours.

Hydraulic and pneumatic power mechanics covering high pressure fluids and the associated power and control systems with symbology, circuit operation, and terminology are covered. COREQ: ESET 2243L. S, D

ESET 2243L Hydraulic and Pneumatic Power Laboratory: 2 semester hours.

Applications of hydraulic and pneumatic power mechanics with hands-on experience are covered. COREQ: ESET 2243. S, D

ESET 2244 Rotating Equipment and Millwright Maintenance: 4 semester hours.

Installation and predictive maintenance techniques that include installations, operation, vibration analysis, lubrication, trend analysis, and troubleshooting techniques are covered. Machine, shaft, and gear alignment practices and methods are discussed. COREQ: ESET 2244L. PREREQ: ESET 1127 or permission of instructor. S, D

ESET 2244L Rotating Equipment and Millwright Maintenance Laboratory: 3 semester hours.

Applications and use of tools and equipment used in the reliability maintenance process. Includes the use of precision maintenance and alignment tools, vibration data collection, oil analysis, and infrared testing. COREQ: ESET 2244. PREREQ: ESET 1127 or permission of instructor. S, D

ESET 2245 Industrial Thermal Systems: 2 semester hours.

Overview of the construction, operation, and maintenance of common industrial thermal systems which includes: heat exchangers; boilers; chillers; evaporators; and heating, air conditioning and ventilation (HVAC) systems. Includes flow patterns, temperature profiles, heat transfer calculations, and analysis techniques to determine performance and efficiency. PREREQ: ESET 1117 OR ESET 2220 COREQ: ESET 2245L. F,D

ESET 2245L Industrial Thermal Systems Lab: 1 semester hour.

Industrial Thermal Systems Lab: 1 semester hour. Practical hands-on experience in the construction, inspection, and repair of common industrial thermal systems. COREQ: ESET 2245. F

ESET 2246 Materials and Metallurgy: 2 semester hours.

Lecture, demonstration, and laboratory emphasizing the practical approach to basic principles of materials and metallurgical science, including behavior of materials under various conditions. F, D

ESET 2248 Power Plant Documentation and Procedures: 2 semester hours.

Covers the use of and relationship among typical drawings, procedures, system description documents, and safety basis documents found at a nuclear power plant through hands-on laboratory experiences. Topics include using various drawings; the information contained in different types of plant control documents; standard symbology used in engineering drawings; and the use of various types of drawings together with procedures and safety documents in order to perform work, locate components, or use for other typical applications. Students will create, apply, and verify documents for LO/TO and work performance. PREREQ: ESET 1100L and ESET 1151 or ESET 1130 or permission of instructor.

ESET 2249 Reactor Plant Materials: 3 semester hours.

Provides an understanding of the various materials used in the operation of a nuclear power plant. Topics include phase equilibria of materials, mechanical properties and behavior of materials, stress and strain, chemistry, corrosion, environmental effects on materials, nuclear specific topics include fuel pellets, fuel rod cladding, control rods, radiation effects on materials, enrichment of radioactive isotopes, and fuel pellet fabrication. PREREQ: CHEM 1101 or CHEM 1111, ESET 2239, and ESET 1151 or ESET 1130 or permission of instructor. S D.

ESET 2250 Radiation Detection and Protection: 2 semester hours.

A laboratory experience that includes application, detection, and shielding of the various types of radiation. Includes detection devices such as typical survey meters, and personnel monitoring devices. Discussion of how exposure to radiation can be minimized and the biological impact of radiation. PREREQ: ESET 1151, ESET 1151L, and ESET 1153 or permission of instructor. F,S,D

ESET 2251 Reactor Theory Safety and Design: 4 semester hours.

Provides laboratory experiences that will allow application of the principles of reactor theory. Including the fission process; the neutron life cycle; the concepts of subcritical multiplication, criticality and reactivity; thermal limits and their importance to operation; the functions and construction of fission product barriers; the practical application of the concepts of defense in depth and redundancy; and the roles of the various employees in reactor safety. Students will perform startup, shutdown, and power changes using reactor simulators, the ISU AGN-201 reactor, and other non-reactor equipment as available and relevant, per both operating and abnormal procedures. ConOps considerations will be integrated with all operations. PREREQ: ESET 1130, ESET 2221, ESET 2239, ESET 2248, ESET 2249, and ESET 2261 or permission of instructor. F,D

ESET 2252 Power Plant Components: 2 semester hours.

Introduces fundamental components and pieces of equipment that are used throughout electrical power generating facilities such as pumps, valves, heat exchangers, motors, and generators. Includes purpose, construction, theory of operation, and typical maintenance requirements of these devices. Lab portion will involve assembly and disassembly of selected components. Lecture/Lab Course. PREREQ: ESET 1151 and ESET 1151L or permission of instructor. COREQ: ESET 2248 or permission of instructor. S, D.

ESET 2253 Introduction to the Smart Electric Power Grid: 2 semester hours.

Overview of the technologies used in Smart Grid to enhance reliability, security, robustness and efficiency of transmission and distribution systems. The course addresses advanced metering infrastructure, home-area networks, micro-grids, real-time pricing, plug-in hybrid vehicles, demand response, and load curve shaping. Included is an in-depth look at the Smart Grid's benefits and potential impact on our energy consumption. COREQ: ESET 2254, ESET 2255, ESET 2256A, ESET 2257, ESET 2258, ESET 2259. PREREQ: Smart Grid major or instructor approval. F

ESET 2254 Smart Grid Design and Integration: 2 semester hours.

Overview of Smart Grid design including combination of technology, utility, and consumer considerations. The rapid changes in communications and power infrastructure in the grid will be presented. Included are Smart Grid applications such as Demand Response, real-time pricing, Home Area Networks, Advanced Metering Systems, smart loads and appliances. COREQ: ESET 2253, ESET 2255, ESET 2256A, ESET 2257, ESET 2258, and ESET 2259. F

ESET 2255 Electric Power Transmission and Distribution Systems: 3 semester hours.

Essential information regarding the transmission and distribution of electric power, including components of transmission lines, transformers and switchgear, substations, and electric power distribution systems. Wide-ranging information related to electric service loads as well as operational aspects and costs involved in transmitting and distributing electric power. The potential trends of electric power transmission are also discussed. COREQ: ESET 2253, ESET 2254, ESET 2256A, ESET 2257, ESET 2258, and ESET 2259. F

ESET 2256A Renewable Electrical Energy and Grid Integration: 2 semester hours.

Assesses existing renewable resources such as wind, solar, geothermal, hydro, tidal, wave power, and biomass and their integration into the electric power grid and various energy storage methods to accommodate the intermittent nature of these resources. Economic constraints, environmental benefits, and institutional regulations are considered. COREQ: ESET 2253, ESET 2254, ESET 2255, ESET 2257, ESET 2258, and ESET 2259. F

ESET 2257 Fundamentals of Modern Protective Relaying: 3 semester hours.

Provides a comprehensive understanding of the principles of digital power system relaying and protection applications. Examines the major components of a power system as well as basic theory and protection principles. COREQ: ESET 2253, ESET 2254, ESET 2255, ESET 2256A, ESET 2258, and ESET 2259. F

ESET 2258 Smart Grid Command and Control: 3 semester hours.

Smart Grid is built upon the concept of computerized command and control over a parallel data network to improve efficiency and reliability of electrical power distribution. This course builds understanding of the control network from the generation site to the end appliance in a residential home, including networking theory, efficacy of various radio technologies, protocols, and security issues. COREQ: ESET 2253, ESET 2254, ESET 2255, ESET 2256A, ESET 2257, and ESET 2259. F

ESET 2259 SCADA and Telemetry: 5 semester hours.

Explains the parts and technologies that make up a Supervisory Control and Data Acquisition (SCADA) system and provides tools used in applying the technology to Smart Grid. This course addresses the various components of a SCADA system including sensor and telemetry components, the background and history of component technologies, and the base standards that apply to SCADA installations. In this course students will design a SCADA system for potential application in Smart Grid, identify the limitations of SCADA systems and vulnerabilities of the design, determine the "scan time" required for SCADA systems of various sizes, and evaluate the Human Machine Interface requirements for the system. COREQ: ESET 2253, ESET 2254, ESET 2255, ESET 2256A, ESET 2257, and ESET 2258. F

ESET 2260 Nuclear Instrumentation: 2 semester hours.

This laboratory course encompasses the principles of operation of various types of instruments in the nuclear industry to measure temperature, pressure, level, flow, position, flux, and radiation. The student will gain a broad range of working knowledge of temperature, pressure, level and flow sensors, position indicators, radiation detectors, in-core instruments, and control systems. Component theory and design, system hardware, and integrated operation as applied to commercial nuclear systems will be explored. PREREQ: ESET 1130 S, D

ESET 2261 Glovebox and Manipulator Operations Lab: 4 semester hours.

Use of gloveboxes and hot cells for nuclear material operations, including CONOPS, MAR concepts, radiological hazards and safety, safety system interactions, and proper operation techniques as well as manipulator function, maintenance, and use. PREREQ: ESET 1153, and instructor permission. F, D

ESET 2279 Conduct of Operations: 4 semester hours.

Practical application and study in Conduct of Operations, to include human performance and safety specific to the nuclear industry. Lecture and Lab course. PREREQ: ESET 1151 and ESET 1151L; or ESET 1130; or permission of instructor. F,S,D

ESET 2280 Capstone and Case Studies in Nuclear Engineering Technology: 2 semester hours.

An examination of case studies from the nuclear power industry and from other industries. Discussion of precursors to poor decision making and how the proper use of human performance enhancement (HPE) and event free tools can minimize the risks of accidents. Lecture/Lab Course. PREREQ: ESET 1151, ESET 1151L, or ESET 1130, ESET 1153, ESET 2220, ESET 2249, and or permission of instructors. COREQ: ESET 2279, ESET 2248. F,S,D

ESET 2282 Introduction to Networking: 3 semester hours.

Facilitates competence in networking fundamentals: OSI model, TCP/IP, ports and services. Students identify networking equipment and functions, perform packet capture and conduct basic traffic analysis, and configuration. F

ESET 2285 Information System Reliability: 3 semester hours.

Design and analysis methods for high security control and data systems. System reliability and security requirements. Specification of mission-critical system properties. Software and hardware validation, verification, and certification. COREQ: ESET 2282. PREREQ: Prior AAS in an Energy System program or instructor approval. S, D

ESET 2292 Electrical Engineering Technology I: 8 semester hours.

This course covers the theory of electrical system distribution, motor controls, programmable logic controllers/human machine interface (PLC/HMI) programming, communication protocols, and technical documentation and standards. Course includes control relays, timer relays, solenoid valves, latching relays, mechanical and semiconductor input/output control devices, variable frequency drives (VFDs), and motor line starters.

ESET 2292L Electrical Engineering Technology I Laboratory: 5 semester hours.

Lab involving communication and various data and information transfer circuits, principles of motor control, microcontroller and programmable logic controllers (PLC) programming, and electrical machines including energy storage, transfer, and conversion applicable to electric motors, generators, and other electromechanical transducers. COREQ: ESET 2292. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1140, or permission of instructor. F,S,D

ESET 2293 Electrical Engineering Technology II: 5 semester hours.

Electrical theory addressing applications of: power generation, operation, and distribution; protective relaying in utility and industrial environments; programmable logic controllers and six-axis controllers; electronic components, device communications, configuration and programming, and SCADA systems. COREQ: ESET 2293L. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1140, or permission of instructor. F,S,D

ESET 2293L Electrical Engineering Technology II Laboratory: 4 semester hours.

Electrical lab addressing applications of: power generation, operation, and distribution; for protective relaying in utility and industrial environments; programmable logic controllers and six-axis controllers; electronic components, device communications, configuration and programming, and SCADA systems. COREQ: ESET 2293. PREREQ: ESET 1101, ESET 1101L, ESET 1102, ESET 1102L, ESET 1140, or permission of instructor. F,S,D

ESET 2296 Independent Study: 1-8 semester hours.

Addresses specific learning needs of individuals for the enhancement of knowledge and skills within the program area under the guidance of an instructor. May be repeated. Graded S/U, or may be letter-graded. PREREQ: Permission of the instructor. F, S, D

ESET 2297 Internship: 1-8 semester hours.

On-the-job placement providing work experience for persons pursuing careers in electronics technology. PREREQ: Permission of instructor. D

ESET 2298 Special Topics: 1-8 semester hours.

Addresses the specific needs of industry, enabling students to upgrade technical skills that are not included in the current program curriculum. May be repeated. Graded S/U, or may be letter-graded. PREREQ: Permission of instructor. F, S, D

ESET 3399 Experimental Course: 1-6 semester hours.

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

ESET 4497 Internship: 1-8 semester hours.

On-the-job placement providing work experience for persons pursuing careers in electronics technology. PREREQ: Permission of instructor. D

ESET 4499 Experimental Course: 1-6 semester hours.

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.