# Principles of Applied Engineering

Subject: Career and Technical Education
Grade: 09
Expectations: 66
Breakouts: 184

(a) Introduction.

1. Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

2. The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

3. Principles of Applied Engineering provides an overview of the various fields of science, technology, engineering, and mathematics and their interrelationships. Students develop engineering communication skills, which include computer graphics, modeling, and presentations, by using a variety of computer hardware and software applications to complete assignments and projects. Upon completing this course, students will have an understanding of the various fields of engineering and be able to make informed career decisions.

4. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

5. Statements that contain the worequired by business and industry. The student is expected to:

    (A) demonstrate knowledge of how to dress, speak, and conduct oneself in a manner appropria

        (i) demonstrate knowledge of how to dress appropriately for the profession

        (ii) demonstrate knowledge of how to speak politely for the profession

        (iii) demonstrate knowledge of how to conduct oneself in a manner appropriate for the

    (B) cooperate, contribute, and collaborate as a member of a group in an effort to achieve a pos outcome;

        (i) cooperate as a member of a group in an effort to achieve a positive collective outc

        (ii) contribute as a member of a group in an effort to achieve a positive collective outc

(iii) collaborate as a member of a group in an effort to achieve a positive collective outcome

(C) present written and oral communication in a clear, concise, and effective manner;

(i) present written communication in a clear manner

(ii) present written communication in a concise manner

(iii) present written communication in [an] effective manner

(iv) present oral communication in a clear man-0. (t)1.70 Tc 22.856 0 ic i r

(C) describe the difference between open and closed systems;

(i) describe the difference between open and closed systems

(D) describe how technological systems interact to achieve common goals;

(i) describe how technological systems interact to achieve common goals

(E) compare engineering, science, and technology career paths, including entry-level employment, military service, apprenticeships, community and technical colleges, and universities;

(i) compare engineering, science, and technology career paths, including entry-level employment

(ii) compare engineering, science, and technology career paths, including military service

(iii) compare engineering, science, and technology career paths, including apprenticeships

(iv) compare engineering, science, and technology career paths, including technical colleges

(v) compare engineering, science, and technology career paths, including community colleges

(vi) compare engineering, science, and technology career paths, including universities

(F) conduct and present research on emerging and innovative technology; and

(i) conduct research on emerging technology

(ii) conduct research on innovative technology

(iii) present research on emerging technology

(iv) present research on innovative technology

(G) demonstrate proficiency of the engineering design process.

(i) demonstrate proficiency of the engineering design process

(3) The student presents conclusions, research findings, and designs using a variety of media throughout the course. The student is expected to:

(A) use clear and concise written, verbal, and visual communication techniques;

(i) use clear written communication techniques

(ii) use clear verbal communication techniques

(iii) use clear visual communication techniques

(iv) use concise written communication techniques

(v) use concise verbal communication techniques

(vi) use concise visual communication techniques

(B) maintain a design and computation engineering notebook;

(i) maintain a design and computation engineering notebook

(C) develop and present ideas using sketching and computer-aided design and drafting (CADD);

(i) develop ideas using sketching

(ii) develop ideas using computer-aided design and drafting (CADD)

(iii) present ideas using sketching

(iv) present ideas using computer-aided design and drafting (CADD)

(D) draw conclusions using industry-standard visualization techniques and media;

(i) draw conclusions using industry-standard visualization techniques

(ii) draw conclusions using industry-standard visualization media

(E) maintain a paper or digital portfolio using the engineering documentation process; and

(i) maintain a paper or digital portfolio using the engineering documentation process

(F) use collaborative tools such as desktop or web-based applications to share and develop information.

(i) use collaborative tools to share information

(ii) use collaborative tools to develop information

(4) The student uses appropriate tools and demonstrates safe work habits. The student is expected to:

(A) master relevant safety tests;

(i) master relevant safety tests

(B) follow lab safety guidelines as prescribed by instructor in compliance with local, state, and federal regulations;

(i) follow lab safety guidelines as prescribed by instructor in compliance with local regulations

(ii) follow lab safety guidelines as prescribed by instructor in compliance with state regulations

(iii) follow lab safety guidelines as prescribed by instructor in compliance with federal regulations

(C)

(5) The student describes the factors that affect the progression of technology and analyzes the potential intended and unintended consequences of technological advances. The student is expected to:

(A) describe how technology has affected individuals, societies, cultures, economies, and environments;

(i) describe how technology has affected individuals

(ii) describe how technology has affected societies

(iii) describe how technology has affected cultures

(iv) describe how technology has affected economies

(v) describe how technology has affected environments

(B) describe how the development and use of technology influenced past events;

(i) describe how the development of technology influenced past events

(ii) describe how the use of technology influenced past events

(C) describe how and why technology progresses; and

(i) describe how technology progresses

(ii) describe why technology progresses

(D) predict possible changes caused by the advances of technology.

(i) predict possible changes caused by the advances of technology

(6) The student thinks critically and applies fundamental principles of system modeling and design to multiple design projects. The student is expected to:

(A) identify and describe an engineering design process needed for a project, including the design process and prototype development and initiating, planning, executing, monitoring and controlling, and closing a project;

(i) identify an engineering design process needed for a project, including the design process

(ii) identify an engineering design process needed for a project, including prototype development

(iii) identify an engineering design process needed for a project, including initiating a project

(iv) identify an engineering design process needed for a project, including planning a project

(v) identify an engineering design process needed for a project, including executing a project

(vi) identify an engineering design process needed for a project, including monitoring and controlling a project

(vii) identify an engineering design process needed for a project, including closing a project

(viii) describe an engineering design process needed for a project, including the design process

(ix) describe an engineering design process needed for a project, including prototype development

(x) describe an engineering design process needed for a project, including initiating a project

(xi) describe an engineering design process needed for a project, including planning a project

(xii) describe an engineering design process needed for a project, including executing a project

(xiii) describe an engineering design process needed for a project, including monitoring and controlling a project

(D) identify emerging trends in robotics, process control, and automation systems.

(i)

(B) formulate goals, objectives, and requirements to solve an engineering problem;

(i) formulate goals to solve an engineering problem

(ii) formulate objectives to solve an engineering problem

(iii) formulate requirements to solve an engineering problem

(C) determine the design parameters such as materials, personnel, r cliwi]n Td[(h (l)-0. (g)-4.1 (in)-43 (e )9.2.1o)8 cering problm

(G) apply structured techniques such as a decision tree, design matrix, or cost-benefit analysis to select and justify a preferred solution to a problem;

(i) apply structured techniques to select a preferred solution to a problem

(ii) apply structured techniques to justify a preferred solution to a problem

(H) predict performance, failure modes, and reliability of a design solution; and

(i) predict performance of a design solution

(ii) predict failure modes of a design solution

(iii) predict reliability of a design solution

(I) prepare a project report that clearly documents the designs, decisions, and activities during each phase of the engineering design process.

(i) prepare a project report that clearly documents the designs during each phase of the engineering design process

(ii) prepare a project report that clearly documents the decisions during each phase of the engineering design process

(iii) prepare a project report that clearly documents the activities during each phase of the engineering design process