

Computer Science Foundations

Level: 1

Career Cluster: Digital Technology

Program: Information Technology

Pathway(s): Coding, Networking Systems and Security, Web Design

Course Catalog Description

Introduces students to core concepts and career pathways in information technology, including computing systems, cybersecurity, networking, web design, and programming. Students build foundational technical knowledge and computational thinking skills through hands-on learning.

Summary

Introductory course that provides students with broad exposure to the core concepts, tools, and career pathways within information technology. Students explore computing systems, digital safety, cybersecurity, networking, web design, programming, and computational thinking while developing problem-solving, collaboration, and professional communication skills. Through hands-on activities and pathway-connected projects, learners examine how technology systems function, how digital tools are used to solve real-world problems, and how responsible technology use supports academic and workplace success. The course also introduces students to postsecondary opportunities, industry expectations, and foundational technical skills that prepare them for continued study in coding, networking systems and security, and web design. Students also begin to understand how different areas of information technology connect to one another within modern digital environments.

Notes

This updated course expands the previous course into a broader and more clearly organized introduction to Information Technology. While the earlier course focused on foundational safety practices, career exploration, basic electronics, internet concepts, introductory cybersecurity, and beginning web topics, the revised course is structured into more detailed learning strands that better reflect current pathway expectations. In addition to strengthening core content related to computing systems, networks, and cybersecurity, the new version adds clearer emphasis on digital citizenship, responsible technology use, cloud technologies, programming and computational thinking, user experience and accessibility in web design, leadership development, and integrated project-based learning. Overall, the revision modernizes the course by creating a more comprehensive foundation that better prepares students for continued study in coding, networking systems and security, and web design pathways. It also creates clearer connections between technical content, career readiness, and real-world application across the full scope of the course.

Student Learning Outcomes

1. Career Exploration and Postsecondary Opportunities

Objective: *Students will analyze career pathways in information technology, exploring industry roles, workplace expectations, required education, certifications, professional organizations, and postsecondary opportunities available in Colorado in order to make informed academic and career decisions.*

- 1) Identify employment opportunities in various fields with a focus in the area of information technology
 - a. Recognize the work typically performed, tools and technology used, and nature of work environments
 - b. Identify potential certifications within the careers
 - c. Find membership organizations associated with the careers
 - d. Understand the necessary education associated within the careers
- 2) Define professionalism within the context of information technology
 - a. Criticism and evaluation
 - b. Presentation
 - c. Assessment
- 3) Recognize laws, regulations, and ethics significant to the fields of information technology
- 4) Identify postsecondary opportunities offered in the state of Colorado
 - a. Technical college, community college, 4-year institutions
 - b. Certificates, associates, bachelor, and advanced degree opportunities

2. Digital Safety, Citizenship, and Responsible Technology Use

Objective: *Students will apply safe, ethical, and responsible practices when using computing technologies, digital resources, and classroom equipment.*

- 5) Identify classroom, equipment, electrical, and internet safety procedures.
- 6) Interpret safety rules, OSHA-related expectations, and appropriate digital-use guidelines.
- 7) Demonstrate safe handling of computers, peripherals, tools, and devices.
- 8) Explain the importance of privacy, copyright, intellectual property, and acceptable use policies.
- 9) Analyze ethical issues related to technology use, including plagiarism, piracy, and misuse of digital resources.
- 10) Evaluate online behaviors for appropriateness, safety, and long-term digital footprint implications.
- 11) Apply responsible decision-making when communicating, collaborating, and sharing information online.

3. Information Technology Careers and Professional Skills

Objective: *Students will examine IT career pathways and develop foundational workplace habits, communication skills, and professional awareness.*

- 12) Describe major fields within information technology, including coding, cybersecurity, networking, and web design.
- 13) Compare job roles, work environments, and core responsibilities across IT pathways.
- 14) Research certifications, postsecondary options, and training routes connected to IT careers.
- 15) Identify professional organizations and industry opportunities within the field.
- 16) Summarize the education, technical skills, and employability skills required in selected IT careers.
- 17) Analyze how teamwork, communication, and problem-solving contribute to workplace success.
- 18) Demonstrate professional communication strategies appropriate for clients, peers, and technical teams.
- 19) Develop a personal academic and career plan aligned to an IT pathway of interest.

4. Computing Systems, Hardware, and Digital Logic

Objective: *Students will explain how computing systems function by examining hardware components, digital logic, data representation, and basic electronic principles.*

- 20) Identify major computer hardware components and describe their functions.
- 21) Differentiate between input, output, processing, storage, and networking devices.
- 22) Explain how data is represented using binary and hexadecimal systems.
- 23) Convert simple values between binary, decimal, and hexadecimal forms.
- 24) Explain the purpose of logic gates in computing and digital circuits.
- 25) Describe the relationship between hardware, software, and the operating system.
- 26) Analyze how internal components work together to process and store information.
- 27) Troubleshoot basic hardware-related issues using a systematic process.

5. The Internet, Networks, and Cloud Technologies

Objective: *Students will investigate how computers connect and communicate through networks, internet infrastructure, and cloud-based systems.*

- 28) Outline the evolution of the internet and its impact on communication and society.
- 29) Define key internet and networking terms such as DNS, ISP, server, protocol, and cloud computing.
- 30) Compare common types of networks and explain client-server environments.
- 31) Describe the role of operating systems in managing hardware, software, and network resources.
- 32) Explain cloud computing roles, including customer, provider, and partner.
- 33) Compare public, private, community, and hybrid cloud deployment models.
- 34) Describe how virtualization, storage, databases, and networking support cloud services.
- 35) Analyze how connected technologies such as the Internet of Things affect data collection and system performance.
- 36) Evaluate the advantages and limitations of cloud-based services for individuals and organizations.

6. Data, Privacy, and Cybersecurity Fundamentals

Objective: *Students will evaluate how data is protected and apply foundational cybersecurity concepts to personal, academic, and organizational technology environments.*

- 37) Explain the principles of confidentiality, integrity, and availability.
- 38) Identify common security threats, vulnerabilities, and internet-based attacks.
- 39) Describe the purpose of encryption, authentication, and secure protocols.
- 40) Recognize personal and organizational practices that reduce the risk of security breaches.
- 41) Compare personal privacy expectations with employer rights and organizational security policies.
- 42) Analyze the impact of malware, phishing, weak passwords, and insecure networks.
- 43) Apply best practices for password security, account protection, and device security.
- 44) Evaluate the effectiveness of cybersecurity strategies in different scenarios.
- 45) Develop a basic cybersecurity awareness plan for safe technology use.

7. Web Design, Digital Communication, and User Experience

Objective: *Students will create and evaluate digital content for the web using design principles, audience awareness, and effective communication strategies.*

- 46) Explain the stages of the web design and development process.
- 47) Identify the roles and responsibilities of team members in a web project.
- 48) Apply a troubleshooting process to diagnose and solve design or development issues.
- 49) Create flowcharts and planning documents to guide the development of digital solutions.
- 50) Use appropriate writing styles and communication techniques for web publication.
- 51) Organize files and folders to maintain an effective website directory structure.
- 52) Create a simple website using a content management system or other introductory web development tool.
- 53) Evaluate websites for clarity, usability, and audience purpose.
- 54) Apply basic visual design principles such as alignment, contrast, repetition, and proximity.
- 55) Incorporate accessibility and inclusive design features into digital content.
- 56) Revise web content based on peer, client, or user feedback.

8. Programming, Algorithms, and Computational Thinking

Objective: *Students will use computational thinking to design, test, and improve simple algorithms and programs.*

- 57) Explain why multiple programming languages exist and how they are used for different purposes.
- 58) Describe the steps of the software development life cycle and explain why it is iterative.
- 59) Define algorithms, variables, inputs, outputs, conditionals, and loops.
- 60) Design algorithms that solve simple real-world problems.

- 61) Create flowcharts or pseudocode to represent program logic.
- 62) Develop simple programs using sequence, selection, and iteration.
- 63) Test and debug programs to identify and correct errors.
- 64) Analyze the efficiency and accuracy of a solution based on program output.
- 65) Modify existing code to improve functionality or readability.
- 66) Reflect on how computational thinking supports innovation across IT fields.

9. Integrated Project and Pathway Reflection

Objective: *Students will synthesize semester learning by planning, developing, and presenting a project connected to an Information Technology pathway.*

- 67) Plan a project that integrates concepts from computing systems, networks, web design, cybersecurity, or programming.
- 68) Apply technical and professional skills to complete a project individually or collaboratively.
- 69) Document project goals, processes, challenges, and revisions.
- 70) Present technical information clearly to an identified audience.
- 71) Evaluate the strengths and limitations of the completed project.
- 72) Justify how the project connects to a future IT pathway or career interest.
- 73) Compile evidence of learning in a digital portfolio or presentation format.

10. Leadership Development in Information Technology

Objective: *Students will develop leadership skills and professional behaviors necessary to effectively contribute to teams, manage projects, and demonstrate ethical responsibility within Information Technology environments.*

- 74) Describe the role of leadership in Information Technology settings and collaborative teams.
- 75) Identify key leadership traits, including integrity, initiative, accountability, adaptability, and ethical decision-making.
- 76) Explain the purpose and impact of Career and Technical Student Organizations (CTSOs) in developing leadership and technical skills.
- 77) Demonstrate effective teamwork strategies, including collaboration, active listening, and constructive feedback.
- 78) Apply conflict resolution strategies to address challenges within team-based projects.
- 79) Demonstrate leadership behaviors during group tasks, including:
 - a. facilitating team discussions
 - b. delegating responsibilities
 - c. supporting team members
- 80) Analyze how leadership styles impact team dynamics and project outcomes.
- 81) Evaluate personal leadership strengths and areas for growth through reflection and feedback.
- 82) Apply ethical decision-making frameworks to scenarios involving technology use and professional conduct.
- 83) Demonstrate professional communication skills appropriate for leadership roles in technical environments.

84) Model inclusive leadership practices that promote teamwork, diversity, and equity in collaborative settings.

11. Work-Based Learning

Objective: *Students will apply technical knowledge and demonstrate professional behaviors through participation in real-world work experiences within the Information Technology pathway.*

85) Describe what work-based learning is and how it connects school learning to real jobs.

86) Participate in real-world experiences such as field trips, guest speakers, internships, mentorships, or client-based projects.

87) Follow directions and complete basic tasks in a workplace or with a client.

88) Demonstrate appropriate behavior and communication when working with supervisors or team members.

89) Use basic technical skills to complete assigned tasks.

90) Ask questions and respond to feedback during work activities.

91) Record simple information about tasks completed and tools used.

92) Explain what was learned from a work-based learning experience.

12. Career and Technical Student Organizations

Objective: *Using the [CTSO Resource Document](#), chapter activities will provide some of the best opportunities CTSO members will have to learn by doing. A successful [program of work](#) creates a positive learning atmosphere in the classroom. CTSO members learn how to accept responsibility, work as a team, manage a budget, and handle success and failure. Per the CTE Admin Handbook, CTSOs are embedded into curriculum.*

Professional Development

Prepare each member for entry into the workforce and provide a foundation for success in a career. Becoming a professional does not stop with acquiring a skill, but involves an increased awareness of the meaning of good citizenship and the importance of labor and management in the world of work.

Community Service

Promote and improve goodwill and understanding among all segments of the community through services donated by CTSO chapters, and to instill in its members a lifetime commitment to community service.

Business and Industry Connections

Increase awareness of quality job practices and attitudes, and increase the opportunities for employer engagement and eventual employment.

Financial Leadership

Plan and participate in activities to allow all members to carry out the chapter's projects. Educate members on their own personal finance for current and future success.

Public Relations

Make the general public aware of the good work that students in career and technical education are doing to better themselves and their community, state, nation, and world.

Social Activities

To increase cooperation in the school and community through activities that allow CTSO members to get to know each other in something other than a business or classroom setting.

Academic Standards Alignment

Colorado CTE courses are required to integrate academic and essential skills into course content. The following academic standards have been identified as aligned to this course and should be integrated throughout instruction.

[CO CTE Academic Standards Resources](#) (Rubrics, integration strategies, etc)

[CDE Colorado Academic Standards Online](#) (Online standards lookup tool)

Note: Mathematics and Science standards will be added in the future. Visit the [Colorado Academic Standards](#) page for the most current version.

Reading, Writing and Communicating Crosswalk

Course: Computer Science Foundations

Colorado Academic Standards – Reading, Writing, and Communicating

Standard	Prepared Graduate Competency	Description	Course Evidence / Alignment
Standard 1: Oral Expression and Listening	Prepared Graduate 1 – Collaboration	Collaborate effectively as group members or leaders	Students engage in teamwork, project management activities, and collaborative problem-solving while exploring computer science pathways and concepts.
Standard 1: Oral Expression and Listening	Prepared Graduate 2 – Oral Presentations	Deliver effective oral presentations	Students discuss and explain computer science concepts, career pathways, ethical issues, and project outcomes to peers and instructors.
Standard 2: Reading for All Purposes	Prepared Graduate 4 – Informational Texts	Read a wide range of informational texts	Students read and interpret informational and technical texts related to computer science, safety guidelines, hardware, internet technologies, and

			career documentation.
Standard 2: Reading for All Purposes	Prepared Graduate 5 – Language in Context	Understand how language functions in different contexts	Students use and interpret computing terminology and adapt communication for technical, academic, and professional contexts.
Standard 3: Writing and Composition	Prepared Graduate 7 – Informational Writing	Craft informational/explanatory texts	Students write explanations, summaries, and reflections describing computer science concepts, systems, and career pathways.
Standard 3: Writing and Composition	Prepared Graduate 9 – Writing Process	Demonstrate mastery of the writing process	Students revise and refine written work to clearly and accurately communicate technical and conceptual understanding.
Standard 4: Research Inquiry and Design	Prepared Graduate 10 – Research and Ethics	Gather and ethically use information	Students research IT careers, technologies, and ethical issues, evaluate sources, and apply information responsibly and ethically.

Free Resource Links

1. Career Exploration and Postsecondary Opportunities

- My Colorado Journey (career exploration, Colorado pathways, training programs)
<https://cwdc.colorado.gov/resources/my-colorado-journey>
- Career Pathways (industry pathways, in-demand careers, Colorado workforce)
<https://cwdc.colorado.gov/strategies/career-pathways>
- Office of Postsecondary and Workforce Readiness (postsecondary planning, apprenticeships, college and career readiness)
<https://ed.cde.state.co.us/postsecondary>
- O*NET OnLine (occupation research, skills, job requirements)
<https://www.onetonline.org/>

2. Digital Safety, Citizenship, and Responsible Technology Use

- Common Sense Education Digital Citizenship (digital safety, online behavior, responsible technology use)
<https://www.commonsense.org/education/digital-citizenship>
- Google Safety Center (privacy, security, digital protection)
<https://safety.google>
- StopBullying Cyberbullying Resources (online safety, digital behavior, prevention)
<https://www.stopbullying.gov/cyberbullying>
- FTC Consumer Information Online Safety (privacy, fraud prevention, digital security)
<https://consumer.ftc.gov/topics/online-security>

3. Information Technology Careers and Professional Skills

- CareerOneStop Explore Careers (career pathways, job skills, workforce readiness)
<https://www.careeronestop.org>
- O*NET OnLine Career Exploration (occupations, skills, job requirements)
<https://www.onetonline.org>
- Bureau of Labor Statistics Occupational Outlook (career outlook, salary, job growth)
<https://www.bls.gov/ooh>

4. Computing Systems, Hardware, and Digital Logic

- Khan Academy Computer Science (hardware basics, binary, logic)
<https://www.khanacademy.org/computing/computer-science>
- BBC Bitesize Computer Systems (hardware, components, system functions)
<https://www.bbc.co.uk/bitesize>
- HowStuffWorks Computers (computer components, digital logic, systems)
<https://computer.howstuffworks.com>
- All About Circuits Digital Logic (logic gates, circuits, electronics basics)
<https://www.allaboutcircuits.com>

5. The Internet Networks and Cloud Technologies

- Cisco Networking Basics (network fundamentals, communication, infrastructure)
<https://www.netacad.com/courses/networking-basics>
- Cloudflare Learning Center (internet basics, DNS, networking concepts)
<https://www.cloudflare.com/learning>
- Google Cloud Basics (cloud computing, services, infrastructure)
<https://cloud.google.com/learn>
- IBM Cloud Education (cloud models, computing systems, virtualization)
<https://www.ibm.com/cloud/learn>

6. Data Privacy and Cybersecurity Fundamentals

- Cybersecurity and Infrastructure Security Agency Resources (cybersecurity, risk awareness, protection)
<https://www.cisa.gov>
- National Initiative for Cybersecurity Careers (cybersecurity careers, skills, pathways)
<https://niccs.cisa.gov>
- Stay Safe Online (cybersecurity, online safety, personal protection)
<https://staysafeonline.org>
- Kaspersky Cybersecurity Basics (threats, malware, protection strategies)
<https://www.kaspersky.com/resource-center>

7. Web Design Digital Communication and User Experience

- Google Web Fundamentals (web design, responsive development, UX basics)
<https://web.dev>
- Mozilla Developer Network Web Docs (HTML, CSS, web development fundamentals)
<https://developer.mozilla.org>
- W3Schools Web Design Tutorials (web development, coding basics, design principles)
<https://www.w3schools.com>
- Canva Design School (visual design, layout, communication principles)
<https://www.canva.com/learn>

8. Programming Algorithms and Computational Thinking

- Code.org Computer Science Fundamentals (programming basics, algorithms, concepts)
<https://code.org>
- Scratch Programming (block coding, computational thinking, problem solving)
<https://scratch.mit.edu>
- Khan Academy Programming (coding, algorithms, logic)
<https://www.khanacademy.org/computing/computer-programming>
- freeCodeCamp Learn to Code (programming fundamentals, problem solving, algorithms)
<https://www.freecodecamp.org>

9. Integrated Project and Pathway Reflection

- Google Applied Digital Skills (projects, problem solving, real world applications)
<https://applieddigitalskills.withgoogle.com>
- Code.org Project Gallery (student projects, application examples, coding projects)
<https://studio.code.org/projects>
- MIT App Inventor Projects (project ideas, app development, real world applications)
<https://appinventor.mit.edu/explore/gallery>
- Adobe Express Student Projects (creative projects, digital storytelling, presentations)
<https://www.adobe.com/express/education>

10. Leadership Development in Information Technology

- Lead4Change Leadership Program (leadership skills, teamwork, project based learning)
<https://lead4change.org>
- Barclays LifeSkills Leadership Lessons (communication, teamwork, leadership development)
<https://barclayslifeskills.com>
- MindTools Leadership Skills (leadership strategies, decision making, communication)
<https://www.mindtools.com>
- SkillsYouNeed Leadership Skills (teamwork, leadership development, communication skills)
<https://www.skillsyouneed.com>

11. Work Based Learning

- Advance CTE Resource Center (work based learning, career readiness, program resources)
<https://careertech.org/resource-center>
- OCTAE Work Based Learning Toolkit (workplace learning, employer engagement, program design)
<https://octae.ed.gov/wbltoolkit>
- O.NET Career Exploration Tools (occupations, skills, workforce readiness)
<https://www.onetonline.org>
- CareerOneStop Work Based Learning Resources (career exploration, job skills, workforce readiness)
<https://www.careeronestop.org>



Technology Student Association – National Competitive Events

Technology Bowl

Objective: *Students will build broad knowledge of TSA, STEM concepts, technology standards, and information technology topics to compete in the TSA Technology Bowl written test and team question/response format.*

- Study TSA history, competitive events, leadership concepts, and technology-content standards.
- Build foundational knowledge across science, technology, engineering, mathematics, and applied technology topics.
- Work as a three-person team to prepare for individual testing and team-based competition.
- Complete practice questions that require accuracy, recall, reasoning, and quick decision-making.
- Analyze missed questions to identify gaps in technology, engineering, and TSA knowledge.
- Practice head-to-head question/response procedures for semifinal-style competition.
- Evaluate team performance using accuracy, collaboration, preparation, and communication criteria.

Resources

- Technology Student Association – Technology Bowl competition guidelines
<https://tsaweb.org/competitions-programs/tsa/themes-problems>
- Technology Student Association – About TSA
<https://tsaweb.org/about>
- Khan Academy – Computing foundations
<https://www.khanacademy.org/computing>
- GCFLearnFree – Computer basics and technology tutorials
<https://edu.gcfglobal.org/>



Technology Student Association – National Competitive Events

Webmaster

Objective: *Students will design, build, launch, and explain a multi-page website that addresses the annual TSA Webmaster design challenge.*

- Research the annual Webmaster topic and identify the website's purpose, audience, content needs, and design requirements.
- Plan the website structure using a sitemap, wireframes, page layouts, or other web design planning tools.
- Develop a multi-page website that communicates the team's solution to the annual theme and problem.
- Apply web design practices related to navigation, accessibility, usability, visual consistency, and responsive layout.
- Launch the website on a publicly accessible web server according to TSA submission requirements.
- Test the website for functionality, links, layout, readability, and access issues before submission.
- Participate in an interview explaining the website, design choices, research, and development process.

Resources

- Technology Student Association – Webmaster competition guidelines
<https://tsaweb.org/competitions-programs/tsa/themes-problems>
- Mozilla Developer Network – HTML, CSS, and JavaScript documentation
<https://developer.mozilla.org/>
- W3Schools – Web development tutorials
<https://www.w3schools.com/>
- GitHub Pages – Website hosting for student projects
<https://pages.github.com/>



Technology Student Association – National Competitive Events

Coding

Objective: *Students will demonstrate coding knowledge and develop a software solution to an on-site programming challenge aligned with TSA Coding competition requirements.*

- Study coding concepts such as syntax, data structures, control flow, algorithms, and object-oriented programming.
- Prepare for an individual coding-concepts test used to determine semifinalist placement.
- Analyze an on-site coding problem, evaluation criteria, required tools, and programming constraints.
- Design and develop a software solution within the allotted competition time.
- Use an approved programming language, operating system, or API specified for the challenge.
- Test and debug the program to improve accuracy, functionality, and efficiency.
- Present the completed solution for objective testing and judge evaluation.

Resources

- Technology Student Association – Coding competition guidelines
<https://tsaweb.org/competitions-programs/tsa/themes-problems>
- Code.org – Computer science and programming lessons
<https://code.org/>
- freeCodeCamp – Programming tutorials and practice
<https://www.freecodecamp.org/>
- W3Schools – Programming references and examples
<https://www.w3schools.com/>