

# INTEGRATED SYSTEMS ENGINEERING TECHNOLOGY (ISET)

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## **ISET-1000 Numerical Applications in Electrical and Mechanical Maintenance** **2 Credits**

Essential math concepts and how they are applied on the job in alternative energy, boiler operation, construction, electrical, HVAC, manufacturing, maintenance, mechanical, pipefitting, plumbing, and welding areas. Teaches applied numerical concepts in visual steps and includes both math exercises and practical applications that reinforce learning.

*Lecture: 2 hours*

*Prerequisite(s): Departmental approval.*

## **ISET-1101 Welding Blue Print Reading** **3 Credits**

Explore the techniques of reading blueprint and welding symbols relating to the welding field, including the proper way to read and apply measurements and dimensioning pertaining to industrial blueprints and metal specifications. Includes how to understand and interpret views and translate measurements and dimensions.

*Lecture: 3 hours*

*Prerequisite(s): None.*

## **ISET-1110 Oxyfuel Processes/Plasma Processes** **4 Credits**

Develop skills in OxyFuel processes, cutting, brazing, and plasma processes. Extensive guided instruction provided.

*Lecture: 2 hours. Laboratory: 4 hours*

*Prerequisite(s): None.*

## **ISET-1120 3G Shielded Metal Arc Welding (STICK)** **1 Credit**

Throughout this course, students will learn the skills necessary to prepare a 3G 1" plate certification test using the Shielded Metal Arc Welding process. Students will become familiar with different stick electrodes including E6010 1/8", E7018 3/32", and E7018 1/8". Students will be given an opportunity to submit a 3G 1" plate weld sample to an internal or external testing site. Students will be awarded a certification if their weld sample met the requirements of the American Welding Society's (AWS) D1.1 Code Test for 3G welding.

*Laboratory: 2 hours*

*Prerequisite(s): Departmental approval: prior welding experience or recommendation from employer.*

## **ISET-1130 6G Shielded Metal Arc Welding (STICK)** **1 Credit**

Throughout this course, students will learn the skills needed to prepare a 6G schedule 80 pipe certification test using the Shielded Metal Arc Welding process. Students will become familiar with different stick electrodes including E6010 1/8", E7018 3/32", and E7018 1/8". Students will be given an opportunity to submit a 6G schedule 80 pipe weld sample to an internal or external testing site. Students will be awarded a certification if their weld sample met the requirements of America Society of Mechanical Engineers (ASME) Section IX, Boiler and Pressure Vessel code SMAW for 6G groove welding.

*Laboratory: 2 hours*

*Prerequisite(s): Departmental approval: prior welding experience or recommendation from employer.*

## **ISET-1140 Fillet Welding (STICK)** **1 Credit**

Throughout this course, students will learn the skills necessary to perform a fillet weld using various welding processes and positions. Students will become familiar with different stick electrodes including E6010 1/8", E7018 3/32" and/or E7018 1/8". Students will also learn welded joints including types, features and weld size specifications.

*Laboratory: 2 hours*

*Prerequisite(s): Departmental Approval.*

## **ISET-1301 Mechanical/Electrical Print Reading** **3 Credits**

Introduction to fundamental theory and application of blueprint reading skills. Included material will cover electrical, mechanical, structural drawings with symbols and wiring diagrams, basic troubleshooting techniques. Extensive guided instruction and practice provided.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): None.*

## **ISET-1310 Mechanical Power Transmission** **2 Credits**

Introduction to basic concepts of industrial maintenance and installation of mechanical drive systems including bearing, shafts, gears, and couplings. With an emphasis on OSHA safety standards, installation, maintenance, troubleshooting, and lubrication of mechanical components.

*Lecture: 1 hour. Laboratory: 2 hours*

*Prerequisite(s): None.*

## **ISET-1320 Fundamentals of Fluid Power** **2 Credits**

Principles of power transmission are presented and contrasted with other means of transmission. Includes laws and principles of fluid power transmission, units of pressure and flow, plumbing materials and sizing, pressure losses through piping, and the uses of vacuum and vacuum applications. Extensive guided instruction and practice provided.

*Lecture: 1 hour. Laboratory: 2 hours*

*Prerequisite(s): ISET-1301 Mechanical/Electrical Print Reading.*

## **ISET-1340 Industrial Piping and Tubing** **2 Credits**

Concepts and principles specific to piping, pipefitting, and tubing techniques, materials, routing and layout including types of material, cutting, threading, measurements, fittings, bending, and offsets. Extensive guided instruction and practice provided.

*Lecture: 1 hour. Laboratory: 2 hours*

*Prerequisite(s): None.*

### **ISET-1410 Applied Electricity I**

#### **3 Credits**

Fundamentals of electricity with emphasis on resistance, direct current voltage and current, electrical quantities and units of measurements. Ohm's Law, Kirchoff's voltage and current laws will also be covered.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): MATH-0915 Basic Arithmetic and Pre-Algebra, or appropriate Math placement score.*

### **ISET-1420 Applied Electricity II**

#### **3 Credits**

Principles and applications of electricity with emphasis on alternating current, inductors, capacitors, and phase relationships. Electrical quantities and units of measurements, Ohm's Law, Kirchoff's voltage and current laws, single and three phase transformers will also be included. Extensive guided instruction and practice provided.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): ISET-1410 Applied Electricity I, or departmental approval.*

### **ISET-1450 Heating Ventilation Air Conditioning/Refrigeration I**

#### **2 Credits**

Learn the basics of refrigeration, heat transfer, and thermodynamics HVAC/R applications. This course covers modern HVAC/R systems including their major components, controls, different duct work designs, combustion, HVAC/R blueprint reading, refrigerants, working fluids, and energy management systems.

*Lecture: 1 hour. Laboratory: 2 hours*

*Prerequisite(s): None.*

### **ISET-1460 Fundamental Boiler Technology**

#### **3 Credits**

Concepts and fundamental skills associated with the operation and maintenance of steam boilers. Topics include an overview of steam boilers and boiler operation, basic boiler processes, boiler construction and material properties, boiler operating and maintenance procedures, combustion theory and fuels, efficiency, and codes and standards. Safety codes and procedures, preventive maintenance and basic troubleshooting techniques will also be covered. Extensive guided instruction and practice provided.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): None.*

### **ISET-1802 Special Topics in 3G Welding**

#### **3 Credits**

Special Topics in 3G Welding is a 1-week course. Throughout this course, students will learn the skills necessary to perform a 3G 1" plate certification test using the Shielded Metal Arc Welding process. Students will become familiar with different stick electrodes including E6010 1/8", E7018 3/32", and E7018 1/8". Students will be given the opportunity to perform their 3G 1" plate certification test during the last day of class. Once completed, this weldment will be tested at an internal or external source. Students will be awarded a certification if their weldments are deemed serviceable.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): Departmental Approval.*

### **ISET-1820 Independent Study in ISET**

#### **1-3 Credits**

Directed individual study. Study/research title and specific content arranged between instructor and student (see Credit Schedule of classes for current offerings). May be repeated for a maximum of six credits of different topics.

*Lecture: 1-3 hours*

*Prerequisite(s): Departmental approval.*

### **ISET-2100 Gas Metal Arc Welding (MIG)**

#### **4 Credits**

Develop skills in Gas Metal Arc Welding (MIG). Extensive guided instruction provided. Prepares students for the MIG certification test.

*Lecture: 2 hours. Laboratory: 4 hours*

*Prerequisite(s): ISET-1101 Welding Blue Print Reading or concurrent enrollment.*

### **ISET-2110 Gas Tungsten Arc Welding (TIG)**

#### **4 Credits**

Develop skills in Gas Tungsten Arc Welding (GTAW-TIG). Extensive guided instruction provided and prepares a student for the TIG certification test.

*Lecture: 2 hours. Laboratory: 4 hours*

*Prerequisite(s): ISET-1101 Welding Blue Print Reading or concurrent enrollment.*

### **ISET-2120 Shielded Metal Arc Welding (STICK)**

#### **4 Credits**

Develop skills in Shielded Metal Arc Welding (STICK). Extensive guided instruction provided and prepares a student for the SMAW (STICK) certification test.

*Lecture: 2 hours. Laboratory: 4 hours*

*Prerequisite(s): ISET-1101 Welding Blue Print Reading or concurrent enrollment.*

### **ISET-2140 Non-Destructive Testing**

#### **3 Credits**

An introduction to terms, definitions, methods, and applications of the non-destructive testing profession and an in-depth exploration of two methods of non-destructive testing: visual inspection and liquid penetrant examination. The tools, proper processing techniques, different testing methods, and interpretation involved with visual inspection and liquid penetrant testing will be discussed and practiced.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): None.*

### **ISET-2151 Robotic Welding**

#### **4 Credits**

Concepts and fundamental skills associated with the operation and programming of robotic welding machines. Topics include safe operation of robotic welding machines; building and editing programs to complete simple and complex welds; welding variables and options; and machine maintenance and setup.

*Lecture: 2 hours. Laboratory: 4 hours*

*Prerequisite(s): ISET-2100 Gas Metal Arc Welding (MIG).*

**ISET-2160 Structural Fabrication****4 Credits**

Complete a fabrication project, beginning by interpreting a set of prints, developing a plan, and working to cut, prepare, fit and weld raw materials together. The fabrication project will resemble a real world scenario related to the shipbuilding, construction, aeronautical, or related industries on a smaller scale.

*Lecture: 2 hours. Laboratory: 4 hours*

*Prerequisite(s): ISET-1101 Welding Blue Print Reading, and ISET-2100 Gas Metal Arc Welding (MIG).*

**ISET-2170 Flux-Cored Arc Welding (FCAW)****4 Credits**

Presents both a practical and theoretical understanding of Flux-Cored Arc Welding (FCAW) processes through extensive hands-on instruction. Provides solid background for field-competitive FCAW certification.

*Lecture: 2 hours. Laboratory: 4 hours*

*Prerequisite(s): ISET-1101 Welding Blue Print Reading; or concurrent enrollment.*

**ISET-2200 Industrial Motor Controls****3 Credits**

Instruction in theory, application, and use of industrial type motors focusing on topics of safety, direct current (DC) motors, alternating current (AC) motors, single-phase motors, three-phase motors, motor troubleshooting methods, and motor starting. Extensive guided instruction and practice provided.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): ISET-1420 Applied Electricity II, or EET-1210 AC Electric Circuits, or EET-1220 Circuits and Electronics for Automation, or departmental approval.*

**ISET-2210 Commercial Wiring****3 Credits**

Principles of commercial electrical installations to prepare for work in the electrical field in a commercial, environmental setting. Based on the National Electric Code, study includes job specifications, sizing and selection of materials, and installation techniques. Extensive guided instruction and practice provided.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): ISET-2240 Applied National Electric Code or concurrent enrollment; or departmental approval.*

**ISET-2220 Fundamentals of Electronics and Instrumentation****3 Credits**

Concepts of electronics circuitry and instruments including purpose, function, and operation of diodes, transistors, Silicon Controlled Rectifiers (SCRs), DIACs, TRIACs, Field Effect Transmitters FETs), and other solid state devices used in live dynamic electronic circuits. Extensive guided instruction and practice provided.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): ISET-1420 Applied Electricity II, ISET-2200 Industrial Motor Controls; and departmental approval.*

**ISET-2240 Applied National Electric Code****3 Credits**

Introduction to the National Electric Code including industry safety hazards, standards, and precautions. Extensive guided instruction and practice provided.

*Lecture: 3 hours*

*Prerequisite(s): ISET-1420 Applied Electricity II.*

**ISET-2450 Heating Ventilation Air Conditioning/Refrigeration II****2 Credits**

This is a continuation in the study of the basics of refrigeration, heat transfer and thermodynamics in Heating, Ventilation, air Conditioning, and Refrigeration (HVAC/R) applications. Emphasis is placed on the calculation and determination of space heating and cooling loads, experimental work, and hands-on training and preparation to pass the Environmental Protection Agency's (EPA) Proper Refrigerant Practices certification exam. Important topics include: HVAC/R thermodynamics and heat transfer, air conditioning processes, comfort and Indoor Air Quality (IAQ), space heating loads, space cooling load, volumetric flow rates, advanced blueprint readings and systems designs, energy consumption, specifications, and components selections.

*Lecture: 1 hour. Laboratory: 2 hours*

*Prerequisite(s): ISET-1450 Heating Ventilation Air Conditioning/Refrigeration I, or departmental approval.*

**ISET-2460 Applied Boiler Technology****2 Credits**

The focus of this course will be the applications of steam and hot water boilers, water chillers, steam and hydronic heating and cooling systems. This course is the prerequisite for the State of Ohio approved Low Pressure Operators Exam Preparatory class. Extensive guided instruction and practice provided.

*Lecture: 1 hour. Laboratory: 2 hours*

*Prerequisite(s): ISET-1460 Fundamental Boiler Technology, or departmental approval.*

**ISET-2500 Programmable Logic Controllers Maintenance I****3 Credits**

Fundamental concepts of Programmable Logic Controllers (PLCs) Maintenance including applications of industrial type PLCs requiring motion control, automated manufacturing and the functions PLCs serve in that environment. Extensive guided instruction and practice provided.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): ISET-2200 Industrial Motor Controls or concurrent enrollment.*

**ISET-2511 Programmable Logic Controllers Maintenance II****3 Credits**

Programming and application of Programmable Logic Controllers (PLCs) including program control, data manipulation, math instructions, sequencers and shift registers. Students will be able to describe Installation and networking systems as well as assess proper troubleshooting techniques.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): ISET-2500 Programmable Logic Controllers Maintenance I.*

**ISET-2990 Reliability Centered Maintenance**

**3 Credits**

Advanced concepts and principles of best practices of the maintenance function within an organization. Preventative and predictive maintenance technology, reports and implementation strategies are explored.

Reliability Centered Maintenance RCM concepts covered include maintenance approaches, leadership, and management, change management, workflow structures, work classifications, spare parts inventory management concepts, KIPs and performance measurement, Total Productive Management TPM, 5S, 6S, Kaizen, Kaban, visual workspace. This course will include a Lean Six Sigma White Belt and prepare students to pass the Yellow Belt Lean Six Sigma exam.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): ISET-2200 Industrial Motor Controls or concurrent enrollment; or ISET-1310 Mechanical Power Transmissions or concurrent enrollment; or ISET-1320 Fundamentals of Fluid Power or concurrent enrollment.*

**ISET-3100 Electrical and Mechanical Systems for Smart Manufacturing**

**3 Credits**

Covers the commissioning and setup of process control equipment and VFDs. Includes networking a totally integrated automation system, networking a variety of industrial control equipment across a mix of vendor platforms and connecting those with other industrial IT networks. Also prepares students to understand a variety of motor control techniques, physics principles and manufacturing processes.

Provides students with the knowledge and skills necessary to take the Siemens Level 2 Mechatronics Systems Associate Exam.

*Lecture: 2 hours. Laboratory: 2 hours*

*Prerequisite(s): MET-2460 Applied Programmable Logic Controllers and Mechatronic Systems.*