

Energy & Manufacturing Systems: Scope & Sequence

(141 days class, 219 days lab, 61% lab)

Year 1, Semester 1

EIT101 Energy & Engineering Technology I
(90 days) (40 days class, 50 days lab, 55% lab)

District Pre-Assessment

Unit 1 (10 Days – 10 days class)

Basic Safety:

- Demonstrate knowledge of safety, health, and environmental rules and regulations to avoid workplace injury and maximize machine productivity.
- Demonstrate knowledge of electrical safety standards and electrical procedures to maintain industrial equipment safely.
- Demonstrate knowledge of safety practices of mechanical and fluid-controlled systems to maintain industrial equipment safely.
- Demonstrate knowledge of proper fall protection.
- Select appropriate Personal Protective Equipment (PPE) for various industrial safety situations.
- Describe how to appropriately use Personal Protective Equipment (PPE) for various industrial safety situations.

CTSO Integration (Leadership Skills): SkillsUSA Officer Elections and Training

Professional Skills: 1.A-D, 4.A-F, 7.A-C

Academic Standards: ELA.11-12.W.4, ELA.11-12.W.5, ELA.11-12.SL.4, ELA.11-12.L.4, 5.NF.B.3, 5.NF.B.6, 5.NF.B.7

Work-based Learning: Industry Guest Speaker, Mock Interview, Job Application

Technical Standards: 101.01-.06

Certification: * OSHA10

* Occupational Safety and Health Administration (OSHA)- Will be trained during the program, scheduled date and time subject to change.

Unit 2 (40 Days - 15 class, 25 lab)

Maintenance Operations:

- Apply knowledge of machine maintenance and operation procedures and effects on factory output.
- Read and interpret technical documents about modern maintenance operations.
- Explain fundamental theories related to modern maintenance operations.
- Solve technical problems related to modern maintenance operations using equations and mathematical principles.

- Use tools and instruments to operate and maintain modern manufacturing/process components and systems.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Fundraiser, Fall Leadership Conference, Regionals Prep

Professional Skills: 2.A-C, 4.A-F

Academic Standards: ELA.11-12.W.4, ELA.11-12.SL.4, ELA.11-12.L.4

Work-based Learning: Industry Guest Speaker

Technical Standards: 101.01-06

Unit 3 (40 Days – 15 class, 25 lab)

Mechanical Drives:

- Apply safety principles about mechanical drive components and systems.
- Read and interpret technical documents about mechanical drive components and systems.
- Explain fundamental theories related to mechanical drive components and systems.
- Solve technical problems related to mechanical drive components and systems using equations and mathematical principles.
- Describe the operation of mechanical drive components and systems.
- Use tools and instruments to operate and maintain mechanical drive components and systems.
- Troubleshoot mechanical drive components and systems.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Fundraiser, Fall Leadership Conference, Regionals Prep

Professional Skills: 2.A-C, 4.A-F

Academic Standards: ELA.11-12.W.4, ELA.11-12.SL.4, ELA.11-12.L.4

Work-based Learning: Industry Guest Speaker

Technical Standards: 102.01-05

Certifications: NC3 Fundamentals of Mechanical Systems (Level 1) and Applied Mechanical Systems (Level 2)

Year 1, Semester 2

EIT102 Energy & Engineering Technology II
(90 days) 32 days class, 58 days lab, 64% lab)

Unit 4 (60 Days – 20 class, 40 lab)

Fluid Power:

Piping Systems

- Apply safety principles about piping components and systems.
- Read and interpret technical documents about piping components and systems.
- Explain fundamental theories related to piping components and systems.
- Solve technical problems related to piping components and systems using equations and mathematical principles.
- Describe the operation of piping components and systems.
- Use tools and instruments to operate and maintain piping components and systems.
- Troubleshoot piping components and systems.

Pumps/Vacuums

- Apply safety principles about pumps.
- Read and interpret technical documents about pumps.
- Explain fundamental theories related to pumps.
- Solve technical problems related to pumps using equations and mathematical principles.
- Describe the operation of pumps.
- Use tools and instruments to operate and maintain pumps.
- Troubleshoot pumps.

Valves

- Apply safety principles about valves.
- Read and interpret technical documents about valves.
- Explain fundamental theories related to valves.
- Solve technical problems related to valves using equations and mathematical principles.
- Describe the operation of valves.
- Use tools and instruments to operate and maintain valves.
- Troubleshoot valves.

Hydraulics

- Apply safety principles about hydraulic components and systems.
- Read and interpret technical documents about hydraulic components and systems.

- Explain fundamental theories related to hydraulic components and systems.
- Solve technical problems related to hydraulic components and systems using equations and mathematical principles.
- Describe the operation of hydraulic components and systems.
- Use tools and instruments to operate and maintain hydraulic components and systems.
- Troubleshoot hydraulic components and systems.

Pneumatics

- Apply safety principles about pneumatic components and systems.
- Read and interpret technical documents about pneumatic components and systems.
- Explain fundamental theories related to pneumatic components and systems.
- Solve technical problems related to pneumatic components and systems using equations and mathematical principles.
- Describe the operation of pneumatic components and systems.
- Use tools and instruments to operate and maintain pneumatic components and systems.
- Troubleshoot pneumatic components and systems.

Heat Exchanges

- Apply safety principles about heat exchangers.
- Read and interpret technical documents about heat exchangers.
- Explain fundamental theories related to heat exchangers.
- Solve technical problems related to heat exchangers using equations and mathematical principles.
- Describe the operation of heat exchangers.
- Use tools and instruments to operate and maintain heat exchangers.
- Troubleshoot heat exchangers.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Regional and State Competition

Professional Skills: 3.A-E, 4.A-F

Academic Standards: ELA.11-12.W.4, ELA.11-12.W.5, ELA.11-12.SL.4, ELA.11-12.L.4, 7.RP.A.3, 6.EE.A.2

Work-based Learning: Industry Guest Speaker, Resume and Cover Letter, Mock Interview, School-Based Enterprise

Technical Standards: 104.01-07, 105.01-07, 106.01-07, 107.01-07, 108.01-07, 109.01-07

Certifications: NC3 Fundamentals of Fluid Power - Hydraulics/Pneumatics (Level 1) and Applied Fluid Power Technology (Level 2)

Unit 5 (30 Days – 12 class, 18 lab)

Mechatronics:

- Apply safety principles about mechatronics components, circuits, and systems.
- Read and interpret technical documents about mechatronics components, circuits, and systems.
- Explain fundamental theories related to mechatronics components, circuits, and systems.
- Solve technical problems related to mechatronics components, circuits, and systems using equations and mathematical principles.
- Describe the operation of mechatronics components, circuits, and systems.
- Use tools and instruments to operate and maintain mechatronics components, circuits, and systems.
- Troubleshoot mechatronics components, circuits, and systems.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Fundraiser, Regional and State Competition

Professional Skills: 5.A-E 7.A-C

Academic Standards: ELA.11-12.L.4, 7.RP.A.3, 7.G.B.4

Work-Based Learning: Resume and Cover Letter, Mock Interview, Career Fair, School-Based Enterprise

Technical Standards: 208.01-07

Certifications: NC3 Introduction to Mechatronics (Industry 4.0)

Year 2, Semester 1

EIT201 Energy & Engineering Technology III
(90 days) (35 days class, 55 days lab, 61% lab)

Unit 1 (10 Days-4 Class, 6 lab)

Introduction to the Power Industry:

- Define energy and name its sources
- Identify the different methods of converting energy into electricity.
- Explain how electricity is transmitted and distributed.
- Describe the economics of power generation and distribution.
- Describe the environmental impacts of producing and distributing electricity and the methods used to minimize negative effects.
- Identify safety considerations associated with the power industry.
- Identify career opportunities and training requirements in the power industry.
- Identify concerns that might affect the future of the power industry.
- Understand the need for alternative energy and identify the various forms.
- Describe the contributions of alternative energy sources to world supplies and their potential.
- Describe the present US electrical grid and issues affecting alternative energy source tie-in, reliability, and economic impact.

CTSO Integration (Leadership Skills): SkillsUSA Officer Elections and Training

Professional Skills: 5.A-E, 6.A-C

Academic Standards: ELA.11-12.W.4, ELA.11-12.W.5, ELA.11-12.L.4, ELA.11-12.S, 5.NF.B.7, 7.EE.B.3

Work-Based Learning: Industry Guest Speaker, Job Application

Technical Standard: 49101.01-08, 74101.01-04

Unit 2 (28 Days-10 class, 18 lab)

Electrical Fundamentals:

- Apply safety principles about direct current electrical/electronic components and circuits.
- Read and interpret technical documents about direct current electrical/electronic components and circuits.
- Explain fundamental theories related to direct current electrical/electronic components and circuits.

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- Solve technical problems related to direct current electrical/electronic components and circuits using equations and mathematical principles.
- Describe the operation of direct current electrical/electronic components and circuits.
- Use tools and instruments to operate and maintain direct current electrical/electronic components and circuits.
- Troubleshoot direct current electrical/electronic components and circuits.
- Apply safety principles about alternating current electrical/electronic components and circuits.
- Read and interpret technical documents about alternating current electrical/electronic components and circuits.
- Explain fundamental theories related to alternating current electrical/electronic components and circuits.
- Solve technical problems related to alternating current electrical/electronic components and circuits using equations and mathematical principles.
- Describe the operation of alternating current electrical/electronic components and circuits.
- Use tools and instruments to operate and maintain alternating current electrical/electronic components and circuits.
- Troubleshoot alternating current electrical/electronic components and circuits.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Fundraiser, Fall Leadership Conference, Regionals Prep

Professional Skills: 1.A-D, 5.A-E, 8.A-I

Academic Standards: ELA.11-12.L.4, ELA.11-12.SL.5, 5.NF.B.7, 7.EE.B.3

Work-Based Learning: Industry Guest Speaker

Technical Standards: 202.01-07, 203.01-07

Certification: NC3 Fundamentals of Electricity - AC/DC, EMCC Level 1 AIT Certification

Unit 3 (13 Days-5 class, 8 lab)

Solid-State Electronics:

- Apply safety principles about solid-state electrical/electronic components and circuits.
- Read and interpret technical documents about solid-state electrical/electronic components and circuits.
- Explain fundamental theories related to solid-state electrical/electronic components and circuits.
- Solve technical problems related to solid-state electrical/electronic components and circuits using equations and mathematical principles.
- Describe the operation of solid-state electrical/electronic components and circuits.
- Use tools and instruments to operate and maintain solid-state electrical/electronic components and circuits.
- Troubleshoot solid-state electrical/electronic components and circuits.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Fundraiser, Fall Leadership Conference, Regionals Prep

Professional Skills: 2.A-C, 4.A-F

Academic Standards: ELA.11-12.W.4, ELA.11-12.SL.4, ELA.11-12.L.4

Work-based Learning: Industry Guest Speaker

Technical Standards: 204.01-07

Unit 4 (33 Days-13 class, 20 lab)

Industrial Controls:

- Apply safety principles about industrial control components and circuits.
- Read and interpret technical documents about industrial control components and circuits.
- Explain fundamental theories related to industrial control components and circuits.
- Solve technical problems related to industrial control components and circuits using equations and mathematical principles.
- Describe the operation of industrial control components and circuits.
- Use tools and instruments to operate and maintain industrial control components and circuits.
- Troubleshoot industrial control components and circuits.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Fundraiser, Fall Leadership Conference, Regionals Prep

Professional Skills: 2.A-C, 4.A-F

Academic Standards: ELA.11-12.W.4, ELA.11-12.SL.4, ELA.11-12.L.4

Work-based Learning: Industry Guest Speaker

Technical Standards: 205.01-07

Certification: NC3 Applied Motor Controls

Unit 5 (6 Days-3 class, 3 lab)

Foundations of Instrumentation:

- Theory of instrumentation
- Types of measurements
- Process of measurements

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Regional, and State Competition

Professional Skills: 3.A-E, 4.A-F

Academic Standards: ELA.11-12.W.4, ELA.11-12.W.5, ELA.11-12.SL.4, ELA.11-12.L.4, 7.RP.A.3, 6.EE.A.2

Work-based Learning: Industry Guest Speaker, Resume and Cover Letter, Mock Interview, School-Based Enterprise

Year 2, Semester 2

EIT202 Energy & Engineering Technology IV
(90 days) (34 days class, 56 days lab, 62% lab)

Unit 6 (28 Days-10 class, 18 lab)

Process Instrumentation:

- Apply safety principles about process instrumentation components and circuits.
- Read and interpret technical documents about process instrumentation components and circuits.
- Explain fundamental theories related to process instrumentation components and circuits.
- Solve technical problems related to process instrumentation components and circuits using equations and mathematical principles.
- Describe the operation of process instrumentation components and circuits.
- Use tools and instruments to operate and maintain process instrumentation components and circuits.
- Troubleshoot process instrumentation components and circuits.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Nationals

Professional Skills: 8.A-I, 9.A-C

Academic Standards: ELA.11-12.W.4, ELA.11-12.W.5, ELA.11-12.SL.4, ELA.11-12.L.4, 8.G.B.7

Work-Based Learning: Industry Guest Speaker, Field Trip

Technical Standards: 206.01-07

Certification: NC3 Fundamentals of Industry 4.0 Smart Sensors

Unit 7 (31 Days-10 class, 21 lab)

Advanced PLCs:

- Apply safety principles about programmable logic controllers.
- Read and interpret technical documents about programmable logic controllers.
- Explain fundamental theories related to programmable logic controllers.
- Solve technical problems related to programmable logic controllers using equations and mathematical principles.
- Describe the operation of programmable logic controllers.
- Use tools and instruments to operate and maintain programmable logic controllers.
- Troubleshoot programmable logic controllers.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Fundraiser, Fall Leadership Conference, Regionals Prep

Professional Skills: 2.A-C, 4.A-F

Academic Standards: ELA.11-12.W.4, ELA.11-12.SL.4, ELA.11-12.L.4

Work-based Learning: Industry Guest Speaker

Technical Standards: 207.01-07

Certifications: NC3 Fundamentals of PLCs and Sensor Technology and Applied PLC Technology II

Unit 8 (31 Days-14 class, 17 lab)

Robotics:

- Apply safety principles to robotics components, circuits, and systems.
- Read and interpret technical documents about robotics components, circuits, and systems.
- Explain fundamental theories related to robotics components, circuits, and systems.
- Solve technical problems related to robotics components, circuits, and systems using equations and mathematical principles.
- Describe the operation of robotics components, circuits, and systems.
- Use tools and instruments to operate and maintain robotics components, circuits, and systems.
- Troubleshoot robotics components, circuits, and systems.

CTSO Integration (Leadership Skills): SkillsUSA Chapter Meetings, Nationals

Professional Skills: 8.A-I, 9.A-C

Academic Standards: ELA.11-12.W.4, ELA.11-12.W.5, ELA.11-12.SL.4, ELA.11-12.L.4, 8.G.B.7

Work-Based Learning: Industry Guest Speaker, Field Trip

Technical Standards: 209.01-07

Certifications: Fundamentals of Robotics (UR) and Applied Robotics (UR)

Common AZCCR Math Standards (CAMS)

English Language Art Standards (ELAS)

The National Coalition of Certification Center (NC3)