

Appendix 2 – Academic Courses

Student Learning Outcomes (SLOs)

Note: Courses are arranged alphabetically by their rubric (i.e.: CETT)

CETT 1302 - Electricity Principles

- Identify basic principles of electricity (A/C and D/C), voltage, current, and circuitry.
- Apply Ohm's law to electrical calculations.
- Use test equipment to measure continuity, voltage, and current values.
- Use electrical safety practices.
- Identify the Binary Coded Decimals (BCDs).

CHEM 1305/1105 – Introductory Chemistry and lab

Lecture Student Learning Outcomes:

- Describe physical and chemical properties of matter.
- Demonstrate dimensional analysis skill in unit conversion calculations.
- Name elements, ions, and simple inorganic compounds.
- Classify, complete, and balance chemical reactions and recognize oxidation-reduction reactions.
- Perform calculations with balanced equations, solution concentrations, and gas laws.
- Describe basic nuclear and electronic structure of atoms.
- Distinguish between nuclear and ordinary chemical reactions.
- Identify regions of the periodic table and trends in periodic properties of elements.
- Draw Lewis structures of molecules and predict shape and polarity of molecules.
- Determine energy changes for chemical reactions and physical processes.
- Use the Arrhenius and Bronsted- Lowry concepts to describe acids and bases.
- Apply equilibrium principles to aqueous systems and predict the shift in equilibrium when conditions change.

Laboratory Student Learning Outcomes:

- Identify basic chemistry laboratory equipment.
- Use basic apparatus and apply experimental methodologies used in the chemistry laboratory.
- Demonstrate safe and proper handling of laboratory equipment and chemicals.
- Conduct basic laboratory experiments with proper laboratory techniques.
- Make careful and accurate experimental observations.
- Relate physical observations and measurements to theoretical principles.
- Interpret laboratory results and experimental data and reach logical conclusions.
- Record experimental work completely and accurately in laboratory notebooks.

ELPT 1215 - Electrical Calculations I

- Calculate and analyze basic applied electrical problems and circuits using:
 - whole numbers, common fractions, decimal fractions and percentages,
 - engineering notation and the metric system.
 - powers, roots, ratio and proportion.
- Convert from the English system of measurement to Metric (SI) system of measurement.
- Analyze literal equations (formulas) pertaining to basic electrical circuits and solve them.
- Solve and analyze basic alternating current electrical problems using trigonometry functions.

ELPT 1325 - National Electrical Code I

- Locate and interpret the sections in the NEC that pertain to electrical installations.
- Calculate the size of conductors, boxes, raceways, and overcurrent protective devices for branch circuits supplying electrical equipment.
- Calculate conductors, overcurrent protection, and service equipment as applied to building services.
- Compute the size of branch circuits, feeders, and equipment for motors.
- Demonstrate personal qualities and workplace skills through regular attendance, punctuality and teamwork.

ELPT 1345 - Commercial Wiring

- Interpret electrical blueprints/drawings.
- Compute the circuit sizes and overcurrent protection needed for the installation of branch circuits, feeders, and service entrance conductors.
- Explain the proper installation of wiring devices according to the National Electrical Code (NEC) and local electrical codes.
- Demonstrate grounding methods.
- Identify commercial wiring methods including conduit bending.
- Demonstrate proper safety procedures.
- Develop the ability to conduct research (includes use of technology research methodologies and information literacy).

ELPT 1351 - Electrical Machines

- Define motor terms associated with both AC and DC systems;
- describe all basic motor and generator parts as to their specific use and application;
- summarize installation procedures focusing on electrical and mechanical requirements;
- discuss troubleshooting techniques for motors and generators.

ELPT 1357 - Industrial Wiring

Wiring methods used for industrial installations. Includes motor circuits, raceway and bus way installations, proper grounding techniques, and associated safety procedures.

- Interpret electrical blueprints/drawings;
- compute circuit sizes and overcurrent protection for the installation of branch circuits, feeders, and service entrance conductors;
- explain the proper installation of wiring devices according to electrical codes;
- demonstrate grounding methods;
- identify industrial wiring methods including conduit bending;
- demonstrate proper safety procedures.

ELPT 1429 - Residential Wiring

Wiring methods for single family and multi-family dwellings.

- Compute the circuit sizes needed for the installation of branch circuits, feeders, and service entrance conductors;
- explain the proper installation of wiring devices according to electrical codes;
- demonstrate grounding methods;
- install ground fault circuits;
- identify residential wiring methods; and
- demonstrate proper safety procedures.

ELPT 1440 – Master Electrician Exam Review I

This is an introductory study of electrical theory, code calculations, and interpretations applicable to becoming a master electrician. It emphasizes residential, commercial, and industrial installations using the current edition of the National Electrical Code (NEC) and local ordinances. Prerequisite or co-requisite: ELPT 2325 or approval of department chair (4:4-0)

- Use circuit analysis techniques to solve for unknown values: direct current (DC) and alternating current (AC).
- Use the NEC to size conductors, raceways, overcurrent protection, and other equipment for branch circuits.
- Use the NEC to size services for single-family dwellings, multi-family dwellings, offices, stores, schools, mobile homes, recreational vehicles, commercial cooking equipment, and motors control centers, and welders.
- Differentiate the requirements and procedures of different cities for taking the Master Electrician's Exam.

ELPT 1441 - Motor Control

Operating principles of solid-state and conventional controls along with their practical applications.

- Identify practical applications of jogging and plugging;
- describe the types of motor braking and their operating principles;
- explain different starting methods for large motors;
- demonstrate proper troubleshooting methods on circuits using wiring and schematic diagrams.

ELPT 1457 - Industrial Wiring

- Interpret electrical blueprints/drawings;
- compute circuit sizes and overcurrent protection for the installation of branch circuits, feeders, and service entrance conductors;
- explain the proper installation of wiring devices according to electrical codes;
- demonstrate grounding methods;
- identify industrial wiring methods including conduit bending;
- demonstrate proper safety procedures.

ELPT 2215 - Electrical Calculations II

Mathematical applications used to solve problems in the electrical field

- Use a calculator to perform operations involving fractions and decimals;
- Calculate percentages utilizing ratio and proportion;
- Apply geometry: calculate areas and volumes of geometric solids;
- and use right triangles to calculate electrical values.

ELPT 2301 - Journeyman Electrician Exam Review

Preparation for journeyman electrician licensure with emphasis on calculations and the National Electrical Code (NEC).

- Recognize and properly utilize formulas used to solve problems for direct current and alternating current application including single-phase and three-phase;
- describe proper materials and wiring methods used for wiring;
- explain license requirements of various jurisdictions and the procedures for applying and testing for licensure;
- identify important test-taking skills.

ELPT 2305 - Transformers and Motors

Operation of single- and three-phase motors and transformers. Includes transformer banking, power factor correction, and protective devices.

- Match the type of single-phase motor with its principles of operation;
- compare the operating characteristics of the three types of three-phase motors;
- explain the advantages of Wye and Delta connections in motor and transit applications;
- size overcurrent, short circuit, and ground fault protective devices;
- utilize nameplate information.

ELPT 2319 - Programmable Logic Controllers I

- Define the term Programmable Logic Controllers, and study the history of development and examples of early applications.
- Demonstrate understanding and/or review common computer mathematical functions and digital logic gates.
- Identify main elements of the PLC system: CPU, memory maps, single bit I/O modules, and power supplies.
- Understand general PLC programming procedures: equipment, formats, ladder diagrams, scanning.
- Demonstrate basic PLC programming: creation of ladder diagrams from process control descriptions, programming on-off inputs to produce on-off outputs.
- Program using input and output registers. Timer and counter functions will be explored.
- Understand PLC arithmetic functions: +, -, *, /, square root, comparisons.

ELPT 2325 - National Electrical Code II

In-depth coverage of the National Electrical Code (NEC) for those employed in fields requiring knowledge of the Code. Emphasis on wiring protection and methods, special conditions, and advanced calculations.

- Explain hazardous location classifications and divisions and wiring methods allowed in these locations;
- state the rules for electrical installation in special locations;
- calculate conductor sizes and overload protection required for residential, commercial, and industrial locations;
- select appropriate sections in the NEC for specific applications.

ELPT 2337 - Electrical Planning and Estimating

Planning and estimating for residential, commercial, and industrial wiring systems.

- List estimating procedures;
- formulate material and labor costs;
- identify types of bids;
- calculate cost adjustments and job costs;
- demonstrate the use of estimating forms.

ELPT 2343 - Electrical System Design

Electrical design of commercial and/or industrial projects including building layout, types of equipment, placement, sizing of electrical equipment, and all electrical calculations according to the requirements of the National Electrical Code (NEC).

- Strategically locate electrical equipment within a building;
- calculate electrical loading for a building;
- manipulate electrical loads to balance systems;
- size service equipment feeding a building;
- analyze the layout of materials and equipment for special or hazardous locations;
- calculate a Return on Investment including current funding options for energy efficient and renewable energy products

ELPT 2449 – Industrial Automation

This is an advanced study of electrical control systems, applications, and interfacing utilized in industrial automation. Ladder logic diagramming and programmable logic controllers are covered as they apply to electrical controls. Prerequisite: ELPT 1441

- Apply advanced programming techniques utilizing programmable logic controllers.
- implement digital/analog interfacing schemes.
- Explain the operation of communication and network methods.
- Devise control system specifications.
- Explain the operation and applications of distributed control systems.

ENER 1240 - Employee Success in Energy Industry

- Describe employer and employee expectations including values, inclusion, and community and environmental and safety roles.
- Describe employer benefits and impact on employee
- Describe the elements of career management.
- Demonstrate the use of e-communications such as timesheet and expense report.
- Describe personal financial management and responsibility.
- Explore career options and choices. (Activities include the investigation of various methods and implementation of education and career plans.)
- Develop the ability to conduct research. (Includes use of technology research methodologies and information literacy.)
- Develop self-responsibility. (Includes health and physical wellness, locus of control, stress management, interdependence, decision making and judgment, and boundaries.)

EPCT 1301 - Hazardous Waste Operations and Emergency Response

- Identify hazards associated with handling of hazardous waste at hazardous waste sites, cleanup operations, and corrective actions, demonstrate knowledge of site-specific Health and Safety Plan (HASP) and sampling and monitoring techniques.
- Demonstrate knowledge of site-specific Health and Safety Plan (HASP) and sampling and monitoring techniques.
- Identify minimum training requirements in 29 CFR-1910.120 and 40 CFR-264.16.

EPCT 1305 - Environmental Regulations Overview

- Explain the historical impact of environmental regulations.
- Identify the agencies that administer various environmental regulations.
- Classify waste streams.
- Identify notification requirements for regulatory compliance.
- Discuss and analyze legal issues associated with environmental compliance.

EPCT 1307 - Introduction to Environmental, Safety, and Health Technology

- Explain the historical impact of the safety and health movement.
- Interpret and summarize safety and health standards based on student-conducted research.

EPCT 1311 - Introduction to Environmental Science

- Explain the historical impact of the environmental movement.
- Describe the environmental interrelationship between social, political, and natural processes.
- Describe the environmental regulatory agencies and their mission at federal, state, and local levels.
- Describe basic principles of ecology including how ecosystems work, biomes and aquatic life zones, and self-sustaining mechanisms in ecosystems.
- Describe those issues posing significant threats to global pollution.

EPCT 1313 - Contingency Planning

- Identify and apply regulations and standards.
- Identify and describe components of the contingency planning process.
- Develop and evaluate a contingency plan.
- Describe the duties of the emergency planning staff.
- Analyze emergency planning and other safety and health information from the internet and other resources.

EPCT 1341 - Principles of Industrial Hygiene

- Explain terminology and discuss concepts of industrial hygiene and toxicology.
- Describe the anatomy and function of the routes of entry.
- Explain the function of the major body systems.
- Identify major health hazards found in the workplace and discuss their effects.
- Apply threshold limit values and other appropriate workplace exposure standards.
- Prepare a report based on research and investigation of an area of industrial hygiene.

EPCT 2333 - Environmental Toxicology

- Assess the human health effects of hazardous materials.
- Describe the major routes of entry, metabolic process, and their effects on target organisms.
- Demonstrate knowledge of solutions to toxicological problems.
- Identify government agencies that monitor and/or govern toxic substances.
- Be able to list a variety of toxins that are both naturally occurring and man-made.
- Understand and describe various routes of exposure to toxins.
- Demonstrate a basic understanding of target organs and the toxins that affected them.
- Understand effects of toxins, both on the affected person and future generations.
- Understand locations of possible toxins within the environment.

INCR 1302 - Physics of Instrumentation

- Use process instruments and devices.
- Describe the control loop as applied to the control and detection of pressure, temperature, level, flow, pH, and other applicable processes.
- Develop knowledge of measurements and calibration of instrumentation.
- Develop familiarization of the communicator.

INTC 1315 - Final Control Elements

- Describe various types of final control elements.
- Calculate proper valve sizing given the process conditions.
- Assemble, calibrate, and troubleshoot final control elements

INTC 1322 - Analog Controls I

- Describe and identify electrical controls components.
- Define electrical controls terminology.
- Identify electrical control symbols and diagrams.
- Describe an electrical distribution system.
- Interpret a motor control circuit diagram.
- Describe relay logic.
- Develop a ladder logic diagram.

INTC 1348 - Analytical Instrumentation

- Describe functions of analyses; analytical instruments
- Describe safety issues of all analytical instruments
- Discuss parts of a control valve and their functions.
- Explain the functioning of analytical systems; model
- State the safety, health and environmental policies and procedures that apply to analytical instruments.
- Extractive and in-situ analyses
- Read and interpret several P&IDs, which include analyzer systems, reactor systems, condensate systems, distillation systems, storage systems and cooling tower systems
- Explain pH; conductivity analyzers
- Perform a final elements startup and shutdown following the glycol unit procedures.
- Explain the overall operation of a process analytics; complex systems including GC, LC, and their detectors
- Draw analytical instrument system models
- Identify abnormalities in the glycol unit's operation and role of analyses
- Troubleshoot, diagnose and correct glycol unit abnormalities with analyses
- Conduct safety, health and environmental inspections using the permit system before beginning minor glycol unit maintenance.
- Determine potential EHS risks or hazards that an instrument technician should be familiar with.
- Conduct stability tests on control valves and analyzers
- Perform disassembly and re-assembly of a control valve safety.
- Create the proper documentation required for equipment maintenance and describe the steps required to prepare equipment for routine maintenance.
- Gain an understanding on regulatory requirements on analyzers
- Understand specialized constructions of analyzers
- Perform several on-line troubleshooting of analyzer systems .

INTC 1355 - Unit Operations

- Describe functions of a final control element in a control loop.
- Describe final control element terminology.
- Discuss parts of a chemical process
- Explain the basics of pump operations
- State the EHS policies and procedures that apply to control valve troubleshooting and maintenance.
- Monitor and control valve functions on the following equipment on the Glycol Unit: heat exchangers, distillation tower, strainers and filters, boiler system, cooling water system, steam system, instrument air, plant air, boiler feedwater, condensate system.
- Read and interpret several P&IDs, which include stripper systems, reactor systems, condensate systems, distillation systems, storage systems and cooling tower system.
- Explain how chemicals are received, transferred, stored and monitored on a process unit. And their relationship to control valve troubleshooting.
- Perform a final elements startup and shutdown following the glycol unit procedures.
- Explain overall operation of a process control system or systems in normal operations, and using a process diagram, identify critical process instrumentation and control loops, trace lines. (impact of control valves).
- Draw process flow diagrams, and be able to read P&ID.
- Identify abnormalities in compressor operations
- Troubleshoot, diagnose and correct glycol unit abnormalities.
- Conduct safety, health and environmental inspections using the permit system before beginning minor glycol unit maintenance.
- Determine potential EHS risks or hazards that an instrument technician should be familiar with.
- Conduct stability tests on control valves.
- Perform disassembly and re-assembly of a control valve safety.
- Create the proper documentation required for equipment maintenance and describe the steps required to prepare equipment for routine maintenance.
- Gain an understanding on distillation operations .
- Understand basics of EHS and plant operations
- Perform several on-line troubleshooting of the glycol process.

INTC 1375 - Sample Systems

- Describe functions of analyses; analytical instruments
- Describe safety issues of all sampling systems
- Discuss parts of a sampling system and their functions.
- Explain the functioning of analytical systems; model
- State the safety, health and environmental policies and procedures that apply to analytical instruments.
- Extractive and in-situ analyses
- Read and interpret several P&IDs, which include analyzer systems, reactor systems, condensate systems, distillation systems, storage systems and cooling tower systems
- Explain pH; conductivity analyzers sampling systems
- Perform a final elements startup and shutdown following the glycol unit procedures.
- Explain the overall operation of a process analytics; complex systems including GC, LC, and their detectors
- Draw analytical instrument system models
- Identify abnormalities in the glycol unit's operation and role of analyses
- Troubleshoot, diagnose and correct glycol unit abnormalities with analyses
- Conduct safety, health and environmental inspections using the permit system before beginning minor glycol unit maintenance.
- Determine potential safety, health and environmental risks or hazards that an instrument technician should be familiar with.
- Conduct stability tests on control valves and analyzers
- Perform disassembly and re-assembly of a sample system
- Create the proper documentation required for equipment maintenance and describe the steps required to prepare equipment for routine maintenance.
- Gain an understanding on regulatory requirements on sampling systems
- Understand specialized constructions of analyzers sampling systems
- Perform several on-line troubleshooting of analyzer systems

INTC 2310 - Principles of Industrial Measurement II

- Apply additional principles of process instrumentation.
- Describe the control loop as applied to additional process variables.
- Calibrate and/or configure measurement instruments.
- Demonstrate safety procedures.
- Demonstrate advanced use of the communicator for the Smart Instrumentation.
- Calibrate pneumatic 13A transmitter and electronic 1151 transmitter.

INTC 2330 - Instrumentation Systems Troubleshooting

- Demonstrate various troubleshooting techniques.
- Troubleshoot startup problems either by simulation or actual event.
- Troubleshoot various instrument faults and process upsets.

INTC 2333 - Instrumentation Systems Installation

- Tune control loops and analyze process response.
- Design process and control specifications.
- Draw wiring and piping diagrams

INTC 2345 – Advanced Analyzers

- Evaluate the various types of analyzers relative to the process or product analysis involved.
- Select the appropriate analyzer and/or sample system.
- Describe the generic characteristics of each analyzer.
- Describe the differences between the various analyzers.
- Calibrate each analyzer.
- Analyze samples on each analyzer.
- Describe the flow path through the various components of each analyzer and explain what occurs in each hardware component.
- Describe any sample conditioning requirements to be used with each analyzer.
- Troubleshoot and make replacements/repairs to each analyzer type.
- Document system setting, calibration, maintenance and repairs.

INTC 2359 - Distributed Control Systems

- Demonstrate measurement, control data acquisition, and data analysis.
- Outline enterprise resource planning and management.

INTC 2374 - Physical Properties Analyzers

- Explain safe work practices for each analyzer type.
- Explain the theory of operation of each analyzer type.
- Calibrate each analyzer type.
- Analyze samples with the various analyzers.
- Troubleshoot and repair the various analyzers.
- Demonstrate preventive maintenance on the various analyzers.
- Document the calibration, repair and maintenance of the analyzers.

METL 1313 - Introduction to Corrosion

- Identify the various types of corrosion.
- Describe corrosion control methods.
- Apply corrosion theory to at least one corrosion problem and design a solution.
- Describe corrosion characteristics of metals, alloys, and nonmetallic materials including plastics.
- Identify the major job markets in corrosion technology.
- Identify the types and levels of certification in each field.
- Report results using electronic media.

METL 1401 - Introduction to Metallurgy

- Define the physical and mechanical properties of ferrous and non-ferrous metals.
- describe the steel making process.
- describe methods of destructive and nondestructive testing.
- explain the effects of hot working, cold working, welding, machining, and heat treating on metal properties.
- define metallurgical terms and processes.
- recognize defects and their causes.
- Conduct various metal property tests.
- Develop the ability to conduct research.
- Develop organizational and study skills.
- Report results using electronic media.

NDTE 1301 - Radiographic Film Interpretation of Weldments

- Describe the performance of radiography of weldments
- Describe radiograph film: composition, proper handling, and storage.
- Read and interpret film images in a general context (degree of penetration, shape recognition, light and dark regions, light source, etc.).
- Identify discontinuities, such as slag, porosity, cracks, incomplete fusion, and laminates.
- Identify from films weldment types and configurations
- Read radiograph films and identify and interpret discontinuities leading to weld failure.

NDTE 1405 - Introduction to Ultrasonics: Levels 1 & 2

- Identify the characteristics of metal and ultrasonic tests.
- Outline the procedure for conducting ultrasonic tests.
- Conduct a straight and angel beam examination.
- Conduct an ultrasonic test on metal samples.
- Report results using electronic media.

NDTE 1410 - Liquid Penetrant, Magnetic Particle, and Visual Testing: Levels 1 & 2

- Identify and select proper materials and equipment to perform a liquid penetrant test of a weldment.
- Interpret the results of a liquid penetrant test to ascertain acceptability of the weldment.
- Demonstrate knowledge of safety precautions relative to fire and toxic hazards.
- Identify and properly select equipment used in magnetic particle testing.
- Demonstrate knowledge of the principles of magnetic particle, magnetic fields, current requirements for testing and demagnetization.
- Perform a magnetic particle examination on a weldment, following established procedures.
- Interpret the results of the above test to ascertain acceptability of the weldment.
- Perform visual inspections.
- Report results using electronic media.

NDTE 1440 - Eddy Current Testing

- Demonstrate discipline specific knowledge of equipment.
- Demonstrate knowledge of procedures and applications.
- Demonstrate calibration procedures.
- Evaluate the signals for a basic Eddy Current examination.
- Report results using electronic media

NDTE 1454 - Intermediate Ultrasonics: Flaw Detection and Sizing

- Identify the characteristics of discontinuities in materials using ultrasonic testing.
- Locate and plot discontinuities in components.
- Write a procedure for conducting ultrasonic testing.
- Evaluate discontinuities to a code or standard.
- Report results using electronic media.

NDTE 2339 – Pressure Piping Inspection

- Apply the related ASME and API codes related to pressure piping inspection, design, fabrication, repair and operations.
- Understand fundamentals of API 570.
- Understand the fundamentals of valves and valve inspection.
- Report results using electronic media.

NDTE 2401 - Advanced Ultrasonics: Phased Array and A.U.T.

- Write an ultrasonic test procedure to a code or standard.
- Demonstrate the effects of test piece shapes, grain structure, types of discontinuities, and how their orientation affects ultrasonic testing.
- Use transducers, couplings, reference blocks, and instrument controls in the testing procedure.
- Perform maintenance checks on instruments to assure accuracy.
- Map transducer fields and test gain control.
- Check resolution and calibrate sensitivity.
- Understand and perform the operations of ultrasonic phased array equipment.

NDTE 2411 – Weld Inspection

- Explain the duties and responsibilities of welding inspectors.
- Use measuring systems.
- Evaluate destructive and nondestructive test.
- Preparation, and qualification of welding procedures.

NDTE 2440 - Pressure Vessel Inspection

- Explain the history, benefits, and applications of codes and standards as applied to the API-510 standard.
- Understand the philosophy and theory of API and ASME standards and standards organizations.
- Explore and apply the ASME code to various applications.
- Perform pressure vessel calculations and determine service rating.
- Demonstrate the ability to look up specific information in the ASME code and interpret the information as applied to pressure vessel fitness for service.
- Demonstrate the ability to look up and utilize the information in the ASME code and calculate the pressure and temperature for operation of a pressure vessel.

OSHT 1307 - Construction Site Safety and Health

- Identify hazards on a construction site.
- Apply regulations to the construction job site.
- Write a job site safety analysis (JSA).

OSHT 1309 - Physical Hazards Control

- Identify the common physical hazards in industry.
- Design a hazard free work environment.
- Utilize hazard recognition techniques to implement safe control practices.
- Describe the hazard control measures used in workplace designs.
- List Occupational Safety and Health Administration (OSHA) standards and other applicable codes and describe their applications.

OSHT 1313 - Accident Prevention, Inspection, and Investigation

- Describe the components of an effective accident investigation.
- Analyze factors which contributed to accidents.
- Recommend appropriate changes to prevent further accidents.
- Explain the components of an effective safety inspection and make appropriate recommendations to correct hazards identified by the inspection.

OSHT 1320 - Energy Industrial Safety

- Describe the basic components of safety, health, and environmental systems as defined by the Occupational Safety and Health Administration.
- Describe Hazardous Waste Operator (HAZWOPER) standards.
- Locate Material Safety Data Sheets (MSDS) and interpret the data.
- Select and don Personal Protective Equipment (PPE).
- Perform lock out/tag out procedures.
- Complete a confined space and hot work permit.
- Select and employ fall protection equipment.
- Fill out a Job Hazard Analysis (JHA).
- Demonstrate knowledge of Process Safety Management (PSM's).

OSHT 2305 - Ergonomics and Human Factors in Safety

- Explain the psychology of human behavior as it relates to workplace safety.
- Identify ergonomic hazards.
- Recommend appropriate controls.
- Relate the human and workplace factors which contribute to ergonomic hazards

OSHT 2309 - Safety Program Management

- Develop and implement a safety program.
- Describe cost benefit analysis.
- Summarize the basic components of human behavior modification.
- Apply the components of the safety audit process including recordkeeping requirements.
- Evaluate the essential elements of a comprehensive risk management plan.

OSHT 2320 - Safety Training Presentation Techniques

- Develop lesson plans, teaching activities, and presentations.
- Describe instructor qualifications and responsibilities.
- Apply principles of learning and techniques of instruction to develop effective industrial/business training.

OSHT 2401 - OSHA Regulations - General Industry

- Identify the OSHA regulations which apply to general industry.
- Demonstrate proficiency in retrieving information from Title 29 Code of Federal Regulations (CFR) 1910.
- Describe the responsibilities of the safety program director in developing a total regulatory compliance program which meets regulatory demands.
- Discuss the challenges of managing regulatory compliance with competing financial limitations.
- Evaluate examples of 29 CFR 1904-Recording and Reporting occupational injuries and illnesses.

PTAC 1302 – Introduction to Process Technology

- Describe the roles, responsibilities, safety, environmental, and quality concepts associated with the work environment of a process technician.
- Identify basic processes, equipment, and systems.
- Identify and describe plant equipment and components using process technology terminology.
- Define basic chemistry terms.
- Utilize basic physics concepts that apply to process technology.
- Define basic environmental terms and acronyms.
- Explain the Process Technician's responsibility for safety and the environment.
- Define basic safety terms and acronyms. Instruct students on Safety, Health and Environment (SHE) policies, procedures and compliance requirements with company, local, state and federal policies.
- Name and explain the use of several types of process equipment and vessels.
- Apply mathematics used in typical plant applications.
- Describe the regulations that affect local industry and their impact on the safety, health, environmental and economics of industry and the consumer.
- Identify symbols; read/explain simple piping and instrumentation diagrams (P&IDs) and process flow diagrams (PFDs).

PTAC 1308 – Safety, Health, and Environment I

- Describe the basic components of safety, health, and environmental systems as defined by the Occupational Safety and Health Administration.
- Describe Hazardous Waste Operator (HAZWOPER) standards.
- Locate Safety Data Sheets (SDS) and interpret the data.
- Select and don Personal Protective Equipment (PPE).
- Perform lockout/tagout procedures.
- Complete a confined space and hot work permit.
- Select and employee fall protection equipment.
- Fill out a Job Hazard Analysis (JHA).
- Demonstrate knowledge of Process Safety Management (PSM).
- Identify the various agents that can present potential safety and health hazards in the Process Industry, including process fluids, pressurized equipment, physical agents, and air contaminants.
- Identify specific categories of hazardous chemicals used in the Process Industry and the potential safety and health hazards posed by these chemicals.
- Explain the routes of entry hazardous chemicals use to enter the human body.
- Describe the short-term and long-term impact specific hazards have on individual health and safety, as well as the environment.
- Identify the various factors that can lead to leaks, spills, and releases and their potential dangers to worker safety and environmental protection.
- Recognize, identify and describe the various engineering controls used by the Process Industry to eliminate and/or minimize threats to safety, health, and the environment.
- Describe and discuss various administrative controls, in the way of specific company SH & E programs and activities industry employs to eliminate and/or minimize threats to safety, health and the environment.
- Discuss the function and purpose of personal protective equipment, testing equipment and permitting systems found in local plants/industries.
- Use MSDS, labels, and placards to obtain key information regarding hazardous materials.
- Discuss the various federal, state, local regulations, and industry standards that impact the Process Industry.

PTAC 1410 – Process Technology I - Equipment

- Define and use terminology.
- Identify and describe components, basic functions and the scientific principles associated with process equipment.
- Describe four types of pumps and their mechanical differences.
- Describe the general operator responsibilities for pumping equipment.
- Identify six types of valves and explain their advantages and disadvantages.
- Describe the general operator responsibilities for valves.
- Describe the types of metals used in plant piping and their advantages and disadvantages.
- Describe the more familiar process instruments, their functions, and draw the instrument symbols.
- Read and interpret P&IDs, including the equipment, streams, and instruments.
- Describe the different types of heat exchangers, the types of flow through an exchanger, and how heat is transferred.
- Explain how a cooling tower operates and describe its basic components.
- Describe the different levels of electrical voltage in a processing unit, and how voltage fluctuations affect electric motors.
- List and explain 4 hazards associated with processing duties or equipment.
- Describe the function of a furnace and the furnace's components.
- Explain the differences in motive force for steam/gas-fired turbines; list the basic components of a turbine.
- List the parts of a relief and flare system and describe the function of those parts.

PTAC 1432 – Process Instrumentation I

- Explain the function of the various instruments used in the process industry.
- Diagram the process control elements in a control loop.
- Utilize terms and symbols used in instrumentation.
- Interpret process flow diagram and piping and instrumentation drawings.
- Describe the evolution/importance of process instrumentation to the petrochemical/refining industry.
- Describe the major process variables controlled in the process industry; and explain the relationship between common process variables.
- Define terms associated with instrumentation.
- Identify some of the most common temperature, pressure, level and flow-sensing devices as well as common temperature, pressure, level and flow-measuring devices used in the process industry and then discuss each instrument's purpose and how it is operated.
- Identify process instrumentation used to analyze process fluids and products in industrial processes and describe two additional process variables—speed and vibration.
- Describe flow level and pressure control loops and their elements along with the various signals that can be transmitted through different control types.
- Identify five of the different types of controllers use in the process industry (local, remote, split range, cascade/remote setpoint, and ratio); describe their components and how they function; understand the applications in which they are best used to control processes.
- Describe a control valve's major components and how the valve operates.
- Identify P&ID symbols in process diagrams that represent equipment, instrumentation and lines
- Explain some instrumentation troubleshooting techniques, including communication, calibration, proper tool use, and safety and environmental guidelines.
- Diagnose equipment or instrument malfunctions or abnormalities using the P&IDs.
- Monitor and regulate certain systems, such as instrument air, truck and rail car loading/unloading, glycol unit, condensate systems, cooling water, flare systems, CO2 systems, Alky 2 unit.
- Expose students to basic DCS software in order to understand pressure.

PTAC 2314 – Principles of Quality

- Use statistical process control to collect, organize, and analyze data.
- Describe the principles of quality control and use quality tools.
- Demonstrate team skills.
- Describe the history of the quality movement in the United States.
- Describe the impact of quality on an organization's economic performance.
- Explain what is meant by "customer expectations" versus "customer specifications."
- Explain what is meant by Total Quality Management.
- Explain what ISO 9000 is, why companies become registered to it, and its advantages.
- Function as an effective team member; employ personal effectiveness techniques during group activities.
- Explain the importance of following procedures and policies in order to ensure operating consistency, reduce variability in the process, reduce waste, and prevent safety incidents.
- Explain how a failure to follow federal, state/local standards/policies affect a process unit's bottom line.
- Use continuous improvement methodology to optimize processes.
- Use Quality Tools and team problem solving skills to resolve operating problems.
- Collect valid/reliable data to use in the analysis of process problems or to plan for process improvement.
- Represent, analyze, and interpret process data using various types of control charts and quality tools.
- Explain Six-Sigma (Lean manufacturing)

NAPTA RECOMMENDED LEARNING OUTCOMES PROCESS QUALITY

- Describe quality movement effects in the U.S. and impacts on economics and customer expectations.
- Explain the importance of everyone understanding and following procedures, policies and documentation (checklists, log books, etc.) to ensure operating consistency, reduce process variability and waste, and to prevent environmental and safety incidents.
- Describe continuous improvement and explain how it is used to optimize processes and/or resolve operational issues.
- Prepare, analyze, and interpret information using process data, control charts and quality tools (QT).
- Given a process scenario, use the team concept to prepare control charts, analyze data and interpret information to determine corrective and/or preventative action(s).

PTAC 2420 – Process Technology II - Systems

- Describe the purpose and function of common process systems.
- Explain and demonstrate the operation of each process system
- Explain the function of and list the major components of the following systems:

1. Fire Water Systems	9. Steam Generation and Distribution Systems
2. Utility Water Systems	10. Extraction and Reaction Systems
3. Waste Water Systems	11. Distillation Systems
4. Cooling water Systems	12. Stripping Systems
5. Utility and Instrument Air Systems	13. Absorption and Adsorption System
6. Nitrogen Systems	14. Filtration Systems
7. Natural and Fuel Gas systems	15. Fired Heater Systems
8. Refrigeration Systems	16. Compressor Systems

PTAC 2438 – Process Technology III - Operations

- Operate various process systems.
- Work in self-directed teams.
- Write and follow safety and operational procedures.
- Collect and use data for determination of process specifications.
- Describe why the role of the process technician exists in industry and the value of the role.
- Describe how Federal, state and local regulations affect a process unit.
- Discuss commissioning new equipment/units and turn-around activities.
- Explain the following on the dept's Glycol Distillation Unit: process flow, auxiliary systems, utility systems, and major equipment associated with the unit when given a unit P&ID.
- State the safety, health and environmental policies and procedures that apply to operating the glycol unit and why these policies and procedures were created.
- Monitor and control the following equipment on the Glycol Unit: heat exchangers, distillation tower, strainers and filters, boiler system, cooling water system, steam system, instrument air, plant air, boiler feed water, condensate system.
- Read and interpret several P&IDs, which include stripper systems, reactor systems, condensate systems, distillation systems, storage systems and cooling tower system.
- Explain how chemicals are received, transferred, stored and monitored on a process unit.
- Perform a successful glycol unit startup and shutdown following the glycol unit procedures.
- Explain the overall operation of a process control system or systems in normal operations, and using a process diagram, identify critical process instrumentation and control loops, trace lines.
- Draw glycol unit from memory and oral board presentation.
- Identify abnormalities in the glycol unit's operation.
- Troubleshoot, diagnose and correct glycol unit abnormalities.
- Conduct safety, health, and environmental inspections using the permit system before beginning minor glycol unit maintenance.
- Determine potential safety, health and environmental risks or hazards in a plant scenario, donning Scott air packs and bunker gear, where necessary, and describe preventative action.
- Conduct accident and incident investigations on several possible scenarios.
- Perform minor maintenance on glycol unit equipment—valves, pumps, filters, leaking gaskets, etc.—using hand tools and the permit system, where applicable.
- Create the proper documentation required for equipment maintenance and describe the steps required to prepare equipment for routine maintenance.
- Connect hoses, operate various pumps, perform valve lineups, transfer tank contents, replace leaking gaskets, drain lines, replace instruments, etc.
- Operate gas detectors (LEL/oxygen and/or Drager).
- Create a blind list and isolation list for various pieces of equipment in the glycol lab, use lockout-tag out for electrical isolation.

PTAC 2446 – Process Troubleshooting

- Collect data and identify techniques for troubleshooting.
- Utilize applicable troubleshooting methods to solve process problems.
- Demonstrate computer literacy skills in the use of the simulated TDC-3000 control system.
- Use trend charts to collect data.
- Demonstrate the ability to safely startup and shutdown each of the 24 separate process systems.
- Demonstrate an ability to control the process using the following control modes: manual, automatic and cascade.
- Interpret problems and solve those problems by using troubleshooting techniques.
- Explain the operation of major vessels and equipment that are associated with each process.
- Monitor and regulate, identify and diagnose malfunction or abnormality of the following systems: Distillation, Absorption, Extraction, Fired Heater/Furnace, Boiler, Heat Exchanger, Continuous Reaction, Batch Reaction, Steam Systems and Amine Treating Unit
- Perform a material balance on a process.
- Explain one specific troubleshooting technique.
- Track the results of the action.

PTRT 1301 – Introduction to Petroleum Industry

- Identify the concepts of exploration, production, refining, marketing, and transportation.
- Describe the terms and phrases associated with the petroleum industry and geological concepts, surveys, and mapping technologies as they relate to the exploration and production of Oil and Gas.
- Interpret petroleum data utilizing analysis supported by relevant software in Petroleum industry.
- Describe natural gas production.
- Describe reservoir production techniques.
- Summarize the historical development of Petroleum Industry.
- Demonstrate importance of professional code of ethics and the legal responsibilities in petroleum Engineering Technology.
- Discuss current local, national and world data in Petroleum Industry.

QCTC 1448 - Metrology and Prints

- Apply accepted methods and procedures to perform metrology.
- Verify traceability to established standards and/or regulations.
- Report results using electronic media.
- Read and understand basic prints/drawings and read/draw P&IDs.
- Perform basic sketch drawings.

QCTC 1470 - Introduction to the Inspection Industry

- Explain the history, benefits and applications of inspection, testing and quality.
- Understand various methods of inspection and testing, their applications, the associated career and certification paths, and the associated professional societies.
- Understand the importance of reporting in the inspection and testing industry. Perform basic data collection, reporting and presentation.
- Develop self-responsibility. Understand the basics of safety and safe work practices in the inspection and testing industry; and understand the importance of attendance and being on time both in school and the workplace
- Develop self-awareness. Understand ethics being on time both in school and the and the importance of ethics in the inspection and testing industry.

QCTC 2331 – Standards and Codes

- Survey the philosophy and theory of standards and standards organizations.
- Apply the systems management approach as related to the development and application of standards.
- Examine national, international, and other standards.
- Implement auditing and documentation practices and verify traceability to the appropriate standards.

SCIT 1418 – Applied Physics

- Define terminology relating to industrial applications in physics.
- Use appropriate measuring devices to analyze systems.
- Apply relationships of length, mass, and time.
- Demonstrate problem-solving techniques applied to principles of industrial physics including vectors, motion, mechanics, and simple machines.
- Demonstrate problem solving techniques applied to principles of matter, heat, and thermodynamics.

TECM 1301 – Industrial Mathematics

- Convert between decimals and fractions.
- Use measuring tools.
- Calculate ratios and proportions in a technical application.
- Transpose linear equations to solve for unknowns.

WLDG 1204 - Fundamentals of Oxy-Fuel Welding and Cutting

- Demonstrate proper set up and use of oxy-fuel welding equipment.
- Demonstrate safety procedures for oxy-fuel equipment.
- Demonstrate proper welding of basic joints and basic cutting.

WLDG 1412 – Introduction to Flux Cored Arc Welding

- Demonstrate equipment safety checks.
- Identify Flux Cored Arc Welding (FCAW) equipment parts.
- Demonstrate the procedures for welding various joints in various positions (T-joints, lap joints, butt joints)

WLDG 1413 – Introduction to Blueprint Reading

- Define terms and abbreviations.
- Interpret views, lines, dimensions, detail drawings and welding symbols.
- Identify structural shapes.
- Demonstrate the proper use of measuring devices.
- Calculate dimensions.
- Develop a bill of materials.

WLDG 1428 – Intro to Shielded Metal Arc Welding (SMAW)

Emphasis placed on power sources, electrode selection, oxy-fuel cutting, and various joint designs. Instruction is provided on SMAW fillet welds in various positions.

- Select electrodes and amperage settings for various thicknesses of materials and welding positions.
- Define principles of arc welding.
- Explain electrode classifications.
- Perform SMAW operations utilizing various positions electrodes and joint designs.

WLDG 1430 – Intro to Gas Metal Arc Welding (GMAW)

- Describe welding positions with various joint designs.
- Describe the effects of welding parameters in GMAW.
- Apply safety rules.
- Troubleshoot equipment used.
- Perform visual inspection.
- Weld various types of structural material.
- Diagnose welding problems.

WLDG 1434 – Intro. To Gas Tungsten Welding (GTAW)

- Describe various joint designs.
- Describe safety rules and equipment.
- Describe the effects of welding parameters in GTAW.
- Weld various structural materials.

WLDG 2406 – Intermediate Pipe Welding

- Describe equipment and required pipe preparation.
- Perform welds using various positions.

WLDG 2413 – Intermediate Welding Using Multiple Processes

This course offers instruction using layout tools and blueprint reading with demonstration and guided practices with some of the following welding processes: oxy-fuel gas cutting and welding, shielded metal arc welding (SMAW), gas metal arc welding (GMAW), flux-cored arc welding (FCAW), and gas tungsten arc welding (GTAW).

- Identify proper safety equipment and tools.
- Select the proper welding process for a given application.
- Demonstrate skills using more than one approved welding process.
- Analyze situations and make decisions concerning safety and electrode selections.

WLDG 2443 – Advanced Shielded Metal Arc Welding (SMAW)

This course covers advanced topics based on accepted welding codes. Training is provided with various electrodes in SMAW with open V-groove joints in all positions.

- Describe effects of preheating and post-weld heating.
- Explain precautions used when welding various metals and alloys.
- Distinguish between qualification and certification procedures.
- Troubleshoot welding discontinuities.
- Perform open groove welds with low carbon steel and low alloy electrodes in various positions.

WLDG 2451 – Advanced Gas Tungsten Arc Welding (GTAW)

- Demonstrate proficiency in various welding positions.
- Describe safety rules and equipment used.
- Describe the effects of welding parameters in GTAW.
- Weld various joint designs.
- Diagnose welding problems.
- Perform visual inspection.

WLDG 2453 – Advanced Pipe Welding

This course covers advanced topics involving welding of pipe using SMAW. Topics include electrode selection, equipment setup, and safe shop practices, with an emphasis on weld positions 5G and 6G using various.

- Describe equipment and required pipe preparation.
- Perform 5G and 6G pipe welds using various electrodes.

WLDG 2455 - Advanced Metallurgy

- Identify the structure and properties of metals.
- Describe changes that occur when fabrication processes are performed.
- Demonstrate and interpret various metallurgy tests on various metals.
- Explain phase diagrams.
- Report results using electronic media.