

Artificial Intelligence Foundation

Level: 2

Career Cluster: Digital Technology

Program: Information Technology

Pathway(s): Coding

Course Catalog Description

This course introduces students to the basic concepts and applications of artificial intelligence within the Information Technology coding pathway. Students build introductory skills in coding, data literacy, computational thinking, and ethical AI use through hands-on, project-based learning.

Summary

This course introduces students to the foundational concepts, tools, and applications of artificial intelligence within the Information Technology coding pathway. Students examine how AI systems use data, algorithms, and machine learning to recognize patterns, make predictions, generate outputs, and support decision-making across a variety of industries and real-world contexts. Through hands-on learning experiences, students develop introductory skills in coding, data literacy, computational thinking, model design, and problem solving while exploring how artificial intelligence is used in areas such as automation, natural language processing, image recognition, and digital systems. The course also emphasizes ethical and responsible AI use by engaging students in discussions of fairness, bias, privacy, transparency, security, and the social impact of emerging technologies. As students progress through the course, they apply their understanding through collaborative activities, workplace-connected learning, and project-based experiences that encourage communication, creativity, leadership, and reflection.

Notes

Compared with the previous course, this revised document expands the course structure into a more detailed and sequenced framework with clearer objectives, numbered student learning outcomes, and stronger alignment to course organization and instructional planning. The earlier version emphasized broad topics such as algorithms, data, machine learning, neural networks, coding projects, and ethical AI in a compact list of outcomes, while the new version breaks those ideas into focused sections on data literacy, coding for AI, machine learning models, neural networks, ethical and responsible AI, AI applications, work-based learning, leadership, and a final assessment project. This updated course also strengthens career exploration, postsecondary opportunities, collaboration, workplace-connected learning, and project-based assessment, making the document more comprehensive, more instructionally specific, and better aligned to current expectations for pathway-based CTE course design.

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. Foundations of Artificial Intelligence

Objective: *Students will explain foundational concepts of artificial intelligence and distinguish among major types of AI systems and applications.*

- 5) Define artificial intelligence, machine learning, and model training using appropriate technical vocabulary.
- 6) Describe how AI systems use algorithms and data to make decisions or predictions.
- 7) Identify common examples of AI in everyday life and digital systems.
- 8) Differentiate among rule-based AI, machine learning, and generative AI.
- 9) Explain how AI differs from traditional programmed software.
- 10) Summarize how AI systems are trained, tested, and improved over time.
- 11) Recognize the role of coding in developing AI systems.

3. Data Literacy and Pattern Recognition

Objective: *Students will analyze data and recognize patterns that support introductory artificial intelligence systems.*

- 12) Identify different types of data used in AI systems.
- 13) Collect and organize data for use in a simple AI task.
- 14) Analyze datasets to identify patterns, trends, or categories.
- 15) Explain why data quality affects AI system performance.

- 16) Prepare data for use in a beginner-level AI model.
- 17) Compare structured and unstructured data in AI contexts.
- 18) Interpret simple visualizations or outputs to support data-based conclusions.

4. Coding for Artificial Intelligence

Objective: *Students will apply foundational coding skills to create, test, and modify simple AI-driven programs.*

- 19) Apply foundational coding concepts to support AI tasks.
- 20) Write simple programs that input, process, and output data for an AI-related purpose.
- 21) Use variables, conditionals, loops, and functions in beginner-level AI programs.
- 22) Modify code to improve the behavior or accuracy of an AI-driven application.
- 23) Test code to verify that inputs and outputs function as expected.
- 24) Debug coding errors that affect an AI model or program.
- 25) Document code using comments and clear naming conventions.

5. Introductory Machine Learning Models

Objective: *Students will design and implement beginner-level machine learning models to solve simple problems.*

- 26) Describe the purpose of a machine learning model.
- 27) Explain the difference between training data and testing data.
- 28) Design a simple classifier or predictor using beginner-appropriate tools.
- 29) Implement an introductory machine learning model to solve a basic problem.
- 30) Compare expected results to actual model outputs.
- 31) Evaluate whether a model performs its task accurately enough for its intended purpose.
- 32) Revise a model or dataset to improve performance.

6. Neural Networks and Emerging AI Tools

Objective: *Students will examine introductory neural network concepts and explore how emerging AI tools are used to solve problems.*

- 33) Describe the basic idea of a neural network in simplified terms.
- 34) Identify situations where neural networks are used in modern AI systems.
- 35) Explain how AI tools support tasks such as image recognition, language processing, or prediction.
- 36) Compare different AI tools based on purpose and output.
- 37) Analyze examples of computer vision or natural language processing applications.
- 38) Use beginner-friendly AI tools to explore how model outputs are generated.
- 39) Evaluate the strengths and limitations of emerging AI tools.

7. Ethical and Responsible Artificial Intelligence

Objective: *Students will evaluate ethical considerations related to AI systems, including bias, privacy, fairness, and responsible use.*

- 40) Describe ethical issues related to artificial intelligence, including bias and privacy.
- 41) Explain how biased or incomplete data can affect model outcomes.
- 42) Identify risks and benefits associated with AI technologies.
- 43) Analyze example scenarios involving responsible or irresponsible AI use.
- 44) Evaluate AI systems for fairness, transparency, and appropriate use.
- 45) Apply responsible digital practices when using AI tools and datasets.
- 46) Justify design choices that support ethical and responsible AI development.

8. AI Applications and Problem Solving

Objective: *Students will apply artificial intelligence concepts to investigate and solve real-world problems through structured design and iterative improvement.*

- 47) Identify real-world problems that can be addressed with AI.
- 48) Analyze a problem to determine what type of AI approach may be appropriate.
- 49) Design a simple AI solution for a defined need or challenge.
- 50) Apply computational thinking to break a problem into manageable parts.
- 51) Test and refine an AI-based solution through iterative development.
- 52) Evaluate whether the selected AI approach meets the intended goal.
- 53) Explain how AI supports problem-solving in automation, data analysis, or digital systems.

9. Work-Based Learning

Objective: *Students will apply foundational AI and coding skills through workplace-connected or real-world project experiences.*

- 54) Describe how AI tools and systems are used to support real-world tasks and decision-making.
- 55) Participate in project tasks that simulate client, user, or workplace needs.
- 56) Apply AI and coding skills to complete an authentic or workplace-connected challenge.
- 57) Follow project requirements, timelines, and expectations during applied tasks.
- 58) Use feedback to improve project performance or technical solutions.
- 59) Document the tasks completed, tools used, and results produced during a project.
- 60) Reflect on how classroom learning connects to practical AI applications.

10. Leadership in Artificial Intelligence Projects

Objective: *Students will demonstrate leadership, collaboration, and responsibility while participating in AI and coding projects.*

- 61) Demonstrate effective communication during AI project work.
- 62) Collaborate with peers to plan, test, and improve AI solutions.
- 63) Take responsibility for assigned roles, tasks, and deadlines.
- 64) Support group problem-solving through constructive feedback and active participation.
- 65) Demonstrate organization and time management in team settings.

- 66) Reflect on leadership strengths and areas for growth.
- 67) Contribute to a respectful and ethical project environment.

11. Final Assessment Project

Objective: *Students will design, develop, test, evaluate, and present an introductory AI project that demonstrates course knowledge and technical skill.*

- 68) Plan an AI project using a defined problem, goal, and success criteria.
- 69) Design a solution that uses data, algorithms, and coding to address the problem.
- 70) Develop a beginner-level AI model or AI-supported program.
- 71) Test the project using sample data or real inputs.
- 72) Evaluate the project for accuracy, limitations, and ethical considerations.
- 73) Revise the project based on testing results or feedback.
- 74) Present the final project and explain design choices, data use, and outcomes.
- 75) Reflect on strengths, challenges, and next steps for improvement.

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: Artificial Intelligence 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 collaborate on analyzing AI problems, discussing ethical implications, and working together on investigations and projects related to AI applications.
Standard 1: Oral Expression and Listening	Prepared Graduate 2 – Oral Presentations	Deliver effective oral presentations	Students explain AI concepts, systems, and impacts through class discussions, presentations, or demonstrations tailored to varied audiences.
Standard 2: Reading for All Purposes	Prepared Graduate 4 – Informational Texts	Read a wide range of informational texts	Students read and interpret technical descriptions, case studies, data explanations, and non-fiction texts related to artificial intelligence.
Standard 2: Reading for All	Prepared Graduate 5 –	Understand how language functions in different	Students interpret and use discipline-

Purposes	Language in Context	contexts	specific AI terminology and adjust communication to explain complex ideas clearly in academic and real-world contexts.
Standard 3: Writing and Composition	Prepared Graduate 7 – Informational Writing	Craft informational/explanatory texts	Students produce explanations, summaries, reflections, or reports that describe how AI systems function and how they affect society.
Standard 3: Writing and Composition	Prepared Graduate 9 – Writing Process	Demonstrate mastery of the writing process	Students revise and refine written explanations and analyses to ensure clarity, coherence, and accuracy when communicating technical content.
Standard 4: Research Inquiry and Design	Prepared Graduate 10 – Research and Ethics	Gather and ethically use information	Students research AI technologies and applications, evaluate credibility and bias, and address ethical considerations such as data use, fairness, and privacy.

Free Resource Links

1. Career Exploration and Postsecondary Opportunities

- Colorado Career Cluster Model Info (career pathways, industry sectors, program planning)
<https://cccs.edu/workforce-education/colorado-career-cluster-model/>
- O NET OnLine (career exploration, job descriptions, skills)
<https://www.onetonline.org/>
- Colorado Community College System (postsecondary options, certificates, degrees)
<https://cccs.edu/>
- Computer Science Careers (technology careers, pathways, job outlook)
<https://www.bls.gov/ooh/computer-and-information-technology/home.htm>

2. Foundations of Artificial Intelligence

- Code.org Artificial Intelligence (AI basics, introductory lessons, high school)
<https://code.org/en-US/artificial-intelligence>
- Elements of AI (AI fundamentals, beginner course, concepts)
<https://www.elementsofai.com/>
- MIT RAISE Resources (AI literacy, foundational concepts, educator tools)
<https://raise.mit.edu/resources/>
- Khan Academy Introduction to AI and Machine Learning (AI overview, machine learning basics, video)
<https://www.khanacademy.org/partner-content/yuva-ai-for-all/x11a06d2ab0cc5322:yuva-ai/x11a06d2ab0cc5322:module-1/v/introduction-to-ai-and-machine-learning>

3. Data Literacy and Pattern Recognition

- Day of AI Curriculum Resources (data science, AI literacy, classroom lessons)
<https://dayofai.org/curriculum-resources>
- AI4K12 Curriculum Materials (machine learning, data, K–12 curriculum)
<https://ai4k12.org/curriculum-materials/>
- Machine Learning for Kids (training data, classification, beginner projects)
<https://machinelearningforkids.co.uk/>
- Teachable Machine (pattern recognition, model training, image sound pose)
<https://teachablemachine.withgoogle.com/>

4. Coding for Artificial Intelligence

- Teachable Machine (no code model building, AI projects, prototyping)
<https://teachablemachine.withgoogle.com/>
- Machine Learning for Kids (Scratch integration, Python integration, coding with AI)
<https://machinelearningforkids.co.uk/>
- Code.org AI Curriculum (coding activities, AI exploration, classroom resources)
<https://code.org/en-US/artificial-intelligence>

- MIT App Inventor (app design, AI extensions, beginner programming)
<https://appinventor.mit.edu/>

5. Introductory Machine Learning Models

- Teachable Machine (classification models, training and testing, beginner ML)
<https://teachablemachine.withgoogle.com/>
- Machine Learning for Kids (supervised learning, model design, student projects)
<https://machinelearningforkids.co.uk/>
- Microsoft Learn Introduction to Machine Learning Concepts (ML concepts, training, evaluation, deep learning)
<https://learn.microsoft.com/en-us/training/modules/fundamentals-machine-learning/>
- AI4K12 Curriculum Materials (AI and ML modules, instructional materials, examples)
<https://ai4k12.org/curriculum-materials/>

6. Neural Networks and Emerging AI Tools

- Elements of AI Course (neural networks, AI concepts, societal implications)
<https://course.elementsofai.com/>
- MIT RAISE Day of AI (AI tools, applications, emerging technologies)
<https://dayofai.org/>
- Experiments with Google Teachable Machine (interactive AI tools, model exploration, demos)
<https://experiments.withgoogle.com/teachable-machine>
- Code.org AI Resources (AI tools, lessons, current classroom applications)
<https://code.org/en-US/artificial-intelligence>

7. Ethical and Responsible Artificial Intelligence

- MIT RAISE AI and Ethics (AI ethics, bias, stakeholder analysis)
<https://raise.mit.edu/resources/curricula/ai-and-ethics/>
- Common Sense Education AI Literacy Toolkit for Families (AI literacy, safe use, ethical considerations)
<https://www.commonsense.org/education/families-ai-literacy-toolkit>
- Day of AI Curriculum Resources (responsible AI, ethics lessons, classroom activities)
<https://dayofai.org/curriculum-resources>
- Code.org AI for Oceans (bias, ethical use, machine learning activity)
<https://code.org/oceans>

8. AI Applications and Problem Solving

- Code.org Artificial Intelligence (real world applications, problem solving, projects)
<https://code.org/en-US/artificial-intelligence>
- MIT RAISE Resources (AI applications, student activities, AI literacy)
<https://raise.mit.edu/resources/>

- Day of AI Curriculum Resources (AI problem solving, investigations, interdisciplinary lessons)
<https://dayofai.org/curriculum-resources>
- AI Literacy Resources for Educators and Learners (applications, design, safety, ethics)
<https://ailiteracyday.org/resources>

9. Work-Based Learning

- O NET OnLine (workplace skills, job tasks, technology occupations)
<https://www.onetonline.org/>
- Code.org Artificial Intelligence (career connections, classroom to industry, AI pathways)
<https://code.org/en-US/artificial-intelligence>
- Microsoft Learn AI and Machine Learning Training (workforce skills, technical training, career readiness)
<https://learn.microsoft.com/en-us/training/modules/fundamentals-machine-learning/>
- Colorado Career Cluster Model Info (career readiness, pathways, employability)
<https://cccs.edu/workforce-education/colorado-career-cluster-model/>

10. Leadership in Artificial Intelligence Projects

- Day of AI (collaboration, project learning, communication)
<https://dayofai.org/>
- Code.org Artificial Intelligence (team projects, design thinking, student leadership)
<https://code.org/en-US/artificial-intelligence>
- MIT App Inventor (team app development, problem solving, leadership roles)
<https://appinventor.mit.edu/>
- MIT RAISE Resources (project based learning, collaboration, classroom implementation)
<https://raise.mit.edu/resources/>

11. Final Assessment Project

- Teachable Machine (final project tool, model creation, testing)
<https://teachablemachine.withgoogle.com/>
- Machine Learning for Kids (student capstone ideas, coding projects, AI models)
<https://machinelearningforkids.co.uk/>
- MIT App Inventor (app based final projects, AI extensions, prototypes)
<https://appinventor.mit.edu/>
- AI Literacy Resources for Educators and Learners (project ideas, instructional tools, showcase resources)
<https://ailiteracyday.org/resources>



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/>



Technology Student Association – National Competitive Events

Data Science and Analytics

Objective: Students will collect, analyze, visualize, document, and present a data set connected to the annual TSA Data Science and Analytics theme.

- Research the annual TSA Data Science and Analytics theme and identify a focused topic for investigation.
- Collect or compile a data set of at least 500 rows from credible and relevant sources.
- Analyze data to identify trends, patterns, relationships, limitations, and possible predictions.
- Create a digital scientific poster that communicates the research question, data source, visualizations, analysis, and findings.
- Prepare a documentation portfolio explaining methods, data collection, analysis, conclusions, and resources.
- Present the digital scientific poster within the TSA time limit using clear, evidence-based communication.
- Complete an on-site semifinal challenge by creating a visual representation and brief synopsis from a provided data set.

Resources

- Technology Student Association – Data Science and Analytics competition guidelines
<https://tsaweb.org/competitions-programs/tsa/themes-problems>
- Kaggle Datasets – Public data sets for analysis
<https://www.kaggle.com/datasets>
- Google Dataset Search
<https://datasetsearch.research.google.com/>
- Tableau Public – Data visualization tools
<https://public.tableau.com/>



Technology Student Association – National Competitive Events

Debating Technological Issues

Objective: *Students will research, document, organize, and defend evidence-based arguments about technological issues in alignment with TSA Debating Technological Issues competition requirements.*

- Research the annual TSA debate topic and related subtopics from credible sources.
- Prepare a one-page summary of references using MLA format according to TSA competition requirements.
- Develop evidence-based pro and con arguments for multiple technological issue subtopics.
- Organize claims, evidence, reasoning, cross-examination questions, and rebuttal points for timed debate rounds.
- Use clear, concise, and persuasive language appropriate for a formal debate setting.
- Respond to opposing arguments through questioning, analysis, and rebuttal.
- Evaluate debate performance using TSA criteria for research, argument quality, communication, reasoning, and professionalism.

Resources

- Technology Student Association – Debating Technological Issues competition guidelines
<https://tsaweb.org/competitions-programs/tsa/themes-problems>
- Purdue OWL – MLA Formatting and Style Guide
<https://owl.purdue.edu/owl/researchandcitation/mlastyle/mlaformattingandstyleguide/>
- National Speech & Debate Association – Debate resources
<https://www.speechanddebate.org/>
- National Institute of Standards and Technology – Artificial Intelligence Risk Management Framework
<https://www.nist.gov/itl/ai-risk-management-framework>