



# Indiana Content Standards for Educators

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## ENGINEERING AND TECHNOLOGY EDUCATION

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Engineering and technology education teachers are expected to have a broad and comprehensive understanding of the knowledge and skills needed for this educator license, and to use that knowledge to help students prepare for the challenges and opportunities of the twenty-first century. This requires the ability to identify, comprehend, analyze, synthesize, and evaluate the basic principles, fundamental concepts, and essential content defined in these standards, and to apply that knowledge to the tasks of planning and delivering effective instruction and assessment.

# Table of Contents

Engineering and Technology Education Educator Standards .....	1
Selected Bibliography of Standards and Sources Related to Engineering and Technology Education .....	6
Alignment of Educator Standards with State and National Standards.....	8

# Engineering and Technology Education Educator Standards

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## **Standard 1: Nature of Engineering and Technology**

Engineering and technology education teachers have a broad and comprehensive understanding of the historical, cultural, political, societal, and economic roles of engineering and technology.

## **Standard 2: The Engineering Design Process**

Engineering and technology education teachers have a broad and comprehensive understanding of the characteristics of the engineering design process and its role in technology systems.

## **Standard 3: Energy Systems and Power Systems**

Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in energy systems and power systems and the scientific and engineering principles underlying these systems.

## **Standard 4: Communication Systems**

Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in communication systems and the scientific and engineering principles underlying these systems.

## **Standard 5: Transportation Systems**

Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in transportation systems and the scientific and engineering principles underlying these systems.

## **Standard 6: Manufacturing Systems**

Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in manufacturing systems and the scientific and engineering principles underlying these systems.

## **Standard 7: Construction Systems**

Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in construction systems and the scientific and engineering principles underlying these systems.

## **Standard 8: Biotechnology Systems and Medical Systems**

Engineering and technology education teachers have a broad and comprehensive understanding of the basic tools, equipment, materials, and procedures used in biotechnology systems and medical systems and the scientific and engineering principles underlying these systems.

## **Standard 9: Instruction and Assessment in Engineering and Technology Education**

Engineering and technology education teachers have a broad and comprehensive understanding of content-specific instruction and assessment in engineering and technology education.

## Engineering and Technology Education Educator Standards

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The Indiana Educator Standards for Engineering and Technology Education describe the knowledge and skills that teachers need to help students achieve the learning outcomes defined by the Indiana Academic Standards for Technology Education. A link to relevant portions of the Indiana Academic Standards can be found below.

[Technology Education](#)

# Engineering and Technology Education Educator Standards

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## Standard 1: Nature of Engineering and Technology

**Engineering and technology education teachers have a broad and comprehensive understanding of the historical, cultural, political, societal, and economic roles of engineering and technology, including:**

- 1.1** the interrelationships among technology, science, mathematics, and engineering
- 1.2** the historical, cultural, political, societal, and economic contexts of engineering and technology
- 1.3** the effects of engineering and technology on the environment
- 1.4** the role of society and government in regulating and influencing engineering and technology
- 1.5** the role of business, business management, and professionalism in engineering and technology

## Standard 2: The Engineering Design Process

**Engineering and technology education teachers have a broad and comprehensive understanding of the characteristics of the engineering design process and its role in technology systems, including:**

- 2.1** the systems model and steps in the engineering design process
- 2.2** applications of the engineering design process
- 2.3** troubleshooting technology systems
- 2.4** the role of research and development, innovation, and experimentation in technology systems
- 2.5** the role of quality control in technology systems

## Standard 3: Energy Systems and Power Systems

**Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in energy systems and power systems and the scientific and engineering principles underlying these systems, including:**

- 3.1** principles of science and engineering in energy and power systems
- 3.2** tools, equipment, and materials used in energy and power systems
- 3.3** processes and procedures used in energy and power systems

## Engineering and Technology Education Educator Standards

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### Standard 4: Communication Systems

Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in communication systems and the scientific and engineering principles underlying these systems, including:

- 4.1** principles of science and engineering in communication systems
- 4.2** tools, equipment, and materials used in communication systems
- 4.3** processes and procedures used in communication systems

### Standard 5: Transportation Systems

Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in transportation systems and the scientific and engineering principles underlying these systems, including:

- 5.1** principles of science and engineering in transportation systems
- 5.2** tools, equipment, and materials used in transportation systems
- 5.3** processes and procedures used in transportation systems

### Standard 6: Manufacturing Systems

Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in manufacturing systems and the scientific and engineering principles underlying these systems, including:

- 6.1** principles of science and engineering in manufacturing systems
- 6.2** tools, equipment, and materials used in manufacturing systems
- 6.3** processes and procedures used in manufacturing systems

### Standard 7: Construction Systems

Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in construction systems and the scientific and engineering principles underlying these systems, including:

- 7.1** principles of science and engineering in construction systems
- 7.2** tools, equipment, and materials used in construction systems
- 7.3** processes and procedures used in construction systems

## Engineering and Technology Education Educator Standards

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### Standard 8: Biotechnology Systems and Medical Systems

Engineering and technology education teachers have a broad and comprehensive understanding of the basic tools, equipment, materials, and procedures used in biotechnology systems and medical systems and the scientific and engineering principles underlying these systems, including:

- 8.1** principles of science and engineering in biotechnology and medical systems and in biotechnology and medical products
- 8.2** tools, equipment, and materials used in biotechnology and medical systems
- 8.3** processes and procedures used in biotechnology and medical systems
- 8.4** legal and ethical considerations in biotechnology and medical systems

### Standard 9: Instruction and Assessment in Engineering and Technology Education

Engineering and technology education teachers have a broad and comprehensive understanding of content-specific instruction and assessment in engineering and technology education, including:

- 9.1** the Indiana Academic Standards for Technology Education
- 9.2** the ITEA/CTTE/NCATE Curriculum Standards and the ISTE National Educational Technology Standards
- 9.3** instructional strategies and resources for promoting students' understanding of concepts and skills related to engineering and technology and their relationship to other academic fields
- 9.4** strategies and skills for planning and designing engineering and technology education instruction, including the use of techniques and approaches that meet the needs of diverse learners
- 9.5** instructional strategies to promote student learning and to foster the development of critical-thinking, problem-solving, and performance skills in engineering and technology education
- 9.6** communication methods that promote student learning and foster active inquiry, interaction, and collaboration in the engineering and technology education classroom
- 9.7** strategies and skills for selecting, adapting, and using technological resources to support teaching and learning about engineering and technology
- 9.8** ways to design, create, and manage safe and effective laboratories and learning environments that promote students' success
- 9.9** strategies and skills for effectively assessing students' understanding and mastery of concepts and skills essential to engineering and technology as well as relevant out-of-content-area concepts
- 9.10** strategies and skills for using assessment data to adjust and modify instruction for diverse learners

## Selected Bibliography of Standards and Sources Related to Engineering and Technology Education

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### State and National Standards and Curriculum Frameworks

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3. International Society for Technology in Education (ISTE). (2008). *National educational technology standards for teachers*. [http://www.iste.org/Libraries/PDFs/NETS\\_for\\_Teachers\\_2008\\_EN.sflb.ashx](http://www.iste.org/Libraries/PDFs/NETS_for_Teachers_2008_EN.sflb.ashx)
4. International Technology Education Association (ITEA)/Council on Technology Teacher Education (CTTE)/National Council for Accreditation of Teacher Education (NCATE). (2003). *ITEA/CTTE/NCATE curriculum standards: Initial programs in technology teacher education*. Reston, VA: ITEA/CTTE. <http://www.cteonline.org/accreditation/NCATEStandards10.03.pdf>

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9. Fricker, J. D., & Whitford, R. K. (2005). *Fundamentals of transportation engineering: A multimodal systems approach*. Upper Saddle River, NJ: Pearson Prentice Hall.
10. Kalpakjian, S., & Schmid, S. (2010). *Manufacturing engineering & technology* (6th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
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15. Hacker, M., & Burghardt, D. (2004). *Technology education: Learning by design*. Upper Saddle River, NJ: Pearson Prentice Hall.

## Selected Bibliography of Standards and Sources Related to Engineering and Technology Education

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### Sources on Student Learning and Pedagogical Methodology

16. International Technology Education Association (ITEA) and its Technology for All Americans Project. (2006). *Technological literacy for all: A rationale and structure for the study of technology* (2nd ed.). Reston, VA: International Technology Education Association.
17. Rose, M. A. (2007). Perceptions of technological literacy among science, technology, engineering, and mathematics leaders. *Journal of Technology Education*, 19(1), 35–52.
18. Gattie, D. K., & Wicklein, R. C. (2007). Curricular value and instructional needs for infusing engineering design into K–12 technology education. *Journal of Technology Education*, 19(1), 6–18.
19. International Technology Education Association (ITEA) and its Technology for All Americans Project. (2005). *Planning learning: Developing technology curricula*. Reston, VA: International Technology Education Association.
20. National Research Council. (2000). *Educating teachers of science, mathematics, and technology: New practices for the new millennium*. Washington, DC: National Academies Press.

## Alignment of Educator Standards with State and National Standards

Indiana Educator Standards for Engineering and Technology Education	Indiana Academic Standards for Technology Education	Standards for Technological Literacy	ITEA/CTTE/ NCATE Curriculum Standards	ISTE National Educational Technology Standards
<p><b><u>Standard 1: Nature of Engineering and Technology</u></b></p> <p>Engineering and technology education teachers have a broad and comprehensive understanding of the historical, cultural, political, societal, and economic roles of engineering and technology.</p>	1, 3, 6, 15, 16, 19	1–7	1, 2, 4	4
<p><b><u>Standard 2: The Engineering Design Process</u></b></p> <p>Engineering and technology education teachers have a broad and comprehensive understanding of the characteristics of the engineering design process and its role in technology systems.</p>	2, 4–10, 14, 16	8–11	3, 4	
<p><b><u>Standard 3: Energy Systems and Power Systems</u></b></p> <p>Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in energy systems and power systems and the scientific and engineering principles underlying these systems.</p>	4, 11–14, 16, 17, 18	12, 13, 16	5	
<p><b><u>Standard 4: Communication Systems</u></b></p> <p>Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in communication systems and the scientific and engineering principles underlying these systems.</p>	4, 11–14, 16, 17, 18	12, 13, 17	5	

## Alignment of Educator Standards with State and National Standards

Indiana Educator Standards for Engineering and Technology Education	Indiana Academic Standards for Technology Education	Standards for Technological Literacy	ITEA/CTTE/ NCATE Curriculum Standards	ISTE National Educational Technology Standards
<p><b><u>Standard 5: Transportation Systems</u></b></p> <p>Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in transportation systems and the scientific and engineering principles underlying these systems.</p>	4, 11–14, 16, 17, 18	12, 13, 18	5	
<p><b><u>Standard 6: Manufacturing Systems</u></b></p> <p>Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in manufacturing systems and the scientific and engineering principles underlying these systems.</p>	4, 11–14, 16, 17, 18	12, 13, 19	5	
<p><b><u>Standard 7: Construction Systems</u></b></p> <p>Engineering and technology education teachers have a broad and comprehensive understanding of tools, equipment, materials, and procedures used in construction systems and the scientific and engineering principles underlying these systems.</p>	4, 11–14, 16, 17, 18	12, 13, 20	5	
<p><b><u>Standard 8: Biotechnology Systems and Medical Systems</u></b></p> <p>Engineering and technology education teachers have a broad and comprehensive understanding of the basic tools, equipment, materials, and procedures used in biotechnology systems and medical systems and the scientific and engineering principles underlying these systems.</p>	4, 11–14, 16, 17, 19	4, 15	5	

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Indiana Educator Standards for Engineering and Technology Education	Indiana Academic Standards for Technology Education	Standards for Technological Literacy	ITEA/CTTE/ NCATE Curriculum Standards	ISTE National Educational Technology Standards
<p><b><u>Standard 9: Instruction and Assessment in Engineering and Technology Education</u></b></p> <p>Engineering and technology education teachers have a broad and comprehensive understanding of content-specific instruction and assessment in engineering and technology education.</p>			6-9	1a-1d; 2a-2d; 3a-3d; 4a-4d; 5a-5d