Computer Systems

Level: 2
Career Cluster: Digital Technology
Program: Information Technology
Pathway(s): Networking Systems and Security

Course Catalog Description

Course that introduces students to the components and functions of computer hardware, operating systems, and software systems used in modern computing environments. Students apply foundational skills in system configuration, device management, networking, security, troubleshooting, and technical support to maintain efficient and reliable computer systems while developing professional communication and problem-solving abilities.

Summary

Course that develops students' understanding of how computer hardware, operating systems, and software systems work together to support modern computing environments. Students explore system architecture, internal components, operating system configuration, storage, networking fundamentals, and cybersecurity practices while building hands-on skills in assembling, configuring, maintaining, and troubleshooting computer systems. Through applied learning, students manage files, devices, and system resources, diagnose and resolve technical issues, and implement best practices for system security and data protection. The course also emphasizes professional communication and customer support skills, preparing students to assist users and document technical processes effectively. Students engage in real-world scenarios and collaborative projects that strengthen problem-solving, teamwork, and technical reasoning, culminating in a comprehensive project that demonstrates their ability to design, configure, and support a complete computer system solution.

Notes

The updated course reflects a clear shift from a traditional, certification-focused model to a more comprehensive and instructionally structured program that balances technical skills with conceptual understanding and professional practice. The original course primarily emphasized hands-on competencies aligned to CompTIA A+ topics, including hardware installation, operating system configuration, networking basics, security practices, and troubleshooting tasks, often presented as discrete technical skills . In contrast, the revised course reorganizes these topics into clearly defined learning sections with explicit objectives and measurable student outcomes, improving coherence and progression across the semester. The updated version expands the depth of instruction by emphasizing system architecture, resource management, data storage strategies, and integrated cybersecurity practices, while also strengthening problem-solving through structured troubleshooting and diagnostic processes.

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. Computer Hardware and System Architecture

Objective: *Students will identify, explain, and apply knowledge of internal computer components and system architecture in order to assemble, configure, and maintain functional computer systems.*

5) Identify and describe the function of major internal computer hardware components
6) Differentiate among motherboards, processors, memory, storage devices, and power supplies
7) Explain how hardware components work together to support system performance
8) Demonstrate proper procedures for assembling and disassembling a computer system
9) Install and configure internal hardware components using industry best practices
10) Analyze hardware compatibility when selecting replacement or upgrade components
11) Evaluate system performance issues related to hardware configuration

3. Operating Systems and System Configuration

Objective: *Students will install, configure, and manage operating systems in order to support computer functionality, user needs, and system maintenance.*

12) Compare the features and functions of common operating systems, including Windows, Linux, and macOS

13) Install and configure an operating system based on device and user requirements
14) Navigate system settings, administrative tools, and control panels to manage system functionality
15) Apply command-line and safe mode tools to diagnose and resolve system issues
16) Manage drivers, updates, user accounts, and software settings for system stability
17) Analyze startup, configuration, and performance issues in an operating system environment
18) Evaluate operating system settings to improve efficiency, usability, and maintenance

4. Storage, File Systems, and Data Management

Objective: *Students will analyze storage technologies and apply file management practices in order to protect, organize, and maintain digital data.*

19) Identify types of storage devices and compare their uses, capacities, and performance
20) Explain how file systems support data storage and retrieval
21) Install, configure, and troubleshoot storage devices
22) Organize files, folders, and partitions to support efficient system use
23) Apply backup and recovery strategies to protect data
24) Analyze storage-related issues and recommend corrective actions
25) Evaluate data management practices for security, efficiency, and reliability

5. Networking and Connectivity Fundamentals

Objective: *Students will explain and apply foundational networking concepts in order to configure, maintain, and troubleshoot computer system connectivity.*

26) Define key networking concepts related to computer systems
27) Explain the purpose of IP addressing, protocols, and basic connectivity services
28) Configure wired and wireless network settings on a computer system
29) Diagnose common connectivity issues related to network hardware, software, and settings
30) Compare wired and wireless networking environments based on performance and use case
31) Analyze network symptoms to determine likely causes of communication problems
32) Evaluate connectivity solutions using technical evidence and troubleshooting data

6. Cyber Hygiene and System Security

Objective: *Students will apply cybersecurity best practices in order to secure devices, protect user data, and reduce system vulnerabilities.*

33) Explain the importance of cybersecurity in computer systems management
34) Identify common threats such as malware, phishing, unauthorized access, and unsafe user behavior
35) Apply authentication, access control, and password management practices to protect devices
36) Configure security settings to improve device and data protection
37) Use encryption, backups, and secure update practices to reduce risk

38) Analyze system vulnerabilities and propose appropriate security responses
39) Evaluate security practices for effectiveness, usability, and responsible technology use

7. Peripheral Devices, Printing, and External Hardware

Objective: *Students will install, configure, and troubleshoot peripheral devices in order to support user productivity and system functionality.*

40) Identify common peripheral devices and describe their functions
41) Install and configure printers, scanners, and other external hardware
42) Update drivers and settings for peripheral device compatibility
43) Troubleshoot common issues related to printers and external devices
44) Analyze peripheral performance problems using diagnostic procedures
45) Perform routine maintenance on external hardware
46) Evaluate device configuration choices based on user needs and system requirements

8. Laptops, Mobile Devices, and Portable Computing

Objective: *Students will analyze, configure, and troubleshoot laptops and mobile devices in order to support portable computing in personal and professional settings.*

47) Identify components unique to laptops and mobile devices
48) Compare portable device hardware and operating system requirements
49) Configure device settings, connectivity, and updates for mobile and laptop systems
50) Troubleshoot common performance, hardware, battery, and connectivity issues
51) Analyze differences between desktop and portable device maintenance needs
52) Apply best practices for protecting portable devices and user data
53) Evaluate device solutions for portability, efficiency, and user support

9. Troubleshooting, Diagnostics, and Preventive Maintenance

Objective: *Students will apply systematic troubleshooting methods and preventive maintenance procedures in order to diagnose problems, improve system stability, and extend device life.*

54) Explain the purpose of structured troubleshooting in computer systems support
55) Apply a step-by-step troubleshooting process to hardware, software, and connectivity issues
56) Use logs, utilities, and diagnostic tools to identify system problems
57) Test possible solutions and revise actions based on observed results
58) Perform preventive maintenance to improve reliability and performance
59) Document symptoms, steps taken, results, and final resolutions clearly
60) Evaluate the effectiveness of maintenance and troubleshooting strategies over time

10. Technical Support and Customer Service Communication

Objective: *Students will demonstrate professional communication and support strategies in order to assist users, document service needs, and resolve technical problems effectively.*

61) Demonstrate effective verbal and written communication when assisting users
62) Interpret user-reported problems and ask clarifying questions to gather relevant information
63) Provide step-by-step technical guidance using clear and appropriate language
64) Document service requests, actions, and outcomes using organized support procedures
65) Apply problem-solving strategies when resolving customer issues
66) Analyze support scenarios to determine appropriate technical and interpersonal responses
67) Evaluate customer service interactions for professionalism, clarity, and effectiveness

11. Work-Based Learning and Professional Practice

Objective: *Students will apply computer systems knowledge and professional behaviors in authentic workplace settings in order to strengthen readiness for technical support environments.*

68) Apply technical computer systems skills during labs, simulations, or service-based tasks
69) Demonstrate punctuality, responsibility, and accountability during project work
70) Follow workplace safety and equipment-handling expectations in technical environments
71) Document procedures, maintenance actions, and troubleshooting steps using professional language
72) Collaborate with peers or stakeholders to complete support and maintenance tasks
73) Reflect on work quality, productivity, and growth in technical practice
74) Evaluate how workplace expectations influence technical decisions and service delivery

12. Leadership and Team-Based Technical Operations

Objective: *Students will demonstrate leadership, collaboration, and ethical responsibility in order to contribute effectively to team-based technical projects and support environments.*

75) Collaborate with team members to complete technical tasks and shared goals
76) Demonstrate leadership by organizing responsibilities, assisting peers, and contributing solutions
77) Communicate technical information clearly during planning, troubleshooting, and presentation activities
78) Evaluate individual and team contributions using feedback and reflection
79) Defend technical decisions using evidence and appropriate terminology
80) Practice ethical decision-making and respectful communication in team settings
81) Set goals for continued leadership growth in technical environments

13. Final Assessment Project

Objective: *Students will design, configure, troubleshoot, document, and present a complete computer systems solution that demonstrates technical proficiency, problem solving, and professional communication.*

82) Plan a computer systems project based on defined user or organizational needs
83) Assemble, configure, or upgrade a computer system using appropriate hardware and software components
84) Apply operating system, networking, and security concepts within the project
85) Diagnose and resolve system issues encountered during implementation
86) Document project procedures, system specifications, and troubleshooting actions clearly
87) Present the completed system and justify design, configuration, and support decisions
88) Evaluate project outcomes and recommend next steps for improvement or expansion

14. 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 Systems
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 collaborate during hands-on labs, troubleshooting activities, and customer service simulations that require clear communication, active listening, and teamwork.
Standard 1: Oral Expression and Listening	Prepared Graduate 2 – Oral Presentations	Deliver effective oral presentations	Students explain system configurations, troubleshooting steps, and technical solutions to peers, instructors, or clients.
Standard 2: Reading for All Purposes	Prepared Graduate 4 – Informational Texts	Read a wide range of informational texts	Students read and interpret technical manuals, operating system documentation, hardware specifications, safety procedures,

			and industry standards.
Standard 2: Reading for All Purposes	Prepared Graduate 5 – Language in Context	Understand how language functions in different contexts	Students use precise technical vocabulary and adjust communication styles when explaining concepts to technical peers versus end users.
Standard 3: Writing and Composition	Prepared Graduate 7 – Informational Writing	Craft informational/explanatory texts	Students produce written documentation such as system setup guides, troubleshooting logs, and service reports.
Standard 3: Writing and Composition	Prepared Graduate 9 – Writing Process	Demonstrate mastery of the writing process	Students revise and finalize technical documentation to ensure clarity, accuracy, and professionalism.
Standard 4: Research Inquiry and Design	Prepared Graduate 10 – Research and Ethics	Gather and ethically use information	Students research hardware, software, and security practices, evaluate sources for reliability, and apply information ethically and responsibly.

Free Resource Links

1. Career Exploration and Postsecondary Opportunities

- CompTIA IT Career Pathways (certifications, career pathways, industry skills) https://www.comptia.org/content/it-careers-path-roadmap
- O NET Online IT Careers (job roles, skills, work environments) https://www.onetonline.org
- CareerOneStop Technology Careers (career exploration, job outlook, education pathways) https://www.careeronestop.org/ExploreCareers/explore-careers.aspx
- Colorado Community Colleges (postsecondary programs, certificates, degrees) https://cccs.edu

2. Computer Hardware and System Architecture

- How Computers Work Hardware Guide (components, system architecture, hardware basics) https://www.howtogeek.com
- Intel Processor Basics (CPU architecture, processing, components) https://www.intel.com
- Computer Hope Hardware Overview (components, functions, computer parts) https://www.computerhope.com
- PCPartPicker Build Guides (hardware compatibility, system assembly) https://pcpartpicker.com

3. Operating Systems and System Configuration

- Microsoft Learn Windows Fundamentals (OS features, configuration, system tools) https://learn.microsoft.com/windows
- Linux Journey (command line, OS management, system navigation) https://linuxjourney.com
- Apple macOS User Guide (system settings, configuration, usability) https://support.apple.com/macos
- GeeksforGeeks Operating Systems (types, functions, management) https://www.geeksforgeeks.org/operating-systems/

4. Storage File Systems and Data Management

- Western Digital Storage Basics (storage devices, performance, data storage) https://www.westerndigital.com
- Microsoft File Management Guide (files, folders, permissions) https://support.microsoft.com/windows
- Backblaze Backup Guide (backup strategies, recovery, data protection) https://www.backblaze.com
- Google Drive Help Center (cloud storage, file organization, sharing) https://support.google.com/drive

5. Networking and Connectivity Fundamentals

- Cisco Networking Basics (networking concepts, connectivity, infrastructure) https://skillsforall.com
- IBM Networking Overview (network systems, communication, connectivity) https://www.ibm.com/topics/networking
- Cloudflare Learning Networking (IP addressing, protocols, connectivity) https://www.cloudflare.com/learning
- Computer Hope Networking Guide (network basics, communication systems) https://www.computerhope.com

6. Cyber Hygiene and System Security

- CISA Cybersecurity Resources (security practices, risk reduction, awareness) https://www.cisa.gov
- Stay Safe Online (cyber hygiene, safe computing, awareness) https://staysafeonline.org
- Microsoft Security Basics (authentication, updates, protection) https://learn.microsoft.com/security
- Kaspersky Cybersecurity Fundamentals (threats, vulnerabilities, defense) https://www.kaspersky.com/resource-center

7. Peripheral Devices Printing and External Hardware

- HP Printer Support (printer setup, troubleshooting, maintenance) https://support.hp.com
- Epson Support Resources (printer configuration, diagnostics) https://epson.com/Support
- Logitech Device Support (peripherals, drivers, configuration) https://support.logi.com
- TechTarget Peripheral Devices Guide (external hardware, devices, usage) https://www.techtarget.com

8. Laptops Mobile Devices and Portable Computing

- Intel Laptop Buying Guide (laptops, mobile hardware, performance) https://www.intel.com
- Apple iPhone User Guide (mobile systems, configuration, usage) https://support.apple.com/iphone
- Android Help Center (mobile device settings, troubleshooting, updates) https://support.google.com/android
- Lifewire Laptop Troubleshooting (mobile computing issues, performance) https://www.lifewire.com

9. Troubleshooting Diagnostics and Preventive Maintenance

- CompTIA Troubleshooting Guide (diagnostics, troubleshooting process, repair) https://www.comptia.org
- Microsoft Troubleshoot Windows (system repair, diagnostics, errors) https://support.microsoft.com/windows/troubleshoot

- iFixit Repair Guides (hardware repair, maintenance, diagnostics)
  https://www.ifixit.com
- HowToGeek PC Maintenance (preventive maintenance, optimization)
  https://www.howtogeek.com

10. Technical Support and Customer Service Communication

- Indeed Career Guide IT Support (communication, customer service, skills)
  https://www.indeed.com/career-advice
- Google IT Support Resources (technical communication, troubleshooting, support)
  https://grow.google
- Zendesk Customer Service Resources (support communication, service strategies)
  https://www.zendesk.com/resources
- HubSpot Customer Service Training (customer interaction, communication skills)
  https://academy.hubspot.com

11. Work Based Learning and Professional Practice

- LinkedIn Learning IT Skills (professional development, technical growth)
  https://www.linkedin.com/learning
- Coursera IT Certificates (technical training, applied skills)
  https://www.coursera.org
- Google Career Certificates IT (technical skills, workplace readiness)
  https://grow.google/certificates
- Harvard Online Professional Skills (professional practice, communication)
  https://online.hbs.edu

12. Leadership and Team Based Technical Operations

- MindTools Leadership Resources (leadership, teamwork, communication)
  https://www.mindtools.com
- Harvard Business Review Leadership (teamwork, decision making, leadership)
  https://hbr.org
- Atlassian Team Playbook (collaboration, teamwork, project coordination)
  https://www.atlassian.com/team-playbook
- Toastmasters Communication Resources (public speaking, leadership skills)
  https://www.toastmasters.org

13. Final Assessment Project

- GitHub (project documentation, version control, collaboration)
  https://github.com
- Microsoft Learn Labs (hands on labs, system configuration, projects)
  https://learn.microsoft.com/training
- CodeHS Projects (computer systems projects, practical applications)
  https://codehs.com
- Codecademy Computer Science Projects (hands on coding, system applications)
  https://www.codecademy.com

Technology Student Association – National Competitive Events

Technology Bowl

Objective: *Students will build broad knowledge of TSA, STEM concepts, computing systems, networking, troubleshooting, cybersecurity, and technology standards 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 computing systems, hardware, software, networking, security, 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 computing systems, networking, cybersecurity, and technology 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
- CompTIA A+ Certification Overview https://www.comptia.org/certifications/a
- GCFLearnFree – Computer basics and technology tutorials https://edu.gcfglobal.org/

Technology Student Association – National Competitive Events

Software Development

Objective: *Students will design, develop, document, test, and present a software application that responds to the annual TSA Software Development challenge.*

- Analyze the annual TSA Software Development challenge and identify the intended users, purpose, and functional requirements.
- Plan the software application using appropriate design tools such as pseudocode, flowcharts, diagrams, or wireframes.
- Develop a functioning software product using programming practices appropriate to the selected platform.
- Create documentation that explains the software purpose, development process, features, testing, and revisions.
- Apply quality assurance practices through testing, debugging, and refinement.
- Prepare a presentation or demonstration that explains the software solution and development decisions.
- Evaluate the final software using TSA criteria for functionality, design quality, documentation, usability, and presentation.

Resources

- Technology Student Association – Software Development competition guidelines https://tsaweb.org/competitions-programs/tsa/themes-problems
- GitHub Docs – Version control and project collaboration https://docs.github.com/
- Replit – Browser-based coding environment https://replit.com/
- Visual Studio Code Documentation https://code.visualstudio.com/docs

Technology Student Association – National Competitive Events

Webmaster

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

- Research the annual TSA Webmaster topic and identify the website's purpose, audience, content needs, and technical 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 technical practices related to file management, links, navigation, accessibility, usability, browser compatibility, and responsive layout.
- Launch the website on a publicly accessible web server according to TSA submission requirements.
- Test and troubleshoot the website for broken links, layout errors, access issues, readability, and functional problems.
- Participate in an interview explaining the website, technical decisions, research, troubleshooting process, and development workflow.

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/