Energy Sys Engr Tech (ESET)

Courses

ESET 0100 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 0100L Engineering Technology Orientation Lab: 1 semester hour.
A laboratory introduction to the skills of an engineering technician. Includes an overview of industrial safety, tools, and electrical wiring. F, S, D

ESET 0101 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. COREQ: ESET 0101L. F, S, D

ESET 0101L Electrical Circuits I Laboratory: 4 semester hours.
Eлектrical circuits are analyzed, designed and constructed using various DC and AC theories and electrical quantities are measured using appropriate test equipment. COREQ: ESET 0101. F, S, D

ESET 0102 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 0102L. F, S, D

ESET 0102L 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 0102. F, S, D

ESET 0103 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 0103L Introduction to Electronics Lab: 1 semester hour.
Experiments in DC electronic circuits covered in ESET 0103, using electronic components, equipment, and tools. D

ESET 0104 DC Electronics Principles Theory: 2 semester hours.
Fundamentals of DC electronics - voltage and current, meters, network theorems, and related algebraic principles. D

ESET 0104L DC Electronics Principles Lab: 2 semester hours.
Experiments in DC electronic circuits analyzing voltage and current, meters, and network theorems. D

ESET 0105 AC Electronics Principles Theory: 4 semester hours.
Electronics AC fundamentals - magnetism, inductors, capacitors, AC-DC network analysis, and related algebraic principles. D

ESET 0105L AC Electronics Principles Lab: 2 semester hours.
Experiments in basic AC electronic circuits topics covered in ESET 0105, using electronic components, equipment, and tools to analyze current and voltage. D

ESET 0106 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 0107 Principles of Control Devices Theory: 3 semester hours.
Comprehensive study of semiconductors, power supplies, transistor amplifiers, operational amplifiers, and related algebraic principles. COREQ: ESET 0107L. PRE-or-COREQ: ESET 0106. D

ESET 0107L Principles of Control Devices Lab: 3 semester hours.
Experiments involving semiconductors, power supplies, transistor amplifiers, and operational amplifiers. COREQ: ESET 0107. PREREQ: ESET 0106. D

ESET 0108 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 0108L. PREREQ: ESET 0106. D

ESET 0108L 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 0108. PREREQ: ESET 0106. D

ESET 0110 Introduction to Process Control: 1 semester hour.
An introduction to the basic concepts of process control through the study of control devices, process variables, programmable logic controllers, instrument calibration, motor control, test equipment, and diagrams. PREREQ: ESET 0100. COREQ: ESET 0110L. F, S, D

ESET 0110L Introduction to Process Control Laboratory: 1 semester hour.
A laboratory introduction to the application and use of control devices, programmable logic controllers, and test equipment. Experiments with motor control, instrument calibration, and process control. PREREQ: ESET 0100L. COREQ: ESET 0110. F, S, D

ESET 0111 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 0112 Introduction to Digital Logic: 2 semester hours.
Digital fundamentals including logic gates, Boolean algebra, combinational logic circuits. Binary and hexadecimal number systems. COREQ: ESET 0112L. F, S, D

ESET 0112L Introduction to Digital Logic Laboratory: 2 semester hours.
Experiments involving digital fundamentals including logic gates, Boolean algebra, combinational logic circuits. COREQ: ESET 0112. F, S, D

ESET 0120 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 0120L. F, S, D

ESET 0120L Introduction to Energy Systems Laboratory: 1 semester hour.
Laboratory exercises in the maintenance and function of selected plant equipment, mechanical perspective of primary process equipment, and their subcomponents are covered. COREQ: ESET 0120. F, S, D

ESET 0121 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. COREQ: ESET 0121L. S, F

ESET 0121L Basic Electricity and Electronics Laboratory: 3 semester hours.
Basic principles of electrical measurement and testing of DC and AC circuits. COREQ: ESET 0121. S, F
ESET 0122 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 0121 and ESET 0121L or permission of instructor. COREQ: ESET 0122L. S, F, D

ESET 0122L Electrical Systems and Motor Control Theory Laboratory: 1 semester hour.
Applications of electrical systems and motor controls. PREREQ: ESET 0121 and ESET 0121L or permission of instructor. COREQ: ESET 0122S. S, F, D

ESET 0123 Mechanical Power Transmission: 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: Permission of instructor. COREQ: ESET 0123L. S, D

ESET 0123L Mechanical Power Transmission Laboratory: 1 semester hour.
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 develop machine documentation and mechanical millwright skills. PREREQ: Permission of instructor. COREQ: ESET 0123S. S, D

ESET 0125 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. F, D

ESET 0126 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 0127 Mechanical Power Transmission I: 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 0121, ESET 0121L, ESET 0123, ESET 0123L, ESET 0140 or permission of instructor. COREQ: ESET 0127L. S, D

ESET 0127L Mechanical Power Transmission Laboratory I: 2 semester hours.
Application and testing of machine dynamics, kinematics and lubrication. Project design, management and teamwork is covered. PREREQ: ESET 0121 and ESET 0121L, or permission of instructor. COREQ: ESET 0127S. S, D

ESET 0130 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 ALEKS score of 60.

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: C- in MATH 0025, a Math ACT score of 18 or higher, an SAT score of 460 or higher, an ALEKS score of 30 or higher. COREQ: ESET 0101 or ESET 0121. F, S, D

ESET 0141 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 0101 or ESET 0121. D

ESET 0142 Applied Mathematics II: 4 semester hours.
Continuation of ESET 0141. 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 0102 or ESET 0127. D

ESET 0151 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 0151L. S, D

ESET 0151L 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 0151S. S, D

ESET 0152 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. F, S

ESET 0153 Radiological Control Fundamentals: 3 semester hours.
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. Lecture and Lab course. F, D

ESET 0162 Industrial Health and Safety: 2 semester hours.
An overview of legislation, worker's compensation, hazard recognition, and safety planning. Includes basic engineering solutions. Addresses employee safety training requirements, recordkeeping, safety inspections, and program planning in the construction industry. Includes First Aid training and responder certification. F, D

ESET 0181 Information Technology - Operational Technology Fundamentals: 3 semester hours.
Establishes fundamental understanding of operational technologies for IT professionals. Topics include: PLCs, SCADA, HMIs, process diagrams. F, D

ESET 0199 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 0200 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 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. Su, D
ESET 0203 Fundamentals of Electrical Generation: 2 semester hours.
Introduction to generator and prime mover principles covering major sources of utility generation. PREREQ: ESET 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, D

ESET 0204 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 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, D

ESET 0205 Fundamentals of Control Logic: 2 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. Lecture/Laboratory. PREREQ: ESET 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. Su, D

ESET 0206 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 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. Su, D

ESET 0210 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 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, D

ESET 0211 Sensors and Control Devices: 2 semester hours.
Theory and application of control devices, sensors, timers, relays. PREREQ: ESET 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, D

ESET 0212 Electrical Systems Documentation and Standards: 1 semester hour.
Introduction to print reading, technical specifications, print annotation, report writing, and electrical codes. PREREQ: ESET 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, D

ESET 0215 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 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, D

ESET 0216 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 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, D

ESET 0218 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 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, D

ESET 0220 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. COREQ: ESET 0239 F, D.

ESET 0221 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 0220, ESET 0102, or ESET 0142 or permission

ESET 0222 Process Control Theory: 3 semester hours.
Electronic instruments-sensors, indicators, transmitters, computing relays, electro-optics, electronic controllers, ratio control, cascade control, recorders, analytical equipment, troubleshooting. COREQ: ESET 0226. PREREQ: ESET 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. S, D

ESET 0223 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 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, S, D

ESET 0224 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 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. S, D

ESET 0225 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 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. S, D

ESET 0226 Process Control Devices Laboratory: 1 semester hour.
Set up, maintenance and troubleshooting of electronic sensors, indicators, transmitters, relays recorders, and controllers, transmission with twisted pair, fiber optics, smart systems, and analytical equipment. COREQ: ESET 0222. PREREQ: ESET 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. S, D

ESET 0227 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 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, S, D

ESET 0228 Measurements Laboratory: 1 semester hour.
Calibration of transmitters, simulation of process variables, temperature, pressure, level flow, and humidity control loops. PREREQ: ESET 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. S, D

ESET 0231 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 0231L. F, D

ESET 0231L 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 0231. F, D
ESET 0232 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 0232L. F, D

ESET 0232L Electrical Machines Laboratory: 3 semester hours.
Laboratory applications of electrical machines including testing, evaluation and
industry best practices for installation and troubleshooting. COREQ: ESET 0232.
F, D

ESET 0233 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 0233L. S, D

ESET 0233L Electrical Power Systems Laboratory: 3 semester hours.
Applications and laboratory studies of power network principles, equipment
application and device evaluation. COREQ: ESET 0233. S, D

ESET 0235 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 0235L. S, D

ESET 0235L 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 0235. S, D

ESET 0239 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 0127, ESET 0127L, ESET 0151, ESET 0151L, or ESET 0130.
COREQ: ESET 0239L. F, D

ESET 0239L Pumps, Valves, and Fluid Flow Laboratory: 4 semester hours.
Applications in the installation, testing, and maintenance of various pump and
valve types. PREREQ: ESET 0127 and ESET 0127L, ESET 0151, ESET 0151L,
or ESET 0130. COREQ: ESET 0239. F, D

ESET 0240 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 0127 and ESET 0127L or
permission of instructor. COREQ: ESET 0240L. F, D

ESET 0240L Pump Applications Laboratory: 3 semester hours.
Applications in the installation, testing, and maintenance of various pump types.
PREREQ: ESET 0123 and ESET 0123L or permission of instructor. COREQ:
ESET 0240. F, D

ESET 0241 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 0127 and ESET 0127L or
permission of instructor. COREQ: ESET 0241L. F, D

ESET 0241L Valves and Piping Applications Lab: 2 semester hours.
Applications of valve and piping installation, layout, and maintenance including
disassembly, reassembly, maintenance, and quality control practices. Valve
control system maintenance and operation are covered. PREREQ: ESET 0127
and ESET 0127L or permission of instructor. COREQ: ESET 0241. F, D

ESET 0242 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 0122 or permission of
instructor. F, D

ESET 0243 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. PREREQ: ESET 0127 and ESET 0127L or permission
of instructor. COREQ: ESET 0243L. F, D

ESET 0243L Hydraulic and Pneumatic Power Laboratory: 2 semester hours.
Applications of hydraulic and pneumatic power mechanics with hands-on
experience are covered. PREREQ: ESET 0127 and ESET 0127L or permission
of instructor. COREQ: ESET 0243. F, D

ESET 0244 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 0244L. PREREQ: ESET 0127 or
permission of instructor. S, D

ESET 0244L 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 0244. PREREQ:
ESET 0127 or permission of instructor. S, D

ESET 0245 Fundamentals of Heat Exchangers and Boilers: 3 semester hours.
Introduction to construction, operation, and maintenance of various heat
exchangers. Includes flow patterns, temperature profiles, and analysis techniques
to determine performance and efficiency. Survey of various boiler types,
fundamental operating principles and general maintenance.

ESET 0246 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. S, D

ESET 0248 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. 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. Lab portion includes creation, application
and verification of documents for LO/TO and work performance. PREREQ:
ESET 0151 or ESET 0130 or permission of instructor.

ESET 0249 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 0239, and ESET 0151 or ESET 0130 or permission of
instructor. S, D.
ESET 0250 Radiation Detection and Protection: 2 semester hours.
The theory, application, detection, and shielding of the various types of radiation. Includes detection devices such as typical survey meters, core power detectors, and personnel monitoring devices. Discussion of how exposure to radiation can be minimized and the biological impact of radiation. PREREQ: ESET 0151, ESET 0151L, and ESET 0153 or permission of instructor. F, D.

ESET 0251 Reactor Theory Safety and Design: 4 semester hours.
Provides an understanding 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. Lab portion will include 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. Lecture/Lab Course. PREREQ: ESET 0130, ESET 0221, ESET 0239, ESET 0248, ESET 0249, and ESET 0261 or permission of instructor. F, D.

ESET 0252 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 0151 and ESET 0151L or permission of instructor. COREQ: ESET 0248 or permission of instructor. S, D.

ESET 0253 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 0254, ESET 0255, ESET 0256, ESET 0257, ESET 0258, ESET 0259. PREREQ: Smart Grid major or instructor approval. F

ESET 0254 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 0253, ESET 0255, ESET 0256A, ESET 0257, ESET 0258, and ESET 0259. F

ESET 0255 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 0253, ESET 0254, ESET 0256A, ESET 0257, ESET 0258, and ESET 0259. F

ESET 0256A 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 0253, ESET 0254, ESET 0255, ESET 0257, ESET 0258, and ESET 0259. F

ESET 0257 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 0253, ESET 0254, ESET 0255, ESET 0256A, ESET 0258, and ESET 0259. F

ESET 0258 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 0253, ESET 0254, ESET 0255, ESET 0256A, ESET 0257, and ESET 0259. F

ESET 0259 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 0253, ESET 0254, ESET 0255, ESET 0256A, ESET 0257, and ESET 0258. F

ESET 0260 Nuclear Instrumentation: 2 semester hours.
This 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 0130 S, D

ESET 0261 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 0153, and instructor permission. F, D

ESET 0279 Conduct of Operations: 4 semester hours.
A study of Conduct of Operations, to include human performance and safety specific to the nuclear industry. Lecture and Lab course. PREREQ: ESET 0151, ESET 0151L, ESET 0130 or permission of instructor. S, D.

ESET 0280 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 0151, ESET 0151L, or ESET 0130, ESET 0153, ESET 0220, ESET 0249, and or permission of instructors. COREQ: ESET0279, ESET 0248 S, D.

ESET 0282 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 0285 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 0281, ESET 0282, ESET 0283, ESET 0284, and ESET 0286. PREREQ: Prior AAS in an Energy System program or instructor approval. S, D

ESET 0292 Electrical Engineering Technology I: 7 semester hours.
Theory involving communication and various data and information transfer circuits, principles of motor controls, microcontroller and programmable logic controller (PLC) programming, and electrical machines including energy storage, transfer, and conversion applicable to electric motors, generators, and other electromechanical transducers. COREQ: ESET 0292L. PREREQ: ESET 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, D

ESET 0292L 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 0292. PREREQ: ESET 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. F, D

ESET 0293 Electrical Engineering Technology II: 5 semester hours.
Electrical power industry theory addressing generation, operations and distribution of power systems including electronic components, functions, and configurations of power, amplifiers, oscillators, thyristors, power control and regulation circuits, sensors, and networks. COREQ: ESET 0293L. PREREQ: ESET 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. S, D

ESET 0293L Electrical Engineering Technology II Laboratory: 4 semester hours.
Electric power generation lab, electric power distribution lab, and electric power industry lab addressing operations of power systems including electronic components, functions, and configurations of power, amplifiers, oscillators, thyristors, power control and regulation circuits, sensors and networks. COREQ: ESET 0293. PREREQ: ESET 0101, ESET 0101L, ESET 0102, ESET 0102L, ESET 0141, ESET 0142, or permission of instructor. S, D

ESET 0296 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 0297 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 0298 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.