

Florida Teacher Certification Examinations
Test Information Guide
for
**Engineering and
Technology Education 6–12**



FLORIDA DEPARTMENT OF EDUCATION

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Third Edition

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Test and Test Information Guide Development

Teacher Certification Testing

Since 1980, Florida teacher certification candidates have been required to pass the Florida Teacher Certification Examinations (FTCE), which consisted of tests in reading, writing, mathematics, and professional knowledge. The 1986 Florida Legislature modified the testing program by also requiring teacher candidates to pass a test in the subject area in which they wish to be certified. In addition, the Legislature substituted the Florida College-Level Academic Skills Test (CLAST) for the reading, writing, and mathematics portions of the FTCE. The 2000 Florida Legislature replaced the CLAST with the General Knowledge Test, effective July 1, 2002.

The subject area knowledge tested on the Engineering and Technology Education 6–12 examination was identified and validated by committees of content specialists from within the state of Florida. Committee members included public school teachers, district supervisors, and college faculty with expertise in this field. Committee members were selected on the basis of recommendations by district superintendents, public school principals, deans of education, experts in the field, and other organizations. In developing the test, the committees used an extensive literature review, interviews with selected public school teachers, a large-scale survey of teachers, pilot tests, and their own professional judgment.

Role of the Test Information Guide

The purpose of this test information guide is to assist examinees in preparing for the subject area test in Engineering and Technology Education 6–12 and identifying areas in need of further study. The guide was designed to familiarize prospective test takers with various aspects of the examination, including the content that is covered and the way it is represented. The guide should enable candidates to direct their study and to focus on relevant material for review. An annotated bibliography of related subject matter materials is available at the end of the test information guide to provide further guidance in identifying additional areas in need of study.

This test information guide is intended primarily for use by certification candidates, who may be students in a college or university teacher-preparation program, teachers with provisional certification, teachers seeking certification in an additional subject area, or persons making a career change to public school teaching. Candidates may have studied and worked in Florida or may be from out of state.

College or university faculty may also use the guide to prepare students for certification, and inservice trainers may find the guide useful for helping previously certified teachers prepare for recertification or multiple certification.

This test information guide is not intended as an all-inclusive source of subject area knowledge, nor is it a substitute for college course work in the subject area. The sample questions are representative of the content of the actual test; however, they are not actual test questions from an actual test form. Instead, the guide is intended to help candidates prepare for the subject area test by presenting an overview of the content and format of the examination.

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Preparation for the Test

The following outline may help you prepare for the examination. Adapt these suggestions to suit your own study habits and the time you have available for review.

Overview

- **Look over the organization of the test information guide.**

Section 1 discusses the development of the test and test information guide.

Section 2 (this section) outlines test preparation steps.

Section 3 offers strategies for taking the test.

Section 4 presents information about the content and structure of the test.

Section 5 lists question formats and includes sample test questions.

Section 6 provides an annotated bibliography of general references you may find useful in your review.

Section 7 identifies a source of further information.

Self-Assessment

- **Decide which content areas you should review.**

Section 4 includes the competencies and skills used to develop this subject area test and the approximate proportion of test questions from each competency area.

Review

- **Study according to your needs.**

Review all of the competencies and concentrate on areas with which you are least familiar.

Practice

- **Acquaint yourself with the format of the examination.**

Section 5 describes types of questions you may find on the examination.

- **Answer sample test questions.**

Section 5 gives you an opportunity to test yourself with sample test questions and provides an answer key and information regarding the competency to which each question is linked.

Final preparation

- **Review test-taking advice.**

Section 3 includes suggestions for improving your performance on the examination.

- **Refer to field-specific references.**

Section 6 includes an annotated bibliography listing general references keyed to the competencies and skills used to develop this subject area test.



Test-Taking Advice

- Go into the examination prepared, alert, and well rested.
- Complete your travel arrangements prior to the examination date. Plan to arrive early so that you can locate the parking facilities and examination room without rushing.
- Dress comfortably and bring a sweater or jacket in case the room is too cool for your comfort.
- Take the following with you to the test site:
 - Admission ticket
 - Proper identification as described in "Identification Policy"
- There are many strategies for taking a test and different techniques for dealing with different types of questions. Nevertheless, you may find the following general suggestions useful.
 - Read each question and all the response options carefully before selecting your answer. Pay attention to all of the details.
 - Go through the entire test once and answer all the questions you are reasonably certain about. Then go back and work through the questions that require more thought.
 - When you are not certain of the correct answer, eliminate as many options as you can and choose the response that seems best. It is to your advantage to answer all the questions on the test, even if you are uncertain about some of your choices.
 - After completing the examination, go back and check every question. Verify that you have answered all of the questions and that your responses are correctly entered.

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Competencies and Skills and Test Blueprint

The table on the following pages lists the competencies and skills used as the basis for the Engineering and Technology Education 6–12 examination. These competencies and skills represent the knowledge that teams of teachers, subject area specialists, and district-level educators have determined to be important for beginning teachers. This table can serve as a checklist for assessing your familiarity with each of the areas covered by the test. The competencies and skills should help you organize your review. The test blueprint indicates the approximate percentage of test questions that will cover each specific competency on the exam.

Competencies are broad areas of content knowledge.

Skills identify specific behaviors that demonstrate the competencies.

Percentages indicate the approximate proportion of test questions that represent the competencies on the test.

The following excerpt illustrates the components of the table.

*Approximate percentage of total test questions
(test blueprint)*

<i>Competency</i>	Competency/Skill	Approx. %
	1 Knowledge of the nature and impacts of technology	10%
	1 Identify the characteristics of technology.	
	2 Analyze a technological system in terms of inputs, processes, outputs, and feedback.	
	3 Assess the role of technology in developing products and systems that solve problems.	
	4 Evaluate the historical, social, ethical, cultural, economic, political, and environmental causes and effects of technological development and change.	
	5 Identify and assess new, emerging, and developing technologies and their impacts on society.	
	6 Identify biotechnology applications and advances in the areas of agriculture, pharmaceuticals, food and beverages, medicine, energy, environment, and genetic engineering.	
<i>Skills 1–6</i>		

Table of Competencies, Skills, and Approximate Percentages of Questions

Competency/Skill	Approx. %
1 Knowledge of the nature and impacts of technology	10%
<ol style="list-style-type: none"> 1 Identify the characteristics of technology. 2 Analyze a technological system in terms of inputs, processes, outputs, and feedback. 3 Assess the role of technology in developing products and systems that solve problems. 4 Evaluate the historical, social, ethical, cultural, economic, political, and environmental causes and effects of technological development and change. 5 Identify and assess new, emerging, and developing technologies and their impacts on society. 6 Identify biotechnology applications and advances in the areas of agriculture, pharmaceuticals, food and beverages, medicine, energy, environment, and genetic engineering. 	
2 Knowledge of principles of drafting	10%
<ol style="list-style-type: none"> 1 Select appropriate drafting instruments, equipment, and materials for a given purpose. 2 Differentiate between various disciplines of drafting (e.g., architectural, electrical, mechanical). 3 Apply fundamental principles of drafting (e.g., line conventions, lettering, dimensioning, scale, measurement, graphing). 4 Analyze the types of drawings used in drafting (e.g., orthographic, pictorial, auxiliary view). 5 Select appropriate 3D modeling processes for a given purpose. 6 Identify components of hardware and software for CAD. 	
3 Knowledge of principles of engineering	10%
<ol style="list-style-type: none"> 1 Identify appropriate design and problem-solving principles and procedures in engineering design. 2 Analyze factors involved in engineering design (e.g., economic, safety, ergonomic, reliability). 3 Analyze data acquisition methods in engineering (e.g., the use of test equipment, measurement instruments, research techniques). 4 Analyze legal and ethical issues in engineering. 	

Competency/Skill	Approx. %
4 Knowledge of energy and power technologies	10%
<ol style="list-style-type: none"> 1 Analyze the characteristics of power (e.g., steam, fluid power, electrical, solid and liquid fuels, nuclear, solar) and methods of generation and distribution. 2 Analyze the economic, social, and environmental impacts of traditional and alternative energy sources. 3 Select appropriate tools and materials used in various energy and power technologies. 4 Identify characteristics of AC and DC circuits and their components (e.g., source, load, path). 5 Apply Ohm's law and Kirchhoff's law to series and parallel circuits. 6 Distinguish between the characteristics of analog and digital circuits. 	
5 Knowledge of information and communication technologies	10%
<ol style="list-style-type: none"> 1 Analyze communication systems in terms of their components (i.e., source, encoder, transmitter, receiver, decoder, storage, retrieval, destination). 2 Analyze the tools, machines, equipment, and sources used in multiple forms of communications (e.g., human to human, machine to machine, human to machine, machine to human). 3 Apply the design process (e.g., storyboarding, wireframes, compositions) for various media. 4 Apply appropriate hardware and software application components for Web-based, audiovisual, and print media. 5 Select the most appropriate form of communication for a given task (e.g., traditional versus emerging technologies). 6 Classify the elements (e.g., color, shape, lines) and principles of design (e.g., balance, rhythm, emphasis). 7 Distinguish between the types, characteristics, components, and processes of prepress operations (e.g., generating and manipulating images, desktop publishing, typography). 8 Identify the characteristics and components of major printing processes (e.g., screen, offset, digital, sublimation). 	

Competency/Skill	Approx. %
6 Knowledge of transportation technologies	10%
<ol style="list-style-type: none"> 1 Analyze transportation systems, their subsystems (i.e., structural, propulsion, suspension, guidance, control, support), and their components. 2 Analyze transportation processes (e.g., receiving, holding, shipping) and systems (e.g., railways, pipelines). 3 Select appropriate transportation systems or components for land, sea, air, and space. 4 Analyze legal and ethical issues related to transportation (e.g., environmental regulations, governmental regulations, safety). 	
7 Knowledge of manufacturing technologies	10%
<ol style="list-style-type: none"> 1 Select appropriate tools, machinery, and equipment used for manufacturing. 2 Analyze types of manufacturing (e.g., job-lot, custom, mass production) and their characteristics. 3 Analyze legal and ethical issues related to manufacturing (e.g., environmental regulations, safety procedures, labeling requirements). 4 Select appropriate manufacturing management systems (e.g., just-in-time, continuous, lean, FMS). 5 Analyze factors affecting choices in manufacturing processes (e.g., rapid prototyping, CAM, CNC, CIM), including emerging technologies. 6 Select appropriate materials according to their properties and characteristics (e.g., strength, weight, costs, environmental impact). 	
8 Knowledge of construction technologies	10%
<ol style="list-style-type: none"> 1 Differentiate between characteristics of residential, commercial, civil, and industrial construction. 2 Analyze structural systems, their subsystems, and their components. 3 Select appropriate tools, equipment, materials, and processes in construction. 4 Identify the constraints (e.g., building codes, environmental sustainability, structural forces) that affect residential, commercial, civil, and industrial construction and renovation. 5 Evaluate factors involved in estimating, bidding, and scheduling. 	

Competency/Skill	Approx. %
9 Knowledge of laboratory management and safety <ol style="list-style-type: none"> 1 Evaluate the requirements for safety precautions and practices in technology education laboratories for staff and all students. 2 Identify student guidelines and processes for safe, functional use, storage, and maintenance of tools, machines, and equipment. 3 Identify student guidelines and processes for safe, functional use, storage, and disposal of materials and supplies. 4 Select precautions and practices in preventing and extinguishing different classes of fires. 5 Identify components of a comprehensive safety program for work and learning spaces (e.g., emergency procedures, OSHA regulations). 6 Select appropriate tools, machines, equipment, materials, and supplies for program objectives. 7 Determine the procedures for developing and maintaining an inventory of tools, machines, equipment, materials, supplies, and records. 	10%
10 Knowledge of technology education, professional development, and standards-based instruction and assessment <ol style="list-style-type: none"> 1 Identify the social, historical, and philosophical foundations of technology education and STEM programs. 2 Apply appropriate instructional and assessment strategies for developing learning activities, including project-based learning, that are aligned with standards (e.g., the Standards for Technological Literacy, Florida Curriculum Frameworks, the Florida Standards). 3 Determine how technology education supports and fosters STEM learning through cross-curricular integration. 4 Apply instructional strategies and measurement instruments for developing and assessing the cognitive learning, psychomotor processes, and problem-solving skills (e.g., critical thinking, lateral problem solving) of diverse student populations. 5 Evaluate the relationships between technology education, career readiness, and career and technical student organizations. 6 Identify components of a lifelong plan for professional and technical development, including learning theories, pedagogical practices, assessment techniques, research findings, and changing technologies. 	10%

5

Test Format and Sample Questions

The Engineering and Technology Education 6–12 subject area test consists of approximately 120 multiple-choice questions. You will have two and one-half hours to complete the test.

Each question will contain four response options, and you will indicate your answer by selecting **A**, **B**, **C**, or **D**.

The table below presents types of questions on the examination and refers you to a sample question of each type.

Type of Question	Sample Question
Direct Question Choose the response option that best answers the question.	Question 1, page 10
Sentence Completion Select the response option that best completes the sentence.	Question 6, page 11
Graphics Examine a question involving a drawing or a diagram, and select the best response option.	Question 11, page 12
Scenario Examine a situation, problem, or case study. Then answer a question, make a diagnosis, or recommend a course of action by selecting the best response option.	Question 16, page 13

Sample Questions

The following questions represent both the form and content of questions on the examination. These questions will acquaint you with the general format of the examination; however, these sample questions do not cover all of the competencies and skills that are tested and will only approximate the degree of examination difficulty.

An answer key follows at the end of the sample questions. The answer key includes information regarding the competency to which each question is linked.

DIRECTIONS: Read each question and select the best response.

1. Which of the following is the best example of consumer demands influencing the development of technology?
 - A. fluctuating costs of steel used in the automotive industry
 - B. increasing sophistication of wireless communications
 - C. growing use of composites in the construction industry
 - D. expanding use of bar codes in medical record keeping

2. A computerized delivery mechanism developed for a biological laboratory for the space program was later adapted for use as an insulin pump that provides individuals with diabetes with regulated amounts of insulin. This example illustrates how
 - A. transferring scientific knowledge of medical product development to technology processes often results in commercial applications.
 - B. developing modeling and technology scenarios aids in creating new products for the medical field.
 - C. sharing ideas, knowledge, or skills from one field with other technologies and fields often results in technological innovations.
 - D. applying the principles of biology to biotechnology helps in the creation of commercial medical products.

3. Which of the following processes is commonly used to produce insulin, human growth hormone, vaccines, and medicines?
 - A. genetic engineering
 - B. bioprocessing
 - C. cell therapy
 - D. transgenesis

4. Which of the following would be the most appropriate drafting instrument for quickly drawing accurate right angles at any point on a page?
 - A. T-square
 - B. triangle
 - C. template
 - D. ruler

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5. An isometric drawing would be most appropriate to use to depict which of the following objects?
 - A. three sides of a machine part
 - B. a cross section of an automobile tire
 - C. two elevations of a building
 - D. an exploded view of a padlock

 6. Using a 3D scanner permits the acquisition of information that can be output to a(an)
 - A. analog interface module.
 - B. rapid prototyper.
 - C. computer information device.
 - D. laser engraver.

 7. A prototype is manufactured after which stage in the development of a product?
 - A. review
 - B. design proposal
 - C. evaluation
 - D. packaging design

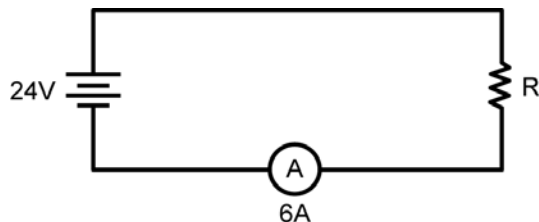
 8. Applications of the study of ergonomics have had the most significant positive effects in which of the following aspects of the workplace?
 - A. lowering production costs
 - B. increasing worker morale
 - C. reducing repetitive stress injuries
 - D. improving employee retention

 9. In automotive design, wind tunnel testing is primarily used to calculate which of the following data?
 - A. radiator air-cooling flow
 - B. cross-sectional air resistance
 - C. air intake pressures
 - D. heating system air volume

10. Which of the following is a significant environmental problem with the use of wind turbines to generate electricity?

- A. Turbine blades can kill large numbers of bats and birds.
- B. Oil leaks from turbines can pollute the ground beneath them.
- C. Air currents generated by turbine blades can create strong winds.
- D. Batteries used by turbines to store electricity can emit carbon monoxide.

11. Use the diagram below to answer the question that follows.



A resistor of unknown value is connected to a 24-volt source in a circuit with a current of 6 amps, as shown. What is the resistance in the circuit?

- A. 0.25 ohms
- B. 4 ohms
- C. 18 ohms
- D. 144 ohms

12. Compared with digital circuits, analog circuits are generally characterized by

- A. signals that are generated electronically.
- B. an ability to amplify the signal.
- C. pulses of exactly the same amplitude.
- D. voltages that vary continuously.

13. Which of the following processes involves demodulating a signal?

- A. transmitting
- B. encoding
- C. storing
- D. recovering

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14. Communication between laptop computers with wireless Internet capability and a nearby router make use of
- A. infrared light waves.
 - B. ultrasonic sound waves.
 - C. shortwave radio frequencies.
 - D. microwave radio frequencies.
15. Which of the following printing processes involves transferring images and text onto a printing plate, which then carries ink to a blanket cylinder that makes contact with the paper?
- A. screen
 - B. offset
 - C. laser
 - D. lithography
16. If an antilock braking system in an automobile fails, which two subsystems should be evaluated?
- A. hydraulic and electrical
 - B. propulsion and control
 - C. pneumatic and guidance
 - D. suspension and mechanical
17. Most international shipping is done via containerships primarily because these ships
- A. can carry more freight than bulk cargo ships.
 - B. have a shallow draft that allows them access to most harbors.
 - C. travel at much faster speeds than other ships.
 - D. save time and money in loading and unloading cargo.
18. A rotary winged aircraft would be most appropriate for performing which of the following tasks?
- A. providing inexpensive transportation for large groups of people
 - B. ferrying supplies to a landing site that is limited in area
 - C. transporting heavy cargo across a country
 - D. carrying weather instruments into a hurricane

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19. Which of the following types of machinery would be most appropriate for knurling the handle of a torque wrench?
- A. lathe
 - B. drop forge
 - C. router
 - D. injection molder
20. A job-lot manufacturing process would be most appropriate for accomplishing which of the following tasks?
- A. producing a large number of different-sized gears
 - B. making high-end shoes in a variety of sizes
 - C. creating a hundred T-shirts bearing a company's logo
 - D. assembling thousands of identical radios
21. Which of the following would most likely be considered legal negligence on the part of a manufacturer?
- A. A product fails in routine use by consumers because of misuse.
 - B. A consumer is injured when a ladder built with substandard fasteners collapses.
 - C. A company fails to warn about unanticipated uses of its products.
 - D. A manufacturer refuses to honor a warranty on a line of discontinued tools.
22. A public civil construction project differs from other types of construction in terms of
- A. materials used.
 - B. sources of financing.
 - C. regulatory restrictions.
 - D. management approaches.
23. Which of the following construction tools has most significantly reduced the amount of time it takes to frame a wooden structure?
- A. planer
 - B. electric drill
 - C. band saw
 - D. pneumatic nailer

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24. Which of the following loads on a building is considered a lateral load?
- A. live load
 - B. rain load
 - C. wind load
 - D. dead load
25. Which of the following resources would provide an instructor with the proper information for placing safety zones around machinery in a school's manufacturing laboratory?
- A. local building codes
 - B. OSHA standards
 - C. UL publications
 - D. school policy manuals
26. Along with safety glasses, which of the following is most important for students to wear when working with rotary power tools such as a lathe or drill press?
- A. hard-toed shoes
 - B. close-fitting, unfrayed clothing
 - C. heavy leather gloves
 - D. safety helmet, filtered visor
27. A class A fire extinguisher would be most appropriate for putting out a fire on which of the following types of materials?
- A. combustible metals
 - B. electrical equipment
 - C. paper products
 - D. flammable liquids
28. Geometric concepts involving triangles and the Pythagorean theorem could be incorporated most effectively into lessons that involve calculating the
- A. number of squares of shingles needed to roof a house.
 - B. rise, run, and length of rafters.
 - C. quantity of board feet of lumber needed for a project.
 - D. size and tolerances of kitchen cabinets.

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29. To maintain reliability when observing and assessing multiple students' performance on a particular task, it is most important for the teacher to use a
- A. standardized rubric or checklist.
 - B. template to record comments.
 - C. consistent time limit for all students.
 - D. commercially prepared scoring sheet.
30. Which of the following professional development activities would best help promote professionalism within a technology education teacher's field?
- A. developing mutually beneficial relationships with vendors
 - B. working in a technology-related industry
 - C. assisting newer teachers with their lesson plans
 - D. participating in conferences and industry internships

Answer Key

Question Number	Correct Response	Competency
1.	B	1
2.	C	1
3.	A	1
4.	B	2
5.	A	2
6.	B	2
7.	B	3
8.	C	3
9.	B	3
10.	A	4
11.	B	4
12.	D	4
13.	D	5
14.	D	5
15.	B	5
16.	A	6
17.	D	6
18.	B	6
19.	A	7
20.	C	7
21.	B	7
22.	B	8
23.	D	8
24.	C	8
25.	B	9
26.	B	9
27.	C	9
28.	B	10
29.	A	10
30.	D	10



Annotated Bibliography

The annotated bibliography in this section includes basic references that you may find useful in preparing for the exam. Each resource is linked to the competencies and skills found in Section 4 of this guide.

This bibliography is representative of the most important and most comprehensive texts pertaining to the competencies and skills for Engineering and Technology Education 6–12. The Florida Department of Education does not endorse these references as the only appropriate sources for review; many comparable texts currently used in teacher preparation programs also cover the competencies and skills that are tested on the exam.

1. Bertoline, G. (2009). *Introduction to graphics communications for engineers* (4th ed.). New York, NY: McGraw-Hill.
Introduces and teaches important skills and practices that engineers use when communicating through graphics, such as two-dimensional drawings and three-dimensional CAD figures. Useful for review of competencies 2 and 5.
2. Fricker, J. (2004). *Fundamentals of transportation engineering*. Upper Saddle River, NJ: Pearson Education, Inc.
Specializes in the field of transportation engineering, particularly for air and highway transportation, while including valuable information on other forms of transport such as rail and waterborne. Also includes content on economic and logistic considerations for engineers. Useful for review of competencies 1 and 6.
3. Goetsch, D.L. (2003). *Construction safety and health*. Upper Saddle River, NJ: Pearson Prentice Hall.
Focuses on the modern needs and standards surrounding the safety of workers and other professionals involved in the construction process and general compliance to the OSHA safety standards. Useful for review of competencies 8 and 9.
4. Goetsch, D.L., Chalk, W.S., Nelson, J.A., & Rickman, R.L. (2005). *Technical drawing* (5th ed.). Clifton Park, NY: Thomson Delmar Learning.
Introductory text focusing on technical drawing, its areas of focus, its symbols, and its techniques for an audience with little or no previous experience in drafting or design. Useful for review of competencies 2 and 5.

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5. Grant, A. E., & Meadows, J.H. (Eds.). (2012). *Communication technology update and fundamentals* (13th ed.). Waltham, MA: Technology Futures, Inc.
Collection of educational essays on various topics in the field of communication technologies and engineering, including digital radio, e-books, and social networking, among others. Useful for review of competency 5.
 6. International Technology Education Association. (2000). *Standards for technological literacy: Content for the study of technology*. Reston, VA: International Technology Education Association.
Establishes clear and effective standards meant to suggest what content should be taught in the field of technology education from grades K–12. Useful for review of all competencies.
 7. Kalpakjian, S., & Schmid, S.R. (2006). *Manufacturing engineering and technology* (5th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
Presents relevant topics, fundamentals, and practices used in technological education, and helps students understand the interrelations between the technical and economic factors involved in manufacturing. Useful for review of competency 7.
 8. Karsnitz, J.R., O'Brien, S., & Hutchinson, J.P. (2009). *Engineering design: An introduction*. Clifton Park, NY: Delmar Cengage.
Focuses on the development of problem-solving skills and technological literacy while presenting a variety of career possibilities in the fields of engineering design. Useful for review of competencies 1 and 10.
 9. Litowitz, L., & Brown, R.A. (2012). *Energy, power, and transportation technology* (2nd ed.). Tinley Park, IL: Goodheart-Willcox.
Studies how power, energy, and transportation affect the daily life of societies, while providing detailed examples of how these elements function and are maintained, including the resources, processes, and systems needed to ensure continued movement. Useful for review of competency 4.
 10. Madsen, D.A., & Madsen, D.P. (2012). *Engineering drawing and design* (5th ed.). Clifton Park, NY: Delmar Cengage.
Specializes in the development of a product from conception to design, as well as providing the reader valuable information regarding standards, tolerances, and other specifications. Useful for review of competencies 2 and 5.
 11. National Center for Technological Literacy. (2008). *Engineering the future: Science, technology, and the design process teacher guide*. Emeryville, CA: Key Curriculum Press.
Establishes practical, real-world connections with the science, technology, engineering, and math fields, while also promoting technological literacy in students. Useful for review of competencies 1, 3, and 10.

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- 12.** Nicholl, D. S. T. (2008). *An introduction to genetic engineering* (3rd ed.). New York, NY: Cambridge University Press.
Provides a valuable introduction to the field of genetic engineering, including fundamental knowledge, technical processes used, and cutting edge topics in the field, such as genetic modification and cloning. Useful for review of competency 1.
 - 13.** Petrina, S. (2007). *Advanced teaching methods for the technology classroom*. Hershey, PA: Idea Group, Inc.
Methods and techniques used in the teaching of technology, from the design of technology education curricula and assessments, to addressing issues related to classroom management. Useful for review of competency 10.
 - 14.** Pond, R., & Rankinen, J. (2009). *Introduction to engineering technology* (7th ed.). Columbus, OH: Pearson Education, Inc.
Covers a number of valuable skills for any student of engineering technology, including vital math skills and calculator use, graphing, report writing, as well as computer skills used in manufacturing and prototyping. Useful for review of competencies 1, 3, and 10.
 - 15.** Rogers, G., Wright, M., & Yates, B. (2010). *Gateway to engineering*. Clifton Park, NY: Delmar Cengage.
Places special emphasis on problem-solving skills and challenges students with hands-on activities to improve understanding of topics such as use of energy, modeling and communicating ideas, as well as production systems. Useful for review of competencies 1, 3, and 10.
 - 16.** Schey, J.A. (2000). *Introduction to manufacturing processes* (3rd ed.). New York, NY: McGraw Hill.
Collects and addresses a wealth of manufacturing processes used in the development and creation of parts, while also covering the physical and chemical properties of materials and the mathematical means used to measure changes in matter. Useful for review of competencies 3 and 7.
 - 17.** Wright, R.T. (2012). *Technology and engineering: Teacher's edition* (6th ed.). Tinley Park, IL: Goodheart-Willcox.
Comprehensive reference resource for addressing general technological and engineering processes and concepts. Useful for review of competencies 1, 3, and 10.



Additional Information

Please visit the following website to review FTCE registration details and to find additional FTCE information, including test locations and passing scores.

www.fldoe.org/accountability/assessments/postsecondary-assessment/ftce/