Massachusetts CTE

Engineering Technology: Third Year (2014)

Third Year Engineering Integrated Area Research Design, Implementation and Maintenance 2.G

1 **Demonstrate integrated area research introductory knowledge.** 2.G.01

1 Identify and explain additional engineering areas such as, but not limited to: Manufacturing, Aerospace, Environmental, Nuclear, Mining, Green/Sustainable Technologies, Geological, Agricultural, Marine and Ocean. 2.G.01.01

2 Identify an emerging or other engineering area for student research. 2.G.01.02

3 Present an emerging or other engineering area's design for a business plan. 2.G.01.03

2 **Explain and apply integrated area research principles and techniques, and use design tools and materials according to current industry and OSHA standards.** 2.G.02

1 Develop a working design of a system used in an emerging or other selected engineering area. 2.G.02.01

2 Identify components of design for the selected emerging or other engineering area. 2.G.02.02

3 Identify how a component or subsystem of a design relates to core engineering learning area(s). 2.G.02.03

3 **Build and implement integrated area research designs.** 2.G.03

1 Build a model of a system for a selected emerging or other engineering area based on a business plan and working design. 2.G.03.01

Third Year Elective Engineering Area Design Template 2.H

1. **Demonstrate elective engineering area introductory knowledge and skills.** 2.H.01
    1. Identify an elective engineering area (EEA) of interest. 2.H.01.01
    2. Present initial research and rationale of the feasibility for further engineering study and activities within the EEA of choice. 2.H.01.02
    3. Determine and demonstrate knowledge of essential scientific discoveries for the EEA. 2.H.01.03
    4. Determine and demonstrate knowledge of the mathematics required for success in engineering within the EEA. 2.H.01.04
    5. Describe the engineering history within the EEA. 2.H.01.05
    6. Explain the evolution and the state of the art of the technology (both devices and processes) within the EEA. 2.H.01.06
    7. Identify and demonstrate knowledge of the design tools, design techniques and materials utilized in the EEA. 2.H.01.07
    8. Identify and demonstrate knowledge of implementing and building a design within the EEA. 2.H.01.08
    9. Identify and demonstrate knowledge of the tools, techniques, skills and materials utilized in the maintenance of the system for the EEA. 2.H.01.09
    10. Comprehensively review and document your introductory EEA findings. Note: this is to strengthen your understanding of the feasibility of continuing your EEA efforts to include engineering design, implementation and maintenance within this domain. 2.H.01.10

2. **Explain and apply elective engineering area principles, and techniques and use design tools and materials according to current industry and OSHA standards.** 2.H.02
    1. Analyze or reverse engineer a design of a system, subsystem or component, typical of your EEA. 2.H.02.01
    2. Demonstrate a working knowledge of the design techniques typical of your EEA industry. 2.H.02.02
    3. Create or recreate an initial EEA design (i.e. schematics, drawing, flowcharts, psuedocode, etc.) using elementary design tools typical to the chosen engineering domain. 2.H.02.03
    4. Specify materials and/or components for your EEA design. 2.H.02.04
    5. Determine a maintenance strategy for your EEA design. 2.H.02.05
    6. After review and update of the initial design, create or recreate a working design (if possible, using computer aided design (CAD) tools) typical of your EEA industry. 2.H.02.06
    7. Follow the engineering design process through all stages of your EEA design or emulated design. 2.H.02.07

3 **Build and implement elective engineering area designs.** 2.H.03

1 Build a model or working prototype of your EEA design or redesign. Or, alternatively, fashion a model of an emulated commercial EEA design. 2.H.03.01

2 Specify and document processes that will ensure efficiency in the commercial manufacturing of an EEA design (either yours or an existing one). 2.H.03.02

4 **Maintain elective engineering area designs.** 2.H.04

1 Identify skills required for personnel who will perform maintenance and repair of design(s) typical of your EEA. 2.H.04.01

2 Identify the tools and processes for maintenance and repair of your design or of design(s) typical for your EEA. 2.H.04.02

3 Practice providing maintenance and/or repair of design(s) typical of your EEA, while keeping a repair log. 2.H.04.03

Engineering Maintenance 2.I

1 **Maintain electrical engineering equipment.** 2.I.01

1 Identify skills for appropriate person(s) for maintenance and repair of electrical equipment. 2.I.01.01

2 Identify the tools and processes for appropriate person(s)for maintenance and repair of electrical equipment. 2.I.01.02

3 Research and provide preventative maintenance on an electrical system (such as a 3D printer), keeping a log for documentation. Provide corrective maintenance on an electrical system. 2.I.01.03

4 Monitor equipment operational indicators to insure that equipment is performing according to manufacturer’s specifications . 2.I.01.04

2 **Maintain mechanical engineering equipment.** 2.I.02

1 Identify required skills for maintenance and repair of mechanically designed equipment. 2.I.02.01

2 Identify the tools and processes required for maintenance and repair of mechanically designed equipment. 2.I.02.02

3 Research and provide preventative maintenance on a mechanical system (such as a bicycle, lathe, or automobile), keeping a log for documentation. Provide corrective maintenance on a mechanical system. 2.I.02.03

4 Monitor equipment operational indicators to insure that equipment is performing according to current industry and OSHA standards, 2.I.02.04

5 Maintain, inventory, and organize tools and equipment. 2.I.02.05

6 Develop and maintain a written log for service and repair of tools and equipment. 2.I.02.06

7 Maintain electronic and mechanical devices and gauges as specified by manufacturer, including cleaning, storage and calibration. 2.I.02.07

8 Store, retrieve, copy, and output drawing files depending upon system setup. 2.I.02.08

3 **Maintain automated systems engineering equipment.** 2.I.03

1 Identify skills required for maintenance and repair of an automated system. 2.I.03.01

2 Identify the tools and processes required for maintenance and repair of an automated system. 2.I.03.02

3 Research and provide preventative maintenance on an automated system (such as a robot), keeping a log for documentation. Provide corrective maintenance on an automated system. 2.I.03.03

4 Monitor operational indicators to insure that the automated system is performing according to current industry and OSHA standards. 2.I.03.04

4 **Maintain civil engineering/architecture equipment.** 2.I.04

1 Identify skills required for maintenance and repair of a structure. 2.I.04.01

2 Identify the tools and processes required for maintenance and repair of a structure. 2.I.04.02

3 Research and describe preventative maintenance on a system (such as a bridge), keeping a log for documentation. Provide corrective maintenance on a system. 2.I.04.03

4 Monitor structural operational indicators to insure that the system is performing according to current industry and OSHA standards. 2.I.04.04

5 **Maintain integrated area research equipment.** 2.I.05

1. Identify skills required for maintenance and repair of integrated areas equipment. 2.I.05.01
2. Identify the tools and processes required for maintenance and repair of integrated areas equipment. 2.I.05.02
3. Research and provide preventative maintenance on integrated areas system, keeping a log for documentation. Provide corrective maintenance on another engineering areas system. 2.I.05.03