Connecticut CTE

Engineering Technology (Grades 9-12)

A Engineering Technology ENG

1. Identify the roles, responsibilities and requirements of engineering. ENG.01
   a. Describe the following engineering fields: mechanical, chemical, civil, and electrical.*(A1) ENG.01.01
   b. Identify the following job functions and responsibilities: research and development, design, production, supervision, management, testing, and analysis in mechanical, chemical, civil, and electrical engineering. *(A2) ENG.01.02
   c. Identify the following educational requirements in engineering: associate, bachelor, master, and doctorate degrees.*(A3) ENG.01.03
   d. Describe the employment opportunities of an engineer. ENG.01.04
   e. Describe ethics related to engineering in the following situations: environmental, sustainable engineering, and corrupt practices.*(A4) ENG.01.05
2. Use the design process to solve problems by creating and refining prototypes. ENG.02
   a. Identify the components of the design process: define the problem, brainstorm, research, develop solutions, prototype, test/evaluate, and communicate results.*(H25) ENG.02.01
   b. Identify the elements of a well-written problem statement.*(H26) ENG.02.02
   c. Describe the process for researching relevant information.*(H28) ENG.02.03
   d. Describe the process of brainstorming.*(H27) ENG.02.04
   e. Brainstorm possible solutions. ENG.02.05
   f. Analyze and research between alternate solutions. ENG.02.06
   g. Describe the process of developing a solution.*(H29) ENG.02.07
   h. Develop details of a solution. ENG.02.08
   i. Build a prototype from working drawings using appropriate materials.*(H30) ENG.02.09
   j. Test prototype to defined criteria.*(H31) ENG.02.10
   k. Redesign prototypes. ENG.02.11
   l. Communicate processes and results. ENG.02.12
   m. Use a variety of productivity software to explain the results of the design process, including, spreadsheets, word processing, data analysis, and presentations.*(H32) ENG.02.13
3. Ensure quality control using the major components of manufacturing processes including measurement systems, tools and instruments to produce a product. ENG.03
   a. Explain the major manufacturing processes. ENG.03.01

b Explain the following quality controls: geometric dimensioning and tolerances, and go-no go gauge.*(E12) ENG.03.02

c Use the following measurement tools and instruments: rulers, micrometers, and Vernier calipers.*(E13) ENG.03.03

d Explain quality control. ENG.03.04

e Identify the following elementary statistical process controls: distribution curves, normal curves, and skew curves.*(E14) ENG.03.05

4 Design using the appropriate materials in engineering by identifying. Comparing, selecting and testing. ENG.04

a Identify common materials used in engineering. ENG.04.01

b Describe the following mechanical properties of steel, concrete, wood, and plastic: ductility/brittleness, tension, shear, and compression.*(D9) ENG.04.02

c Test materials for specific characteristics.*(D11) ENG.04.03

d Explain the process used for selecting the correct materials for specific functions.*(D10) ENG.04.04

5 Works collaboratively in engineering teams throughout the design process. ENG.05

a Read and understand design documentation and technical manuals. ENG.05.01

b Write technical reports. ENG.05.02

c Make an oral presentation. ENG.05.03

d Actively contribute to a team project. ENG.05.04

e Identify the following characteristics of an effective design team: team norms, leadership, responsibility, respect, rapport, and time management.* (C8) ENG.05.05

f Identify the roles and responsibilities of the following engineering design team members: team leader, designers, reporters, testers, and fabricators.* (C7) ENG.05.06

6 Use engineering equipment, laboratory materials and tools appropriately and safely. ENG.06

a Describe the function of a safety device. ENG.06.01

b Demonstrate safe personal behavior in the classroom. ENG.06.02

c Use all tools and equipment safely ENG.06.03

d Describe and demonstrate the proper use of engineering laboratory equipment.* (B6) ENG.06.04

e Describe and demonstrate the components of personal and group laboratory safety. ENG.06.05

f Describe and use safety laboratory equipment. ENG.06.06

g Explain and demonstrate the proper use of personal protective equipment (PPE).*(B5) ENG.06.07

7 Identify and demonstrate the use of various software programs used in the engineering field. ENG.07

- a Identify available resources for researching problem solutions.*(F15) ENG.07.01
- b Use word processing software to develop reports.*(F16) ENG.07.02
- c Use presentation software to develop oral presentation of findings.* (F17) ENG.07.03
- d Describe and demonstrate the process for using CAD in a design solution.* (F18) ENG.07.04
- e Use spreadsheet software to develop tables, graphs and charts and track data.* (F19) ENG.07.05

8 Demonstrate the application of science and math principles to the electrical engineering process. ENG.08

- a Describe and apply the following electricity principles: Ohm's, Watt's, series, parallel, combination circuits, AC/DC systems, and conductors/insulators.* (G22) ENG.08.02
- b Use appropriate electrical units to solve problems. ENG.08.03
- c Draw a circuit diagram and lay out the circuit. ENG.08.04
- d Describe work in electrical systems. ENG.08.05
- e Explain rate in electrical systems. ENG.08.06
- f Describe resistance in electrical systems. ENG.08.07

9 Demonstrate the application of science and math principles to the fluids engineering process. ENG.09

- a Identify what causes resistance in a fluid system. ENG.09.01
- b Describe the following components and applications of fluid power principles: reservoir, fluid conductors, valves, pumps, actuators, Pascal's Law, and Bernoulli's Principle.*(G23) ENG.09.02
- c Describe components of hydraulic and pneumatic systems. ENG.09.03
- d Describe work in electrical, mechanical, fluid and thermal systems. ENG.09.04
- e Explain rate in electrical, mechanical, fluid and thermal systems. ENG.09.05
- f Describe resistance in electrical, mechanical, fluid and thermal systems. ENG.09.06

10 Demonstrate the application of science and math principles to the thermal engineering process. ENG.10

- a Identify the three ways heat is transferred. ENG.10.01
- b Describe the following principles and applications of thermodynamics: heat flow and transfer, convection, conduction, radiation, temperature scales, and conductors/insulators.*(G24) ENG.10.02
- c Solve thermal problems using appropriate units. ENG.10.03
- d Describe work in thermal systems. ENG.10.04

e Explain rate in thermal systems. ENG.10.05

f Describe resistance in thermal systems. ENG.10.06

11 Demonstrate the application of science and math principles to the mechanical engineering process. ENG.11

a Describe and apply the following mechanical systems principles: Law of Conservation of Energy, six simple machines, mechanical advantage, efficiency, work, rate, and friction/resistance.(G21) ENG.11.01

b Solve problems using appropriate units in engineering systems. ENG.11.02

c Describe and apply the following statics principles: vectoring to predict resultant forces, equilibrium, trusses, and moment of inertia.*(G20) ENG.11.03

d Explain the effects of gear ratios. ENG.11.04

e Describe work in mechanical systems. ENG.11.05

f Explain rate in mechanical systems. ENG.11.06

g Describe resistance in mechanical systems. ENG.11.07